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Transforming Health Care Through Information

Second Edition

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With 11 Illustrations

Springer

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Robert T. Riley PhD
June 26, 1937–January 18, 2003

Bob Riley was not only one of the original editors of the first edition of *Transforming Health Care Through Information: Case Studies*, he was *the* managing editor! In that role he personally edited all the cases and ensured that they were more readable and had a sense of balance and humor.

Bob was a tenured faculty member at the University of Cincinnati, College of Business Administration, until he founded Riley Associates, a successful international consulting and training firm. He was nationally and internationally acclaimed for his presentations, his management development seminars, and his consulting skills. He authored several books and numerous articles on management and on managing technological change.

Bob was known for his humor, his constant quest for new knowledge, his ability to understand and solve problems, his ability to make friends, and his ability to teach others. Bob was active in the early stages of planning this book. Tragically on January 18, 2003, he lost his two-year battle with cancer. We miss his presence very much.

Nancy M. Lorenzi
Joan S. Ash
Jonathan Einbinder
Wendy McPhee
Laura Einbinder

To all those who realize that informatics
is transforming health care
and
to those who soon will

Series Preface

This series is directed to healthcare professionals who are leading the transformation of health care by using information and knowledge. Launched in 1988 as Computers in Health Care, the series offers a broad range of titles: some addressed to specific professions such as nursing, medicine, and health administration; others to special areas of practice such as trauma and radiology. Still other books in the series focus on interdisciplinary issues such as the computer-based patient record, electronic health records, and networked healthcare systems.

Renamed Health Informatics in 1998 to reflect the rapid evolution in the discipline now known as health informatics, the series will continue to add titles that contribute to the evolution of the field. In the series, eminent experts, serving as editors or authors, offer their accounts of innovations in health informatics. Increasingly, these accounts go beyond hardware and software to address the role of information in influencing the transformation of healthcare delivery systems around the world. The series will also increasingly focus on "peopleware" and the organizational, behavioral, and societal changes that accompany the diffusion of information technology in health services environments.

These changes will shape health services in the next millennium. By making full and creative use of the technology to tame data and to transform information, health informatics will foster development of the knowledge age in health care. As coeditors, we pledge to support our professional colleagues and the series readers as they share advances in the emerging and exciting field of health informatics.

Kathryn J. Hannah
Marion J. Ball

Preface

Thorough understanding of, and careful attention to, people and organizational issues are essential for successful healthcare information technology initiatives. Despite this, very few case studies about healthcare information technology—either successes or failures—have been published. For instance, the case collections at Harvard Business School and the Darden School of the University of Virginia contain virtually no cases about healthcare information technology. As a result, students and faculty have turned to other sources, though these vary considerably in content, length, format, and suitability for use in the classroom. One of the more frequently cited examples is Massaro's[1] description of a difficult order entry implementation. In 1995, Lorenzi and colleagues[2] published a book of case studies—the first edition of *Transforming Health Care Through Information*.

At the same time, rapid and groundbreaking developments in information technology, presentation, and processing have translated into an increased interconnection between business and policy issues and healthcare informatics. As a result, the value of informatics is becoming recognized outside traditional departments, and informatics trainees are assuming positions outside academic settings.

Case studies may be useful for many readers but are particularly valuable in the classroom where learners can become active participants in the learning process by experiencing thought-provoking discussions with their colleagues. The case study method uses reports of "real-life" experiences "to narrow the gap between theory and practice," pressing students to analyze real situations, come to conclusions, and defend these conclusions among their peers.[3] The purpose of the second edition of *Transforming Health Care Through Information* is to continue to fill this gap in the healthcare informatics literature.

Jonathan Einbinder

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Special acknowledgment also is made to Laura Einbinder who so very capably managed the entire process. If not for Laura, this book would not have been published.

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Section I
Case Studies in Technological Change

Introduction

Nancy M. Lorenzi

Health care throughout the world is becoming increasingly complex. Almost every major economy in the world experiences the effects of the high cost of health care, and many, if not most, national and regional governments are in some stage of healthcare reform. However, the changes associated with health care are not easy to understand. They are complex, political, technical, and rapid, and there does not seem to be any end in sight. Neither those working within the healthcare system on a daily basis nor those on the outside seem to be able to comprehend the expansive changes. Furthermore, most people have very definite—and sometimes quite emotional—opinions about what should be done to improve the system.

For a variety of reasons, health care has traditionally been a "dabbler" in the information technology area. Many healthcare organizations are still functioning with information systems that by contemporary business standards are ludicrous for organizations of their size (i.e., as measured by "sales," capital investment, or number of employees). However, this situation is rapidly changing. These healthcare organizations are realizing that information technology is transforming health care.

Today, there is a greater need for information to support decision making both in clinical arenas and in administrative-financial arenas. Thus, the effective and efficient use of integrated information systems is crucial for healthcare organizations and their success. It is within this framework of change that we have assembled the case studies included in this book. We can use these case studies to peer into a variety of organizational windows and begin to see how people are addressing the issues of healthcare information technology in today's complex environment.

Why Cases?

A major question is, "How do we help those who will be responsible for managing technological change understand all the issues involved in the process?" Case studies offer us an opportunity to study a wide range of directions and actions being taken in institutions around the world to address the healthcare issues raised by the use of information technology.

The first case studies book on medical informatics was *Transforming Health Care Through Information: Case Studies* (Lorenzi, Riley, Ball, and Douglas). As part of the Springer-Verlag Computers in Health Care series, which addresses the practical side of healthcare informatics, this book provided access to previously unpublished case studies for use in management and educational settings and courses. Both instructors

and informatics students benefited from organizational case studies in healthcare informatics management.

Cases also give us an opportunity to learn from both the right things and the wrong things that others have done. Experience is a great teacher. However, if we rely only on our own experiences, we run into the issue highlighted by Mark Twain when he commented that the problem with the school of hard knocks is that its graduates are too old to hire. It is ideal if we can gain at least some insights from the experiences of others, thereby accelerating the learning process.

As we look at the implementation of changes—whether technological changes or system operation changes—we see several issues that must be considered in educating others about managing technological or systems changes. Five major issues that are difficult to convey to others but that are brought out by many cases are organizational change, implementation, economics, leadership and organizational and interpersonal conflicts.

Content Overview

Some casebooks include only cases, with no accompanying text. This book is divided into five major sections: change, implementation, economics, leadership, and conflict. Within each section is a brief, targeted introduction to a few key concepts, followed by cases related to the section topic. Some cases can apply to several different sections, as they illustrate a number of different points.

Change

The rate of change in virtually all organizations is escalating. However, this change is often not so exciting when you are on the receiving end. In fact, these changes may be downright threatening to many people. Therefore, the phrase *change management* has become fairly common, appearing in articles on management everywhere. Review the job ads in the *Wall Street Journal* or the Sunday edition of a major newspaper and notice the positions available for people skilled in change management.

What is change management? What is a change agent or a change management person? How does change management help people feel less threatened? How did it evolve, and why does everyone seem so fixated on it today? One reason for this fixation is a realization of the tremendous hidden costs involved in many informatics implementations. The initial cost of a system may be only the tip of the proverbial iceberg when implementing systems—even when the implementation is successful. Unless changes are managed well, the people costs, many of which are buried in other budgets, can skyrocket and dwarf the supposed cost of the system.

There are as many ways to introduce change in organizations as there are organizations themselves—the blend of people, prevailing philosophies, plans, and even pathos help create the mix for the overall change process. Change is usually planned within the context of specific needs, e.g., meeting competitive pressures or reassessing "what business should we be in?" The chapter for this section of the book will briefly cover some core change issues and will include cases that focus on the process and outcomes on introducing information systems into complex healthcare organizations.

Implementation

It is not always easy to know exactly why a particular group resists change. However, experience shows that intelligent application of a change model—coupled with a sound

technological implementation plan—leads to more rapid and more productive implementation of technology into organizations. The process can be expensive in terms of time and energy but nowhere near the cost of an expensive technical system that never gains real user acceptance.

The introduction to Section III of this book focuses on the challenges of current clinical information systems, such as determining the best ways to sell, design, implement, train for, and maintain the system. Some cases are success stories, whereas others deal with failed implementations, importantly addressing what and how things went wrong in the implementation process.

Change is difficult, but eventually it happens and systems are implemented. Stories about successful change continue to grow. Some change is smooth and some change is difficult, but nonetheless change happens. Several of the cases give an exposure to the individual styles and practices of some of today's top people in informatics implementation.

Economics

The true techie says, "If it can be done, it should be done!" The true bean counter says, "Show me a detailed cost-benefit analysis—and I don't want to see any of those phony soft benefits included!" In economic terms, today's optimal health informatics strategies lie somewhere between these two extremes. Healthcare systems everywhere are facing increased economic pressures; therefore, our informatics thrusts must recognize and adapt to these pressures.

Many healthcare organizations have been slow to realize just how critical information and its proper management are to the modern healthcare organization. As an example, hospitals in the United States typically spend 2 to 4 percent of their revenues on information systems, whereas other types of organizations typically spend 5 to 15 percent. Even in the late 1980s, there were still a few hospitals in the United States that could not produce an itemized, computerized bill on demand—let alone a revised one.

While computerization has lagged behind other industries in administrative areas, it has been even further behind in clinical areas. It is a general axiom of informatics that computers produce their greatest productivity benefits when they reach the hands of those on the "factory floor," i.e., the people in the system who actually produce the organization's goods or services.

Since all organizations must have an economic base for survival, the introduction to Section IV reviews some general economic perspectives, including current expenditures toward the changes, projected expenses, and projected economic value that the changes will add. The cases in this section will link financial issues with information systems today.

Leadership

Leaders are facilitators. They are individuals instrumental in guiding and directing the efforts of groups of workers toward achievement of the organization's goals and objectives. In addition to competition within the industry, today's health informatics leaders face tremendous political and time pressure. The range of the goals and objectives and the nature of leadership vary from organization to organization, but the effective performance of those in leadership positions is essential to the overall success of any organization. Similarly, weak or poor leadership can undermine projects and create lasting conflict.

Leaders have different styles. One style is not necessarily better than another, but it may fit the situation better. Some leaders are more capable of modifying their style depending on the situation, and such insight and flexibility are useful leadership traits. To lead, a person must have followers, and an important aspect of leadership includes the ability to take advantage of the capabilities of followers. An equally important aspect is the existence of a high level of trust between leaders and their followers.

Leaders, above all, articulate the vision of the organization and, to motivate those in the organization to strive to reach this vision, great leaders also make sure there is a strategy in place for propelling the organization toward that vision. The cases in Section V illustrate a wide range of leadership styles and strategies as well as different leadership philosophies concerning the value of planning, the approach to leading an organization with scarce resources, and the involvement of leadership in information technology rollout strategy.

Organizational and Interpersonal Conflict

All organizations create structures to enable their workers to accomplish the goals and objectives of the total organization. Some organizations are very hierarchical, others less so. There are also informal organizational links that aid or hinder accomplishment of the organization's goals and objectives.

The introduction to Section VI briefly reviews organizational and interpersonal conflicts and presents cases that are within the scope of this topic. It examines tensions that arise within power relationships and structures as well as between people. People differ in their value structures, personalities, talents, experience, and many other variables. As various professional groups and subgroups see their roles, status, procedures, and perhaps their incomes being "threatened" by change, the intergroup politics can become ferocious. In addition, rapid changes within information technology make it a volatile field, compounding the changes in health care. Several of the cases illustrate some very complex political forces at work within the organization.

The Cases and Their Authors

The people who wrote the cases for this book shared their thoughts, beliefs, and hopes—as well as their "battle scars." Their cases reveal the complexities that an organization faces when implementing technological systems by showing what actually occurs during the various implementation processes. This gives us a chance to see and feel the issues as the key implementers saw and felt them.

The writers of these cases represent many professions, including medicine, nursing, information systems, organizational development, business, public health, and education. They have taken time to explain their information systems issues, conveying both positive and negative developments. Reading these cases is an opportunity to discover what has happened in healthcare institutions and systems around the world.

As in the real world, these cases are "messy"—and this is intentional on our part. The cases do not conform to a standard format. The writers have followed different formats, varying from the traditional business case format to the traditional medical case format. All these approaches are legitimate, and they provide the reader with a look at how different groups in the healthcare arena present and consume information. Jargon is not always explained, and many undefined acronyms are used. Welcome

to the real world of informatics! As it turns out, a number of undefined elements do not really matter in analyzing the case; however, some do.

The cases described here are real. However, fictitious names are used in some cases, and some data or details may have been altered to protect the innocent—or perhaps the guilty. The lessons learned from these cases may help us to avoid making expensive, and perhaps even life-threatening, mistakes. Many of the authors are pioneers in their areas and had to develop their strategies with little to guide them. The hope is that this book will allow those who follow to learn from the experience of these pioneers.

These cases can be used either for classroom learning or in support of a self-learning process. The case authors have either witnessed or experienced the stress caused by the introduction of change, especially technological change. One of their goals is to reduce this personal and organizational pain for others. We hope that these real-life cases will be the catalyst (or the big stick!) that motivates the people responsible for introducing change to actually change their behavior.

Case Introduction

The case presented in Chapter 1 illustrates the richness of the case approach in understanding the complexities of introducing technological change into a healthcare organization. It provides an overview of the people who work within one organization and the problems and issues that the organizational leader faces in attempting to implement an information system. The people here are representative of those found in many healthcare organizations.

Three people wrote the case as part of the educational program at the University of Virginia. GEMINI is a prognostic information system designed to gauge the severity and risk of hospital mortality for critically ill adults. It can potentially enhance decision making by supplementing the information on which to base tests, treatments, and do not resuscitate (DNR) assessments. The case chronicles the failed implementation of the system at an academic medical center by presenting the perspectives of administrators, physicians, and house staff and the barriers that prohibited successful implementation. Lessons include the importance of a common organizational vision, effective advocacy by influential persons, regular communication of goals among levels, adequate allocation of resources for unanticipated shortcomings, sufficient technical training of staff, an appreciation for perceptions of need, and cultivation of an active association so that members of the organization feel vested in the success of the project.

It is one thing to be very successful in an organization when you have the luxury of personally controlling all aspects of the effort, including the external vendor. However, unless we are living a dream, this is generally not the case. The more typical challenge is how to appraise systems, people, and processes for technology implementations. How do you decide whom to put in charge, especially when no one comes close to your "ideal" criteria? Assume that you are the leader of this organization. Follow along and think about your decisions and your actions. What would you have done differently? What would you do to ensure organizational success?

1
GEMINI: The Life and Times of a Clinical Information System

Navid Fanceian and Lisa Shickle

Decision to Deimplementation

It was a gray day. The light sound of rain on the window gave the office a peaceful calm. Outside the door, music from the assistant's radio filled the office, creating a warm, pleasant ambience. But the thoughts of Dr. David Billings* weren't as peaceful, as he considered the opposing factions turning his confidence into doubt about his decision. Billings was the director of medical affairs for University Hospital (UH), a nationally known academic teaching hospital recognized as one of the top 100 and one of the top 25 major teaching hospitals in the United States. Billings was passionate about the distinction the hospital had earned and was apprehensive both about changing what had worked and about not adapting to remain competitive.

Dr. Billings was brought out of his reflective state by a new e-mail message activating an alert from his computer. Dr. John Cleary, codirector of the surgical intensive care unit (SICU) at the medical center, was requesting a meeting to complete the deimplementation of GEMINI. ". . . Good riddance to that system," Dr. Cleary concluded on a sour note. The message's matter-of-fact manner exemplified the negative perceptions about the project. It troubled Billings that a clinical information system with so much potential did not work at UH. Other institutions had successfully implemented GEMINI—why had UH failed to do the same? The potential benefits of the system were great, but the obstacles overwhelmed the medical center. "Was it the right choice to abandon GEMINI?" Billings whispered aloud. "What was the right choice?" Billings remembered a time when he was excited by the idea of installing GEMINI at the center and was much more hopeful about its potential.

GEMINI Advocate

Dr. Edward Morgan began a dialog with Billings in the early 1990s about the GEMINI system. Dr. Morgan was director of the SICU at UH between 1987 and 1998. In the early 1990s, he became aware of medicine's inevitable convergence toward evidence-based practice and a shift in focus from individual patient care to the care of larger populations. Providers were becoming increasingly conscious of the need for higher levels of quality and access as well as lower costs in competing in the market. In early letters to Billings, Morgan explained how he was convinced that GEMINI could

* In the interest of confidentiality, names and locations have been changed.

improve the performance of hospital intensive care units (ICUs) and provide a competitive edge.

GEMINI

GEMINI is a prognostic system designed to measure the severity of illness and risk of hospital mortality for critically ill adults. The development of GEMINI began in the late 1970s by researchers at Eaton University Medical Center and has undergone continuous refinement. The original GEMINI was introduced to the intensive care medicine community in 1979. The two components of the GEMINI prognostic system are (1) a score to provide initial risk stratification for patients within independently defined groups and (2) a predictive equation that uses the score and reference data on major disease categories and treatment location immediately prior to ICU admission to estimate the risk of mortality.[1] The GEMINI logic was developed, packaged, and marketed in the form of a proprietary clinical information system. GEMINI can provide real-time risk-of-mortality assessments for individual patients and requires dedicated data collection and entry during the first 48 hours of admission, with regular updates thereafter.

Most critically ill patients admitted for active treatment or monitoring are at a higher risk of mortality than non-ICU patients. It is a patient's severity of illness, either acute or chronic, and need for unique ICU treatments that most directly determine the need for, and potential benefit from, ICU services.[2] These factors are incorporated into GEMINI equations.

A primary strength of GEMINI derives from its ability to serve both as a clinical decision tool that measures the severity of illness and risk of various outcomes such as mortality and as an administrative tool for benchmarking adult ICUs. As many as forty hospitals in the United States, both community hospitals and those at major academic medical centers, as well as several hospitals of a major managed care organization based in California, have purchased this system in hopes of improving quality of care and lowering costs. Few risk and case-mix measurement systems rival the potential of GEMINI. The system utilizes a user-friendly graphical user interface (GUI) that eases training and increases the likelihood of acceptance.

Lobbying for GEMINI

Morgan used GEMINI scoring equations as an evaluation tool starting in the mid-1980s, shortly after UH's involvement as one of the original institutions in the GEMINI data set. He believed that output from the computerized GEMINI system would improve ICU care processes, support decision making, improve outcomes, and serve as a benchmarking tool. Morgan lobbied the administration for the purchase of GEMINI, arguing that it would potentially save substantial amounts of money. However, even Morgan's higher profile as SICU director gave him limited influence over hospital purchases.

To persuade the administration, Morgan pointed out that physicians would be able to better assess patient need for ICU beds, a limited and expensive resource. If physicians could sooner determine which patients are at low risk of mortality, they could move them out of the ICU sooner with minimal risk. Consequently, supplies and equip-

ment could be managed and utilized more resourcefully. He argued that recognizing the futility of treating terminally ill patients sooner could help expedite DNR (do not resuscitate) decisions and thus reduce the number of frivolous, expensive tests. Furthermore, through mechanisms of external benchmarking of ICU patients, Morgan believed that the hospital could decrease variation in care, enhance quality, and reduce costs.

With a new understanding of GEMINI's potential, Dr. Billings became a supporter and finally took action. Morgan's hopes were realized. Morgan and Billings shared a common passion for quality improvement and both appreciated the seemingly boundless potential, but the question remained whether others could be so easily persuaded.

Intensive Care Units

Since their inception in the 1960s, adult ICUs had rapidly grown to consume approximately 20 percent of hospital expenditures around the time that GEMINI was developed in 1981.[3] ICUs demand a high percentage of hospital resources (human, technological, and monetary), approximately twice as much as a typical hospital unit on a per-bed basis.* The significant investment of resources demanded by ICUs contributed to evaluations of the appropriateness of care across the United States in the early 1980s.

Patients are generally admitted to ICUs for one of three reasons: (1) an immediate need for one or more of more than thirty active life support therapies, (2) a perceived risk of the need for one of these therapies, or (3) a need for specialized nursing care unavailable in other units of the hospital. Patients often enter the ICU without a thorough analysis prior to admission, and ICUs are thus challenged to filter the large numbers of patients desiring intensive care to determine which patients most require their services. In addition, the drastic nature of the diseases and treatments of ICUs, as well as idiosyncratic patients and physicians, have resulted in a great variation in care and treatment style. Variation is arguably one of the greatest sources of waste in healthcare organizations because it may signify that processes are out of control or operating inefficiently. It prohibits widespread application of cost-effectiveness principles to decision making and potentially results in unnecessary or inappropriate treatments.

There are four adult critical care units at UH that could potentially benefit from GEMINI: (1) the medical intensive care unit (MICU), (2) the SICU**; (3) the neurology intensive care unit (NICU), and (4) the thoracic cardiovascular (TCV) postoperative unit. Each unit contains ten beds and contributes substantially to expenditures (and revenues) at the medical center.

Early Implementation Efforts

GEMINI *seemed* like a clear winner to Billings, so he decided to act quickly. He did not see any reason to delay the introduction of a system that could certainly help cut ICU lengths of stay and enable external benchmarking. In September 1997, all the

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* Anthony Freedman, Assistant Director of medical affairs, UL Medical Center.
** The SICU is an "open" unit, meaning that patients' primary care teams retain final decision-making authority regardless of recommendations by the intensive care group.

clearances had been granted, and implementation of GEMINI was scheduled to begin in late January 1998. It would cost the medical center approximately $330,000 (U.S.) to purchase the GEMINI system interfaces for three of its ICUs. GEMINI was an expensive clinical information system by most standards, costing nearly $110,000 for each ICU to cover the cost of the hardware (terminals) and license use of the system for ten beds. These figures don't include the cost of UH staff time. In addition, GEMINI Medical Systems, Inc., charged an annual maintenance fee of approximately $15,000 to $20,000.

Each ICU would receive one computer system with the GEMINI prognostic software preinstalled. A staff member from each unit would need to be assigned responsibility for data collection and entry. At Morgan's request, Billings set out to find a project manager. Billings had initially thought "who better than Morgan" to supervise the data activities, but Morgan had warned that with his responsibilities as SICU director, it would be difficult for him to oversee the project. "Also," Morgan added assuredly, "It might be good to pull in someone from one of the other intensive care units—we already know that *my* unit will be dedicated to the data collection activities . . ." Billings placed a call to his colleague and friend, Dr. Ronald Katz, director of the NICU. Dr. Katz agreed to speak with his nursing director in an effort to find a representative.

Within only 2 days, Dr. Katz responded to Billings, indicating that he had found someone, a practicing registered nurse, to manage the GEMINI implementation. "He does not have the best bedside manner—patients' families have been complaining to our nurses about him. But, he is knowledgeable about computers, knows the ICU environment, and should be able to handle the job. I think this is just what we need to solve both of our dilemmas," Dr. Katz mused. Billings thought for a moment to ask about the nurse's qualifications to manage such a project, but their relationship dissuaded him from questioning the recommendation. With that out of the way, Billings took advantage of the opportunity to wash his hands of the project and return to his other responsibilities. However, his problems with the system were only just beginning.

Tommy Whiting, a registered nurse in the NICU, assumed the position of project manager for the GEMINI implementation. He looked forward to the opportunity and did not mind the change. He even thought it might give him more free time during the day. Whiting enjoyed using computers and spent a great deal of time (including time at work) playing computer games and surfing the Internet.

GEMINI Implementation

Representatives from GEMINI Medical Systems, Inc., would visit UH for 3 days to install the computer systems and provide hands-on training. As GEMINI project director, it would be Whiting's job to supervise the collection and entry of data within the four intensive care units. He had been told that he must find a nurse (or nurses) in each unit to handle the data collection—the GEMINI questionnaire was entirely too complex for someone without a clinical background.

Finding volunteers in the ICUs was not an easy task. Soon after Whiting became project manager, Mary Stone from the SICU volunteered for data collection in her unit. He later discovered that the SICU director, Edward Morgan, had been the main reason that UH had purchased GEMINI and that Stone already had some GEMINI experience. Neither the NICU nor the MICU, however, seemed to have available (or interested) staff to assist with data collection.

Whiting reviewed a list of nurses who were unable to perform their normal job assignments because of injuries, illnesses, or other disabilities. After speaking with the personnel director, it was agreed that Whiting could approach these nurses to collect GEMINI data on a temporary basis until they were able to return to direct patient care. Whiting was sure that the data collection forms were fairly easy for nurses to understand and that it would not be difficult to train new nurses as needed.

Installation of the GEMINI systems in all three ICUs was completed in one day early in February 1998 without technical glitches. GEMINI Medical Systems, Inc., was able to connect the NICU GEMINI system to the NICU database to fill in preliminary patient data. Whiting, Stone, and three "sick leave" nurses gathered the next day to attend a formal GEMINI system training session. Training progressed smoothly, and GEMINI Medical Systems released its newly trained data collectors to begin their work.

Stone was excited to be in charge of data collection for the SICU. She had worked closely with Morgan for many years and shared his interests in quantitative analysis and quality improvement. She knew she would have to rearrange her day to accommodate the additional work required for GEMINI but was optimistic about the project. She was concerned, however, that the other nurses did not share her enthusiasm because they didn't seem engaged during the training sessions. Whiting was especially complacent, taking several breaks during the session. "I probably just have a bit of a head start since Morgan has shown me the GEMINI equations before," she reconciled.

July 1998—Problems Mount

Five months passed, and Stone could not believe the turn of events. It was now July, and the benefits of GEMINI had yet to be realized. Data collection for GEMINI was so much more time-consuming than she had ever imagined—she had been unable to leave the hospital at a reasonable hour since the project had started. Every time she tried to contact Whiting to arrange a meeting to discuss GEMINI issues, he was "unavailable." She had heard that he was not working additional hours to keep up with necessary data collection in the ICUs. "How is it possible that I am the only one feeling the burden of data collection?", she wondered. To top things off, Morgan had been replaced as SICU director, and the new directors, Dr. John Cleary and Dr. Anthony Knight were skeptical of GEMINI. The GEMINI project was Morgan's baby, but for Cleary and Knight, it was a thorn in their sides, taking away staff time and delivering minimal output.

"Why am I staying late collecting data when my boss doesn't even care?" Stone often asked herself. Not knowing where to turn, she had sent a letter to Billings a week earlier outlining all of the barriers she was encountering. She remembered Morgan's claim that Billings was supportive of the GEMINI project and that he agreed with Morgan that UH needed a system like GEMINI. Perhaps Billings would take some initiative to reinvigorate the GEMINI project. Instead, and unfortunately for Stone, her effort was fruitless—Billings' response was that the service center directors were supposed to have taken over and that there wasn't much he could do. When she approached the service center directors, they pointed to the ICU directors. Stone felt as though she was getting the runaround.

Billings became concerned about the problems with GEMINI after reading Stone's letter, but he also knew that new computer systems had a fairly steep learning curve. He sent her to the service centers, certain that they would listen to her—she probably just needed somewhere to "vent" her frustrations. He didn't hear from her for some time and assumed that everything had worked itself out.

Integration and Information Technology Issues

Many of the personnel problems with GEMINI stemmed from poor data collection and input into the system. These problems were the result of poor integration of the system's hardware and software with other hospital systems. The only exception among the four units was the NICU, which had bedside monitors to capture vital information. However, even these bedside monitors could eliminate only the data collection step and not the data entry step because there was no automated interface with the GEMINI system.

The hardware for GEMINI had been built by Sun Microsystems, resulting in two potentially major problems. First, the center did not have contracted support with Sun, meaning it had no coverage for maintenance of the terminals if they needed service. The second problem posed by the Sun terminals was that they did not integrate with other systems in the medical center.

Software Bugs

In October 1998, just 8 months after the installation, much to his surprise and chagrin, Billings received a letter from GEMINI Medical Systems, Inc., stating that GEMINI was not year 2000 (Y2K)-compliant and that they would bill the medical center should they want software upgrades. The systems and software that had been installed would not pass Y2K compliance, and GEMINI was not financially able to provide the needed upgrades. "Maybe I'd better check on what is going on," thought Billings as he realized the GEMINI problems were becoming more serious. After some investigation, he learned that Stone, after not getting any responses to her complaints, had reduced her data collection efforts. She had become ambivalent about GEMINI. "I decided that if no one cared, there was no reason for me to be driving myself crazy trying to collect all the data that is useless for its intended purpose," she explained to Billings. He sent e-mail messages to each of the ICU directors to determine their attitudes toward and usage of GEMINI. Billings thought that if their responses were anything like that of Stone, then perhaps they should cut their losses and move on. "There's no sense pouring more money into something that just isn't working," he concluded.

Unwilling Organization

The ICU directors replied to Billings by voicing their dissatisfaction with GEMINI. Many of the intensive care house staff did not embrace they system. Some were hesitant to expand their daily activities to include analysis of GEMINI output for each patient. Others were concerned that the GEMINI score would drive an impersonal wedge between doctors and patients. The physician's role could potentially change from that of treating patients regardless of diagnoses to one that included hesitation to consider whether further efforts were warranted before taking action. There was great fear that patients would be viewed as statistics. Many attending physicians shared the same sentiment as the house staff and were offended by the suggestion that a decision tool "knows more about a doctor's patients than he does."

However, GEMINI was not disagreeable to every physician. Dr. James Hill, a physician working in the ICU during the GEMINI implementation, saw virtue in the system. "With GEMINI, physicians are not subject to availability bias; in other words doctors

tend to recall the most recent and extreme data. Databases on the other hand can recall all data." Dr. Hill indeed realized that many did not accept GEMINI in the UH ICUs. "People's impression was that it was inaccessible." He noted many other common complaints, including the inconvenience of only one terminal per ICU and infrequent updating of the database. While the database required updates every 8 hours to provide reliable information about patients, it was in fact updated only every 24 hours. This led many physicians to question the validity of the GEMINI database and the system's usefulness, because a patient's status can change by the hour in an ICU.

Physicians were not the only staff group to have issues with GEMINI. Nurses and technical staff felt an additional burden regarding data collection and system maintenance. They had become disinterested and unexcited about using the GEMINI system. Physicians as well as house staff felt their concerns were not taken into consideration.

Farewell to GEMINI

In light of these events, Dr. Billings decided to terminate the implementation. To continue pouring resources into the project at such a late stage, without the needed infrastructure and support, would be foolish, he thought. The project was beyond restoration, and he would have to live with the failed attempt at implementing the system. The aftermath of unmet expectations and the prohibitive logistics of organizational change justified abandonment; it was as simple as that. Billings stood up and walked out of his office. The sun was beginning to creep out of the clouds, and birds were singing under the partly overcast sky. "Well, at least now UH is free from worrying about the right choice," Billings mulled, more at ease with himself. "Deimplementation was clearly the right decision. I've done my part."

EPILOGUE

Several months after GEMINI was completely removed, a meeting was held to discuss its failure. Dr. David Billings, director of medical affairs, found himself amid an angry group of key people involved in the GEMINI implementation, including ICU directors, service center directors, and project personnel.

As Billings sat in the meeting, he noted that those who had invested many hours trying to make GEMINI work were venting their frustrations, trying to find someone to blame for the failed project. Edward Morgan rose from his seat and spoke. Morgan had been outspoken about GEMINI's potential and had played a key role in convincing the hospital administration to lay out funds for the system. "We didn't even try to use the system—how can we say it wouldn't be beneficial . . ." Morgan's voice trailed off as he angrily sat down in his chair.

Questions

1. What problem was GEMINI intended to solve? In other words, what clinical or administrative need was the system intended to address?
2. Who at UH perceived this to be a problem? In particular, what did Billings, Cleary, and Morgan think? What about the clinical staff (doctors, nurses, respiratory therapists, etc.)?

TABLE 1.1. University Hospital Patient Care Services—Approximations for July 1, 1997–June 30, 1998.

Beds (excluding nursery)	600
Average daily census	500
Number of inpatients (including newborns)	30,000
Average percentage of occupancy	75%
Days of inpatient care	150,000
Average number of days in hospital per admission	6
Outpatient visits	500,000
Emergency visits	60,000
Surgical procedures	15,000
Births	1,500
X-ray procedures	200,000
Radiation oncology procedures	25,000
Billed laboratory tests	1.5 M
Staff physicians (full-time faculty)	600
Staff physicians (residents and fellows)	600
Staff physicians (visiting faculty)	80
Professional nurses (average)	1,400
Full-time employees	4,000
Volunteers	1,000
Volunteer hours (average)	65,000
State appropriations—Medicaid disproportionate share payment	$35 M
Operating expenses	$400 M
Percentage of expenses from state appropriation	10%

3. Why did the implementation fail? Was there one critical factor that outweighed the others? How could this factor have been predicted and/or addressed?
4. Critique the selection of Tommy Whiting as project manager. What characteristics should an effective project manager have?
5. What training was offered in preparation for GEMINI? What training could have been done?

Appendix 1.1: University Hospital Background

University Hospital is part of an academic medical center that serves the suburbs of a medium-sized city and enjoys little competition in intensive, specialty care. Managed care was slow to penetrate the region in the 1980s and 1990s, allowing UH to enjoy a certain level of freedom from competitive market pressures. UH is a nationally recognized and respected health center, ranked among the top 100 hospitals and among the top 20 academic medical centers in the United States.

Patient care, education, and research are the three cornerstones of the UH health center, supported by a network of facilities that includes the main UH hospital, also including the four ICUs for which GEMINI was purchased (Table 1.1).

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Section II
Organizational Change

Introduction

Nancy M. Lorenzi

Life in the new millennium continues to be as hectic as, or more so than, in the 1990s. The rate of change in virtually all organizations is escalating, and healthcare organizations are no exception. The phrase *change management* has become fairly common, appearing in management articles everywhere. Review the job ads in the *Wall Street Journal* or the Sunday edition of a major newspaper and notice the positions available for people skilled in change management.

Management in the past decade was associated with many words beginning with "re." Some of the most common were *renew*, *reengineer*, *restructure*, *revitalize*, *reenergize*, *reframe*, *reinvigorate*, and, unfortunately, *redundancy*. Why were we so fascinated with all these words? Organizational dynamics is one possible answer. Organizational change had escalated to such an intense level that the old paradigms of organizations and of organizational leadership changed. We needed new ways to cope with change—not only to describe it but also to manage it in positive and proactive ways. All the "re" words were the organizational equivalent of whistling in the dark or reciting an organizational mantra: "We are not afraid of the future. We understand the future. We are clearly in charge and ready for the future."

What do all the "re" words really mean? While most executives talk about the importance of people, most do not focus a large amount of their resources and attention on human resources. Many do not know how to effectively deal with people issues. When they identify a new "re" word that offers some concrete steps or suggestions for looking at the complexity of today's problems and issues in an easy-to-understand style and manner, they grab the "re" word eagerly and then want instant results. When one strips away all the hype from each of the "re" words and their respective advocates, somewhere within the core of each "re" word is a set of principles that goes back to basic concepts and theories drawn from a number of associated disciplines such as sociology, psychology, social psychology, anthropology, organizational development, and management.

Common Principles

Regardless of the particular "re" word followed by an organization and its leaders, there are seven basic principles shared by all "re" concepts. These principles are linked to understanding people and the organizational environment in which they function and to learning—both by the individuals and by the organization as a whole. While some "re" words have other names, they still share the following seven principles, which we call "the magnificent seven."

The Magnificent Seven

1. Respect for People

Treating people with respect through honesty and trust is the cornerstone of all the "re" words and programs. This should be a basic life principle for everyone. With respect for people as the leading force, all the other principles follow and enrich this basic respect.

2. Involvement

Involving people is another core principle. If you want people to change, they must not be merely informed about the changes that leaders perceive are needed but must also be involved. All "re" programs include the actual involvement of everyone.

3. Empowerment

Once involved, people must be empowered. A major "re" principle is energizing and empowering employees within the organization to move beyond involvement to the next stage of commitment to the organization and accepting responsibility. Empowerment is often accomplished by a flattening of the organizational structure, effectively eliminating middle-management positions—and in some cases contributing to insecurity among employees about what empowerment really means.

4. Teamwork

People working together to make change happen is another core principle underlying the "re" philosophy. In today's complex organizations, changes affect far more than just one job or one area; therefore, high degrees of teamwork are needed. In many organizations, today's emphasis on self-directed work teams is an integration of the empowerment and teamwork principles.

5. Customer First

The customer must come first. Once employees feel comfortable with themselves, it is only natural to refocus the thinking of the organization to determine what their customers need and what the organization can do to offer support and services to customers—whether patients, physicians, other employees, etc. This principle places the customer in a central position and requires those on the inside of the organization to shift their perspective and view the organization from the external or customer point of view. Customers must be asked to become involved, either directly or indirectly, with the organization so that the organization learns what its customers need from the total organization.

6. Openness to Change

All the "re" words or programs imply that the system must be open to change, as opposed to being a closed, highly structured bureaucratic system. In our traditional systems, stability has been viewed as the norm, with change being a temporary deviation from that norm. In true "re" systems, change is the norm, and stability is the

aberration. A good example is the continuous quality improvement (CQI) concept, with its informal motto: If it ain't broke, break it!

7. Vision-Oriented

All the "re" philosophies emphasize the importance of a longer-run, vision-oriented approach to the management process in contrast to the more traditional short-run, activity-oriented approach. The word *paradigm* is used constantly to reflect the need for this future-oriented model.

What Is Change Management?

The healthcare industry, and other businesses as well, are constantly trying to reassess their future direction. Some organizations seemed to go through a series of management "fads" in a search for some sort of organizational nirvana. Total quality management (TQM) and CQI are systems that many organizations have adopted today. Most of these implementations are not as successful as organizations had hoped they would be. Rather than truly working to change the organizational culture, many adopters have simply installed a new set of rituals. Rather than leading the effort for change, top management delegates the process to staff and gallops off to deal with crises in the same old way. The danger is that the concept called change management may meet the same fate.

Change management is the process by which an organization reaches its future state—the vision. Traditional planning processes delineate the steps along the journey. The role of change management is to facilitate this journey. Therefore, creating change starts with creating a vision for change and then empowering individuals to act as change agents to attain this vision. The empowered change management agents need plans that are (1) a total systems approach, (2) realistic, and (3) future-oriented. Change management encompasses the effective strategies and programs that enable its champions to achieve the new vision.

There are critical success factors when managing change, and these include human-human interaction, understanding users' needs, transcultural management, education and training, and organizational development.

Change Management Strategies

Change management is the process of assisting individuals and organizations in passing from an old way of doing things to a new way of doing things. Based on our research, there is no single change management strategy that can be used in every situation. It is essential for the change management leader to take the time to know the desired state (vision/goal) and the "diagnosis" of the organization's current (and past) situation and then to develop appropriate strategies and plans to help facilitate attainment of the desired state.

Over the years we have evolved a core model for the major process of change management. There are many options within this model, but we believe that it is helpful for leaders to have an overview map in mind as they begin to implement new information technology systems. The five-stage model that has proven effective for

reducing barriers to technology change begins with an assessment and information-gathering phase.[1]

Assessment

The assessment phase of this model is the foundation for determining the organizational and user knowledge and ownership of the health informatics system under consideration. Ideally this phase of the model begins even before planning for the technological implementation of the new system. The longer the delay, the harder it will be to successfully manage the change and gain ultimate user ownership.

There are two parts to the assessment phase. The first is to inform all potentially affected people, in writing, of the impending change. This written information need not be lengthy or elaborate, but it will alert everyone to the changes in process.

The second part involves collecting information from those involved in the change by using both surveys and interviews. The survey instrument should be sent to randomly selected members of the affected group. One person in ten might be appropriate if the affected group is large. Five to ten open-ended questions should assess the individuals' current perceptions of the potential changes, their issues of greatest concern about these changes, and their suggestions for reducing these concerns. Recording and analyzing the responders' demographics will allow more in-depth analysis of the concerns raised by these potentially affected people.

In personal face-to-face interviews with randomly selected people at all levels throughout the affected portions of the organization, it is important to listen to the stories they tell and to assess their positive and negative feelings about the proposed health informatics system. These interviews should help in ascertaining the current levels of positive and negative feelings, what each person envisions the future will be both with and without the new system, what each interviewee can contribute to making this vision a reality, and how the interviewee can contribute to the future success of the new system. These interviews provide critical insights for the actual implementation plan. Often the people interviewed become advocates—and sometimes even champions—of the new system, thus easing the change process considerably.

An alternative or supplement to one-on-one interviews is focus-group sessions. These allow anywhere from five to seven people from across the organization to share their feelings and ideas about the current system and the new system.

Feedback and Options

The information obtained as described above must then be analyzed, integrated, and packaged for presentation to both top management and to those directly responsible for the technical implementation. This is a key stage in understanding the strengths and weaknesses of the current plans, identifying the major organizational areas of both excitement and resistance (positive and negative forces), identifying the potential stumbling blocks, understanding the vision the staff holds for the future, and reviewing the options suggested by the staff for making the vision come true. If this stage occurs early enough in the process, data from the assessment stage can be given to the new system developers for review.

When designing a model, this phase is important in order to establish that the organization learns from the inputs from its staff and begins to act strategically in the decision and implementation processes.

Strategy Development

The strategy development phase of the model allows those responsible for the change to use the information collected to develop effective change strategies from an organizational perspective. These strategies must focus on a visible, effective process to "bring on board" the affected people within the organization. This can include newsletters, focus groups, discussions, one-on-one training, and confidential "hand holding." The latter can be especially important for professionals, such as physicians who may not wish to admit ignorance and/or apprehension about the new system.

Implementation

The implementation phase of the model refers to implementation of the change management strategies determined to be needed for the organization, not to implementation of the new system. Implementation of the change strategies described above must begin before actual implementation of the new system. These behaviorally focused efforts consist of a series of steps including informing and working with the people involved in a systematic and timely manner. This step-by-step progression toward the behavioral change desired and the future goals is important to each individual's acceptance of the new system. This is an effective mechanism for tying together the new technology implementation action plan and the behavioral strategies.

Reassessment

Six months after the new system is installed, a behavioral effects data-gathering process should be conducted. This stage resembles the initial assessment stage—involving written surveys and one-on-one and/or focus-group interviews. Data gathered from this stage allows measurement of the acceptance of the new system, providing a basis for fine-tuning. This process also serves as input in evaluation of the implementation process. It ensures all the participants that their inputs and concerns are still valued and sought after even though the particular implementation has already occurred.

Case Introduction

The following four cases represent a variety of change management practices and strategies, successes and failures, and phases. They are meant as learning opportunities for those considering the process of implementing information systems.

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2
The Web Center: A Case Study in Strategy and Power

Christel Villarivera, Shane McWilliams, and Candace Boyce

Scott Stevens once again found himself on a plane ride to a small town with a huge health system in need of assistance. His consulting firm, MBV Consulting, had the well-deserved reputation of successfully assisting healthcare systems in the creation and implementation of new information technologies. Still, each new project presented obstacles and guaranteed difficulties. Stevens knew the project before him would be his largest and most formidable yet. Metropolitan College Health System (MCHS) already had some Web-based technology in place and had recently established a Web center. They had used consulting firms in the past, but to no avail; little progress had been made in taking the health system's Web technology to the next level, despite urging from various departments at MCHS.

Stevens had been hired by Bill Bradley, chief information officer (CIO), to assess the barriers to the Web center's development beyond a mere static presence on the Internet. MBV, because of its proven track record, was contracted by MCHS to bring an outside consultant, Stevens, into the picture to provide MBV expertise.

Stevens knew he would have to deal with this project on an organizational front. Externally, MCHS had a reputation of excellence as a quality institution. It was recognized as one of the top hospital systems in the country. Internally, the culture at MCHS was still very much dependent on positions of power and seemed to impede rather than facilitate forward progress. The role and impact the Web center would have in such a stagnant organization was unclear. It seemed to Stevens that the Web center had much potential but would ultimately fail if it did not assert itself. Before anything could happen with the Web system, the issue of the Web center and the organizational culture of MCHS would need to be addressed.

MCHS and the Web Center

Metropolitan College Hospital is a 560-bed teaching hospital that serves as the major provider of healthcare services for residents in a major metropolitan area in the Northeast. MCHS is a network comprised of the hospital and its outpatient and research facilities, as well as nursing and medical schools. Although MCHS had an excellent reputation for providing quality care, some people in the organization believed that it faced losing an edge to its competitors if it did not consider the use of Web technology not only to promote its health services but to provide them as well. The Web was clearly becoming an avenue by which health systems could offer interactive care, such

as access to electronic medical records or disease management tools. If such technology was possible, why couldn't MCHS offer such innovations to its customers?

In 1994, a small group was formed to address the prospect of using the Web. By 1995, the first homepage for MCHS was designed, with the server housed in the information technology center (ITC). Pages for individual health system departments were developed within the department. From 1996 to 1998, the health sciences editorial board was created and took on the task of maintaining the homepage. Seen as neutral ground for clinical, research, and academic interests, this board was centered in the health sciences library (HSL). This fact was important to the interests involved, for each valued its priorities over the others and the library had traditionally been viewed as neutral ground within the health system. The board consisted of the HSL director, Leonard Cusick, as well as another library staff member, Ken Chandler, a marketing staff member, and a technical manager. This board managed to implement numerous design changes to establish a final design which MCHS was now using on its Web site. A standard design was one of the first steps taken to create a unified Web presence for the health system.

In 1999, the School of Medicine (SOM) took over the responsibilities for the Web site, with the associate dean, John Scott, in charge. The SOM had the funds to support the growing Web resource needs of the organization and so continued maintenance of the site with the help of Ken Chandler, who worked in the HSL but devoted half of his time to the Web project. During this same time period, the marketing department, led by Doreen Jackson, marketing director, became interested in how the Web could be used by her department for a clinical enterprise. Specifically, she was interested in how the Web could meet consumer needs. Jackson felt that little had been done to meet the needs of clinical departments and thus hired Greystone Consulting to come up with a new clinical Web strategy with a consumer focus. Greystone managed to produce a strategy for the marketing, department, but this strategy had not been put into place. The department failed to realize that its plan would not work without the support of everyone involved in the Web initiative.

By the end of 1999, an Internet task force was created with many of the same people from previous planning groups. This task force concluded that the growing demands of the Web initiative would require a central location and separate staffing, and thus they created the Web center. They contracted with yet another consulting firm to assist them in renewing the focus of their efforts. The result of this task force was creation of the Web center. Although never outlined explicitly, the task force planned for the Web center to serve the purpose of maintenance and support for the Web system. It was also expected to enhance the Web system beyond its present static, "brochure-type" information to realize the Internet needs of the health system.

After the Web center was created, Ken Chandler, formerly of the library, was called on to continue to lead the health system's Web initiative as the center's first director. The new Web center created much excitement and momentum, and it was during this time that the clinical, research, and academic departments began lobbying for their own agendas for the new Web center. For example, researchers wanted access to data and information. Those with academic interests focused on providing access to medical information and teaching materials via the Web. The consultant to the task force recommended that a Web board be created to help set priorities and address the various needs now vying for Web center resources.

Shortly after his appointment as Web center director in 2000, Chandler contracted a third consulting firm, CSC, to assist the new Web center in creating a strategy to leverage the Internet immediately as a content delivery tool for the institution, and in the future as a dynamic device for interactive healthcare delivery. CSC also recommended

the creation of a Web advisory board to provide strategic guidance for the Web center. This board had not been formed yet because of competing concerns regarding who would be on it. Without the board in place, the Web center was unable to prioritize competing demands. During this time, the center devoted its efforts to building its technical and staffing infrastructure as well as maintaining the present system of Web page development distributed by the health system departments.

Assessing the MCHS Organization

Stevens read through the history of the Web center and about its current state and soon realized who the key figures were. On his list were Chandler, Jackson, Cusick, and Bradley. When Stevens finally arrived at MCHS, he quickly scheduled appointments and began the task of assessing the current situation at the Web center. First and foremost, he planned to speak with the key players and get a feel for what was going on in the organization that was keeping the Web center from reaching its fullest potential as a fully active Web design and management resource for MCHS. Stevens also planned to speak with some of the intended users of the new Web center.

The Web Center

Stevens met with Ken Chandler, the person caught in the middle of everything after becoming Web center director. Having shepherded the health system's Web presence nearly since its inception, Chandler was acutely aware of the politics of his situation. He understands the daunting task of administering a center whose many responsibilities were challenged by the health system's competing priorities. He voiced the need for a higher authority to determine the priorities of the nascent center. The Web center had inherited the current Web system consisting of static Web pages for various departments that had wanted a Web presence: "The problem here is not the technology to achieve this goal—it's the people process that's the problem." Chandler went on to explain to Stevens that the Web center had yet to prioritize the tasks it needed to accomplish to reach its goal, and that part of the problem was that everybody had their own agenda that they wanted addressed. He had, however, come up with the key tasks that would need to be prioritized and agreed on, at least to some extent, by all interests involved (clinical, research, and academic). These tasks included:

- Redesigning the site to better present information to consumers and other users.
- Creation of a portal system to categorize Web content into separate portals for consumers, clinicians, and researchers.
- Development of an intranet to provide access for MCHS employees to MCHS-related material such as MCHS policies, financial reports, etc.

An informal Web advisory board that had been in operation a year ago was disbanded, and a new advisory board was now being formed. How this board would be chosen, what authority it would have, and when it would be in operation were still unclear, according to Chandler. When asked how he felt the upcoming board should prioritize these tasks, he stated that the intranet should be the first priority because it had the "broadest benefit throughout the institution. It cuts across all of the different CSC findings, and a lot of things need a home." As for the other tasks, Chandler stated that he felt they were not ready for the portal system because much of the Web content

could not easily be categorized into a portal format. In regard to site redesign, Chandler said they were currently addressing this issue but that he was in need of more staff. In the meantime, the Web center was hard at work creating an infrastructure to support all the upcoming initiatives.

In terms of the organization, the Web center was in a difficult situation and was most affected by the lack of guidance in the form of a Web advisory board. Stevens found that Chandler had to deal with conflicting agendas from the marketing and clinical departments, as well as from those in the organization who had yet to fully understand the need for a strong infrastructure. In addition, hospital politics and the lack of compromise in the organization were holding back progress. According to Chandler, the Web center still had "no mission statement because the Web center is still not completely defined."

As Stevens assessed the Web center and the issues facing Chandler, he noted that the center was being held back because it lacked not only leadership but also authority and direction. It seemed to Stevens at this point that poor planning and the lack of an organizational vision were plaguing the Web center. The center did not even have a mission statement. Although the tasks delineated by Chandler were worthy goals, it was clear to Stevens that the Web center would not be able to accomplish any of them without first establishing its own organizational vision and building a strong foundation. Stevens knew that part of this foundation was the infrastructure needed to support current as well as future demands on the Web center. He observed that the Web center was ill-equipped to meet these demands, having few staff members, and lacked the necessary technical knowledge needed to improve the Web system. The Web template in use was no longer adequate for the needs of many departments. In essence, Stevens believed that the Web center was not prepared to serve the purpose for which it was created.

Stevens believed that Chandler had much at stake, having been appointed the Web center director. He was the representative of the Web center to MCHS. If the center were to lose support from MCHS departments and MCHS leadership, making any progress in improving the Web system would be even more difficult. Stevens knew that Chandler would have to act quickly and garner continued support for the Web center in terms of a Web advisory board and additional staffing and training. Chandler would have to play an integral part in any strategy to improve the state of the Web center.

The Marketing Department

Another key figure Stevens met with was Doreen Jackson. The marketing department had always been involved in the dissemination of information for MCHS. Now that the Web was enabling not only broad dissemination of information but also interactive dissemination, it was clear to Jackson that this department would be actively involved in the transition to the Web system from traditional brochures and handouts. As marketing director, Jackson's focus was on consumer use of the MCHS Web site, such as the ability for patients to make appointments, etc. After becoming impatient with the pace of the Web initiative, she hired Greystone to help with this focus. According to Jackson, Greystone suggested that "each center would author its own content, marketing would manage it, and the Web center would run the systems." She said the Greystone recommendation to have separate clinical and academic sites was struck down and that what she called a "blue ribbon panel" was formed to look at a health

system-wide plan for Internet strategy. It was clear to Stevens that Jackson thought little of the blue ribbon panel, which she said had met only twice and had come up with overall principles that appeared to apply Greystone recommendations to research and academics. The most significant recommendation from this particular panel was for the formation of a department to centralize resources for the health system's Web initiative.

When the CSC consultants came to evaluate the health system's Web strategy shortly after the Web center was established, Jackson said that the focus became the intranet as well as the use of a portal system to organize Web content. She became a strong supporter of the portal system and, consequently, pushed for the Web content to go through the marketing department before being placed on the Internet. Greystone had made the recommendation previously that this department should be in charge of editing or "scrubbing" the content and that one full-time marketing employee could be responsible for this task. Jackson was finding her efforts to take control of the Web content difficult because "marketing doesn't have the authority to scrub all the content without a mandate." Consumer health paper brochures were required to be reviewed by the marketing department, but the Web allowed any clinical department to publish content easily on the Web without ever consulting the department. According to Jackson, because the marketing department lacked this control, the quality of the content would suffer.

Another issue regarding the Web content that concerned Jackson was the Web's role in institutional "branding," that is, the institutionwide movement to create a uniform logo or brand appearance to provide a unified presence for Metropolitan College and, in turn, MCHS. To remain competitive with other health systems, MCHS would need to establish this uniform look and feel on its Web site and on the various department pages. Jackson felt it was her department's role to ensure that the Web system would be aligned with the institution's new mandate for a MCHS brand.

Stevens found that Jackson definitely considered the portal system and Web content the first priorities for MCHS and the Web center. She also felt that site redesign would be part of this process. The intranet came next on her list of priorities for the Web center. As expected, Jackson's priorities for the Web center were different from Chandler's.

In terms of the organization, Jackson stated that it seemed that there were "too many issues and [that] people are bumping heads on every issue." In addition, she believed there was "no way that a central group could manage all the Web content," thus, her push to take control of this component. For Jackson, it made sense that her department would have the final say on what would be published on the Web. She believed the Web center's function was to provide the technical side of the Web system, while the marketing department would have control over all aspects of Web content.

Stevens assessed Jackson's role in the Web initiative. He realized that control over the content of the Web system, especially information having to do with clinical care and consumers, was important enough to Jackson to warrant creating a separate strategy for the Web system by hiring Greystone. She supported the portal system because she believed it to be the best way to disseminate information on the Web. For her, expediency was paramount. She wanted the redesign and increased functionality as soon as possible. Her role as marketing director had not changed with the introduction of the Web initiative. Her job was still to attract patients to MCHS, and improvement of the Web system with input from the marketing department was one way she was going to do this.

The HSL

Another key figure in this project was Leonard Cusick. Cusick had been involved with the Web initiative from the very beginning. His role had been important during the initial planning process. Everyone saw the HSL as neutral ground where all interests had equal footing. Once consulting firms were brought into the picture, according to Cusick, a lot of "pent-up needs" came out, as many voiced what they felt was needed in the Web strategy. As a result, the various consulting firms had all made recommendations to set up a Web advisory board that would help set priorities, as well as to create a Web center to address these priorities. Thus, the Web center was born. The board, however, had yet to be formed because of disagreements regarding who would serve on it. Cusick said that many people believed that the "board would assist in the move out of a neutral place to the hospital, which is a threatening move for researchers and academics." Researchers and academicians felt that their own concerns would be given less priority. Although the project had since moved out of the HSL, such concerns still remained. In addition, Cusick felt that the "lack of not only resources but also attention, a lack of a clear mission statement for the Web center, and practical issues such as the number of members, charter, etc." were further impediments to creation of the Web advisory board.

When Stevens asked him what he felt the priorities of the Web center were, Cusick stated that he thought the site redesign was top priority. He felt that it would drive other issues. Next on his list was the portal system, and then the intranet.

Cusick felt the biggest issue facing the organization, and thus the Web center, was the issue of authority. Who had the authority to make decisions for the center? He believed that this issue needed to be addressed in order for anything to be accomplished. He was a strong proponent of creation of a Web advisory board with authority designated to its members to make decisions regarding the Web system.

Cusick also represented the needs of academicians, one of which was increased access to medical and clinical information on the Web. He informed Stevens that, once the Web center became the resource it was intended to be, increased functionality and access to tools, such as medical information databases, would meet some of the increasing needs of academicians. Cusick had already helped implement some of the Web tools available on the HSL Web page and felt that the Web center should be responsible for such tasks in the future.

The CIO's Viewpoint

Stevens met with Bradley to get his take on what was occurring with the Web center. "The Web Center was set up without governance. There was no plan," Bradley stated. When CSC had made suggestions regarding the Web initiative, they focused mainly on clinical Web strategy and failed "to address other needs of other constituents." According to Bradley everyone had his or her own agendas and expectations. "They want what they want and don't care how it gets done," he explained.

He believed there was a lot of excitement about the Web center and was optimistic about its potential. He thought that they needed, as an organization, to pull resources and put a strategic plan in place. Bradley saw his role as facilitating strategy implementation. Strategy, however, was missing from the Web initiative. He felt he was now "playing catch-up in forming a broader view of the Web strategy for the organization and in translating this strategy into an annual tactical plan." This strategy included the

creation of a Web governance board that would be responsible for setting priorities for the Web center as well as policies and standards, as opposed to the advisory board Chandler, Cusick, and Jackson had spoken of previously. This board would be different from an advisory board because it would have the authority to make decisions. Essential to the creation of this board was the agreement of all involved that it would represent their interests and would have the final say. The governance board would set up smaller user groups that would act as advisory boards for specific tasks. One of these user groups would be in charge of the annual tactical plan for the Web center that outlined a road map to accomplish yearly goals.

As for the priorities for the Web center, once the governance board was in place, Bradley stated that he would not necessarily prioritize site design, a portal system, or intranet development. According to him, in addition to the governance board and an annual tactical plan, he thought the first priority of the Web center was to ensure creation of the technical infrastructure that would be needed to support the Web center for the next 3 to 5 years. He believed that they needed to make sure that the center had a good foundation in order to support other initiatives.

As for the organization, Bradley thought that the MCHS culture was what he termed "a thousand points of veto." He explained to Stevens that he believed his deliberate planning process was a novelty to MCHS. He stated that there were some people in the organization who felt his role was to make decisions. He disagreed with this, explaining his role as being the "steward of the resource." Despite some discouraging remarks, Stevens found that Bradley was very optimistic about the prospects of the Web center.

Intended Users

For Stevens, some of the most valuable information he could receive regarding the Web initiative would come from the intended users of the new Web center. Stevens decided to interview people from departments that had chosen to post a Web site and had used the Web center for this purpose.

Stevens met with Jane Guarini, a nurse practitioner who coordinated a special screening program for smokers that had just recently been created called Lungs for Life. Guarini had noticed that many of her patients came in for office visits with information they had gathered from Web searches. She felt that the Web would be an extremely useful device to provide information to potential patients regarding her new program, but she did not know where she could find the resources or the time to develop a site. Serendipitously, as she was considering this dilemma, a staff member at the Web center contacted her to offer the center's services. Within several weeks, Guarini had a Web site that provided information about her program that exceeded her expectations. The Web center had even offered to set up Web-based appointment making for Guarini's program, but she declined the offer because a large component of her program, involved personalization and contact with program team members. She thought that online appointments would decrease this desired contact. Overall, however, she was thrilled with her results from the Web center.

Stevens also met with Suzanne Faulk who was in charge of marketing for the department of facial plastic and reconstructive surgery. This department had decided to use the Web center for its department Web site but not to use it when it created a Web site for its commercial venture, the cosmetic surgery center. According to Faulk, they had initially sought assistance from the Web center, but the center could not meet their

needs. "The Web Center has great support when it comes to using their template, but if you want additional graphics, for example, there is little they can help you with," said Faulk. She informed Stevens that because the cosmetic surgery center wanted additional graphics and the ability to make the Web site more appealing, they had to go outside MCHS and use a private vendor to help design their Web site. By using an outside vendor, not only did they manage to make the site more attractive, but they were also able to implement more functionality than that offered by the Web center template, such as the ability for consumers to contact them via the Internet to request information. According to Faulk, even the marketing department, although involved with the Web system, had few resources they could access for assistance with the Web content of their site.

Faulk believed that the Web center needed more support staff to meet increasing demands from departments wanting to post Web sites. The current template, according to Faulk, needed revamping. She explained to Stevens that the Web center needed to set better standards and actually put in place items that would be required of a Web site posted to the MCHS Web system, such as contact information or the curricula vitae of physicians working in a department. If the Web center did not improve its infrastructure and policies, departments would continue to seek outside vendors to create their Web sites.

From his interviews with some of the Web center's intended users, Stevens could see that the center was not the resource it was intended to be. Departments viewed the Web center differently, and it was clear to Stevens that it had much to do in terms of setting even the basic standards of a MCHS Web site. If the Web center could not get past setting standards and enforcing their use, how could it hope to advance the Web system past this static stage?

A Crucial Period for the Web Center

Stevens felt the Web center was in danger of missing an opportunity to establish itself as an important resource at MCHS if it did not take advantage of the momentum surrounding the Web initiative. With the establishment of the Web center, MCHS was well positioned to take a substantial lead among health systems, most of whom were not prepared to even contemplate the creation of such a Web resource. MCHS, however, would first have to deal with many obstacles still in the way. The Web center's lack of an organizational infrastructure in terms of staffing and technical training, as well as standards and policies, was partly to blame. Poor planning and organizational vision were also to blame for the Web center's inability to make progress in improving the Web system. Added to these issues was the center's lack of guidance and direction and authority to make decisions. The failure to establish a Web advisory or governance board had as much to do with conflicting agendas among departments as it did with dealing with the MCHS culture. Stevens discovered MCHS was a difficult place to garner support for a new initiative among the higher-level executives because of continuous power struggles and hospital politics.

The Web center was being held back from achieving its goals, which included taking the Web system from a largely static Web system to a transactional Web system. Stevens knew that the Web center would have to get past the difficulties it faced to be able to address such needs. His job was to help the center make it through this crucial period and enable it to succeed.

Analysis

The rapid pace of development of the Internet as a means for transmission of information via the Web is in sharp contrast to the painfully slow process that stereotypes most academic medical centers. MCHS is no exception to this common perception of academic medical centers as bastions of political maneuvering and cost inefficiency. Within this traditional structure are lodged innovative offices and laboratories that nursed the Web in its infant stages. The Web exploded onto the scene of general society in the 1990s and seemed to permeate nearly all aspects of modern life. This chapter describes some of the conflicts that arise when a limited resource, Web access, is suddenly thrust into the limelight from its humble origins without a well-devised plan. This case analysis hopes to address the problem, the lack of a strategic plan, and the resulting issue of power.

Issues of Strategy

Lack of a Comprehensive Institutional Plan

The lack of a strategic plan for the Web center is due in part to its gradual development over the years. Scott Stevens outlined the chronology of MCHS's Web initiative and saw in short order that until recently the leadership of the health system had not made the Web a priority in its planning for the institution. The Internet's utility to the business strategy of academic medical facilities remains to be defined even today. Health care has been slow to adopt the enthusiasm the rest of the world has for using the Internet beyond simply marketing. The reasons for this hesitation include privacy issues, the perception that computers depersonalize health care, cost concerns, and inherent difficulties in implementation in a healthcare setting. But as patients enter their providers' offices with information they have culled from the Web, providers are opening their eyes to the possibilities the Internet may have to offer. Healthcare management can no longer remain blind to the Internet, even with its ill-defined utility for health care.

The organization of MCHS Web activity began on a very small scale in 1994 to somehow bring together the disparate assortment of Web sites that had originated from a number of the departments in the health system. Although minimal, the resources set aside for this endeavor marked the beginning of when the Internet's first appearance on the radar screen of hospital leadership.

Even after numerous boards had been convened at the enterprise level and server resources were offered at a more centralized location, Web development and content management decisions were made locally. Individual departments could also choose to maintain their own servers. This decentralized approach may not be the most appropriate for a center with a more centralized mandate.

The allocation of significant resources for the creation of the Web center serves as recognition of the importance of the health system's Web efforts in the eyes of key enterprise-level decision makers at MCHS. Explicitly stated or not by this leadership, a more appropriate strategy would support technology decision making made at the enterprise level and involve a deliberate planning process integrated with the enterprise's business strategy.

The Lungs for Life and plastic surgery Web sites certainly illustrated that the decisions to develop a Web site remained at the local level. If an individual department of MCHS did not wish to conform to the Web center standards for Web sites, they were able to go elsewhere for development as well as site hosting. There was no overall plan that directed departments in how they presented their content, although there were general guidelines intended to generate a consistent look and feel throughout the entire health system. Departments could use whatever font attributes they desired, and there was no organized, consistent policing of their sites. Content management also remained at the local level.

Differing Demands

The task of centrally governing a large institution's Web initiative that MCHS appears to be undertaking is complex. The effort is made particularly challenging by different factions whose individual missions may not be in alignment with the entire health center's mission. In most business settings, all departments are usually directed to perform specific duties related to a common outcome whether it is making widgets or providing widget support services. An academic medical center may have a very clear expressed mission to care for patients yet find conflict among the various communities found within the center. The groups at MCHS are the clinicians, the researchers, and the academics. These three entities are interdependent within the institution; however, each group may be operating under its own implicit mission statement. This natural tension among researchers, clinicians, and academics was recognized before formation of the Web center.

Despite these apparent cross-purposes, strategic principles for the Web center should originate with the health system's mission statement from either a CIO, whose position enables him to visualize the role of the Web center within the entire context of the health system, or from upper management. If instead, the Web center is forced to take direction from the department and individual levels, the center will appear as organizationally weak and possibly as the pawn of a few instead of serving the needs of the institution as a whole.

Tool or Gizmo?

Web technology has been the "latest and greatest" in computer technology. In evaluating the Web center, it is worth noting that its existence might be the result of the efforts of one or a handful of MCHS leaders looking for a quick fix to dispel the perception of the health center as a slow-moving behemoth. Well-defined strategic direction acting as the guiding force for the institution's Web activities can mitigate the unbridled expenditure of resources to use Web technology simply because it can be done.

Lack of Guidance

Although an individual familiar with MCHS and its history heads the Web center, Ken Chandler needs higher-level guidance in his efforts to serve the members of the health system and their varying needs. A fully competent leader, Bill Bradley, was able to use his perspective to view the Web center fairly objectively in light of MCHS's organiza-

tional structure. He vividly describes MCHS's decision-making process as "a thousand points of veto." Bradley falls short on providing the support the Web center needs in its early days of formation—a time when it needs a champion the most.

An additional, very important source of guidance for the Web center that is crucial for its success is a board comprised of key players who will represent the interests of the three groups vying for the center's resources. One essential function of this board should be to set near- and long-term priorities for the center. The board would be a neutral decision point where competing interests could argue the importance of their projects. The Web center would then be left to concentrate on implementation. During his discussions with the various players, Stevens observed that two distinct descriptions of this board emerged. The first entity could be termed an "advisory board" and would receive requests, consider their importance, and submit recommendations for prioritization. The second type of board could be called a "governance board," and this board, the stronger of the two, would field and actually prioritize requests for Web center projects. This subtle difference is very important. The Web center would benefit from a governance board because this board would have the final say in priority decision making.

Issues of Power

From Strategy, Power

There is a relationship between strategy and power. A strategic plan is a tool of formal authority, which is a source of power. In the case of the Web center, formal and informal authority are crucial to its success. The political process will be useful to the center, and political support should be cultivated carefully. Most useful to the Web center would be a champion external to it with the power to implement these recommendations and shepherd the needed organizational support. This individual would not necessarily have to be the CIO to be effective.

Competition for Power

Although formally recognized as MCHS's source for Web services support, the marketing department feels threatened by the Web center. The most obvious reason for this uneasiness is that the Web center is offering clinical content to the public without the material passing through the marketing department for review. This loss of control equates also to a loss of power. The marketing department is no longer responsible for access to some information. Access to information is a source of power. The Web center is also providing a service once provided only by the marketing department, thus threatening its exclusive position within the institution.

Vendors outside the institution are another source of competition for the Web center. As the center drifts without a strategic direction and without clear priorities, there is the potential that customers will seek Web center services elsewhere, as in the case of Suzanne Faulk. The Web center lost Faulk to an outside vendor because of its inability to meet her needs for a .com uniform resource locator (URL) and a more polished design for her Web site. Moreover, although Jane Guarini was very pleased with her Web center experience, she would not have known about the Web center's services if a Web center staff member had not contacted her.

Power of the Brand

Another important issue of power in the discussion of the Web center and its relationship with the marketing department, the power of the brand, should be considered. The name of MCHS is a very important part of the product it offers to the public. Potential patients look to the brand, especially in a competitive market, and the Web center controls the presentation of the brand on the Internet. Certainly the marketing department has reason to be concerned about this control. Many hospital marketing departments stress the importance of a unified look and feel for all materials associated with the facility in the hope of increasing recognition by potential customers.

Recommendations

Stevens, as a consultant, should be an objective observer of the situation. However, the fact that he was hired by Bradley to assist the Web center in advancing beyond its early success admits bias in favor of Bradley's position in the organization into his assessment of the picture.

Whatever the motivation for his hiring, Stevens sees the need for quick action to strengthen the Web center organizationally and structurally to ensure its success before embarking on a plan to advance it beyond providing static content. Stevens understands that to be successful, the Web center must support MCHS's own organizational structures. He kept this in mind as he made recommendations in his final report to Bradley whom he felt needed and would appreciate frank honesty.

His first recommendation was for Bradley to institute a strong board of governance for the Web center. Stevens expressed the importance of having a board truly representative of the three main factions within the health system—clinicians, academics, and researchers. The purpose of the board would be to establish priorities at an enterprise level for the Web center. The center could then perform the work it is charged to do without having to field competing discussions among many requestors.

Stevens referenced the MCHS mission, vision, and value statements to be sure that his strategic planning recommendations would align with the institution's overall strategy. His second recommendation was that the board, once established, carefully undergo a formal strategic planning process commencing with the recognition of common values and the development of a shared vision. Then a mission statement expressing the purpose of the Web center and the reasons for its existence could be written. The goals of the Web center could then be established and act as a bridge to the more pragmatic aspects of the process: objectives (measurable, time-specific, steps to achieve goals) and strategy (action steps to achieve objectives). Then, finally, Chandler could author a business plan to guide his departmental activities. The result would be a plan that recognizes the complex political forces in play at MCHS.

The governance board might also consolidate the many recommendations already made by consultants hired to assess MCHS's Web presence. These consultants were expensive, and although the information they offered was valuable, their recommendations may have been biased. The board would be in a position to evaluate all previously made suggestions with the best interests of the health system in mind. Additionally, a needs assessment should also be made to determine that the tools the center requires to complete its mission are available.

Stevens also recommends that the Web center concentrate on building its technical infrastructure. This includes hiring staff and purchasing the necessary hardware and software to meet the short- and intermediate-term needs of the health system.

Another specific suggestion for the center is to increase its organizational marketing so that the health system is aware of its presence and the services it offers. Departments can and will go elsewhere if they are unable to find the services they need at the Web center.

Scott Stevens was hired to assess the Web center's ability to move beyond a static Web presence. He found an interesting mélange of strategic and power issues at MCHS that certainly must be addressed before any further progress can be made in the evolution of the Web center. The next level for the center is not the transactional system that Bradley might have had in mind when he contracted Stevens. Once the Web center has a well-formulated strategy, organizational support, and an infrastructure, it will be able to move ahead, but this time it will be stronger and better prepared for the dynamic world of information technology. The Web center might even be positioned to be a leader in bringing technology to the reticent world of health care.

Questions

1. Who are the current champions of the development of explicit strategic principles?
2. Who else's early support is critical, and how can it be obtained?
3. What are the time constraints for the development of these strategic principles?
4. What are the relevant historical factors?
5. What are the most effective processes for use in developing these principles?
6. Who should be involved?
7. What organizational plans must be considered in developing strategic directions?
8. What is the role of the CIO (whether formally designated as such or not) in determining the strategic principles?
9. What practical political factors have to be considered?
10. Once the principles are determined, how can additional agreement and support be obtained?
11. What other events need to happen for the successful establishment of new information principles?
12. What recommendations should Scott Stevens provide?
13. If you were Chandler, what would you do/require before moving the Web center from the library to the enterprise?
14. Now that Chandler has an "unstable" organization on his hands, what steps should he take to change it?
15. Will the advisory board work and provide the stability the system needs?
16. What would you do?

3
Computers for Kids: Not All Fun and Games

Jacob Weiss

A Shocking Discovery

Helen Sadler arrived for work at University Children's Hospital (UCH) early Monday morning. She began the day by checking her e-mail, assisted by her usual cup of fresh ground coffee. Not long after taking her first sip, the phone on her desk rang noisily, jolting her awake faster than even the most potent blend of caffeinated black beans. A mother was asking for help with starting up the computer in her son's room.

Helen walked down the hall to Room 514 and turned on the computer monitor. Much to her surprise and disappointment, she discovered several links to "adult-only" sites on the desktop screen. She quickly realized that she had not reinitialized the computer to the default setup before the patient checked into the room. She apologized to the family and immediately wiped the computer clean of the files from the previous patient's indiscretions. The parents accepted her apology, and they were glad to have the computer ready for use during their time in the hospital.

Helen headed back to her office, rather embarrassed, but thankful that she was able to handle the situation relatively painlessly. It could have been much worse.

Background—University Children's Hospital

UCH is part of an academic health center located in a major city in the Northwest. UCH is associated with a medical school ranked in the top 20 and about 50,000 pediatric patients are treated each year by a staff of more than 100 pediatric specialists. It is a national leader in the treatment of pediatric heart disease, behavioral problems, pulmonary disorders, diabetes, and other endocrine disorders. The UCH units currently are located within the main buildings of the medical center.

Construction for a new, stand-alone children's hospital began in 2000, and it is scheduled to open for patient care in April 2004. Throughout the development, UCH has emphasized a "family-centered" approach to patient care in the new building. This strategy involves creating a comfortable environment for both patients and their families and recognizing the role of relatives in caring for the children.

Background—Computers for Children

Around the time that the building plans were getting under way, a project was proposed to put personal computers and Internet access in the inpatient rooms of the hospital. The proposal aimed to help isolated children maintain contact with family,

teachers, and friends at home or anywhere in the world. The computers could also be used by family members to get work done, send e-mails, and communicate with relatives. Additionally, they could provide entertainment, education, and relief from the monotony and boredom often associated with staying in a hospital for extended periods of time.

These goals meshed well with the family-centered direction of the new hospital, but it was not easy to secure financial support through the medical center. The center saw the potential of such a system, but the backing came mostly in the form of "Get the money and that's great!" Outside donations provided $175,000 in funding for the technology, and the medical center paid for the addition of a full-time child life specialist dedicated to the implementation and operation of the project.

Helen Sadler and the Project Team

Helen Sadler was hired for the child life specialist position of managing the Computers for Children project. She has a formal education in child development, with a personal interest and experience in computer systems. She takes on the roles of administrative and technical support for the patients and is the primary contact person for the project. The pilot involves a total of thirty-two computers distributed throughout the pediatric floors of the main hospital, targeting the adolescent unit, the myelosuppression rooms, and some of the family areas.

Helen continues to get advice from the project manager, Matthew Hunt, who has led the planning since the initial funding was received. Matthew is part of the informatics center at the medical center, and Computers for Children was his first project assignment. He and Helen worked closely during the initial implementation in which they purchased, built, and installed the hardware and software. Once the system was up and running, his role became that of an advisor and collaborator for Helen, but he is not directly involved in the day-to-day activities in the hospital. Helen's boss, the child life director, and the original project team continue to function as an oversight committee, and they in turn report to a steering committee of hospital directors.

But in the end, it is Helen alone who runs the program and who deals with the concerns and challenges each day.

Factors Contributing to Reimaging Difficulties

The incident with the pornography in Room 514 occurred in part because of Helen's admittedly hectic schedule. She makes an effort to wipe the hard drives clean of all personal downloads before new patients move into their rooms, but during a busy week it can be hard for her to reimage the machines before the patients arrive. There are times when a patient checks in before she has a chance to clean the hard drive and install the default software and settings. Usually there are no offensive files left on the computer, and it is not always necessary to reimage, but there is still the potential for another problematic situation.

Helen estimates that she is able to reimage the computers between patients only 75 percent of the time. She spends the majority of her day providing technical support for the patients and families who have trouble using the computers. On top of her regular schedule, each computer takes approximately 30 minutes to reimage by hand. The orig-

inal project proposal planned for the use of "client update push technology," which allows an administrator to update software from a remote server without having to visit each machine in person. Although desired, the team was not able to purchase such a system with the current funding.

Outside the "In Loop"

As the single staff member responsible for reimaging and technical support, Helen needs to know when rooms change over and when new patients arrive. However, the children's computer network is completely independent of the official hospital network, and Helen does not have access to the occupancy listings on the main hospital information system. The nurses do not always inform her of room changes, and Helen's only source for patient schedules comes from daily lunch meetings with her fellow child life staff. They inform her when new families are in the hospital and discuss the general issues and concerns of the patients they have visited.

Because Helen does not work late nights or weekends, room reassignments can occur without her presence. Situations such as these can interfere with her ability to erase potentially harmful downloads after a patient leaves.

Single Username and Password

The method chosen for assigning user accounts on the network also contributes to the reimaging problems. In order to log on to the computers, patients are all given the same username and password. Because each user accesses the computer with the same account, the downloaded files and settings on the desktop carry over between patients unless the computer is reimaged. A potential alternative to this approach would be for Helen to (attempt to) assign unique usernames and passwords to the ever-changing collection of users. Such a solution undoubtedly would add complexity to Helen's already hectic job of keeping up with new patients.

Is Locking Down the Machine a Solution?

"I think we may lock it down. I know that sounds bad, but lock it down to the point where the patients can't save anything to the desktop," Helen explains. "They can save to a disk, or they can attach it to an e-mail." She does not want to reduce the functionality of the computers for honest users, but it is a choice she must make in order to maintain the privacy and security of patients and their families. Because of the difficulties she has faced with reimaging in the current system, this may be a necessary and acceptable compromise that does not limit the computers too severely.

Freedom and Functionality vs. Security and Safety

In practice, the decision to lock down the computers will shape Helen's capacity to manage the network without additional manpower. However, Helen's hesitation toward limiting downloads uncovers another issue that cuts to the heart of the entire project's goals: How much freedom can we give patients on the computers and on the

Internet while still protecting the security of the patients and ourselves? Any answer to this question inherently will affect the potential benefits that patients can get out of the technology.

At UCH, the project team's approach is first to provide as much functionality as possible and then to deal with individual indiscretions as they arise. Standard measures are in place to protect patients from easy access to inappropriate Web sites, but a determined, knowledgeable patient can still find ways around such controls. The team realistically did not aim to create a 100 percent foolproof network because this would severely limit the usefulness and benefits of the service.

The following examples demonstrate the team's trial-and-error process of finding the ideal balance between functionality and preventative control.

Filtering Inappropriate Material

In order to limit access to inappropriate and adult-oriented Web sites, a commercial server-based software filter was installed on the network. In addition to blocking the content, Helen initially configured the filter to notify her via e-mail each time a blocked site is accessed. An acceptable use policy defining the network rules in clear and simple language is displayed on the desktop for each user.

Once the project got under way, Helen periodically received an overwhelming number of e-mails from the filter software. When the filter prevented access to a blocked site, some patients or family members would attempt to visit different sites, and Helen was sent an e-mail after each unsuccessful attempt. She responded to the situations by approaching the family and frankly explaining that the computers should not be used to access inappropriate material. She had a list of the visited Web sites, and the family was usually embarrassed enough not to visit blocked sites again.

Helen did not enjoy these uncomfortable confrontations, and she had never expected that she would have to deal with such cases so frequently. She approximates that someone tries to access an inappropriate site on the computers at least once a day, usually searching for pornography. Helen needed to prevent these attempts from getting out of control, but she did not want to constantly lecture the patients.

She changed the settings on the filter to display an additional warning message notifying the patient that "An e-mail has been sent to University Children's Hospital." When a patient or family member tries to access a blocked site, they are told explicitly that they have been caught. Compared to merely denying access to the sites, this simple change significantly reduced the number of repeated attempts to find inappropriate material.

Downloading Illegal Movies

Another surprise came when Helen received a call from university network security. Apparently, the university was notified by the Motion Picture Association of America (MPAA) that someone was downloading illegal copies of movies on the university's network. An e-mail from the MPAA stated that if the person downloading the files was not stopped, they would take the university to court. The network address was traced to one of the computers in the UCH, and Helen had to confront the family to ask if they had downloaded the movie. They denied doing anything, but when Helen looked at the computer, the file was there. The time logs also showed that the incident occurred after the time that the current family checked into the room.

In response to this potentially very serious infringement, Helen took the computer out of the patient's room for the remainder of his stay. She also took the computer away during the family's next visit to the hospital. However, the patient's doctor was upset about this, and Helen explained what the family had done and how they had lied. The doctor did not insist that she return the computer, but Helen talked to the family again and gave them one more chance. The same family has been in the hospital since that time, and there haven't been any more problems.

The Web filter blocks illegal sites, and the computer software prevents patients from installing file-sharing programs, but this case demonstrated the potential for knowledgeable users to find ways around the filters. As a result, the downloading bandwidth restrictions were increased so that users cannot download files larger than a certain size.

The Health Insurance Portability and Accountability Act and Personal Web Sites

A planned component of the project is to provide children with a Web site to share their experiences in the hospital with friends and family. A Web design company was hired through donations and is in the process of creating templates that will allow children to easily build their own personal Web pages. In spite of the honorable intentions, the idea of patient Web pages approaches the fuzzy boundaries of publishing patient information on the Internet, and the team has encountered potential concerns related to privacy rules of the 1996 Health Insurance Portability and Accountability Act (HIPAA).

HIPAA issues strict limitations on a hospital's ability to publish personally identifiable patient information on the Internet. For example, the UCH would run into trouble if the administration wanted to publish information about patients on the UCH Web site. Helen and the team discussed this issue with the university general counsel's office, and the current opinion on the matter is that if patients put their own information on their own Web site, it would be analogous to talking to someone and that can't be regulated. Additionally, patient sites will be physically hosted on a donated server not located at the hospital. UCH will merely function as the portal for patients to access the service.

The Web sites are not yet in place, and there still may be a possibility that HIPAA regulations will limit the extent to which this aspect of the project can be realized.

Instant Messaging

Throughout the pilot, patients were required to get parental permission in order for Helen to install instant messaging (IM) chat software on the computers. This arrangement is intended to protect patients from strangers or predators who might IM them. "Kids are curious," Helen explains, "and if a new message pops up on the screen, they are going to click on it." Over time, Helen found that many patients used IM at home, and they typically asked to install the software in the hospital. IM often supplements or even replaces e-mail as the primary channel that children use to keep in touch with their friends and classmates online.

The potential threat of online predators has been a very small practical concern in comparison to the speculative worries of the project team. Patients who use the soft-

ware usually just want to talk to their relatives and friends from home and school. There have not been any reported incidents of patients being harassed or bothered while using IM software. At a meeting with network security and members of other computing departments in the medical center, Helen and the project team discussed the idea of lowering the restrictions on IM.

"If the patients have IM at home, they're going to want to use it in here," she reported to the others. Almost everyone agreed with Helen, and they felt that the benefits of reducing isolation would outweigh the relatively unlikely risk of IM predators. Giving the patients a sense of normalcy is a main goal of the project, and IM is a free and powerful means for achieving this goal. Helen is currently exploring different IM programs that she plans to install on all the computers. She has not received a final confirmation from the general counsel's office, but she does not expect there to be a legal problem with this change in policy.

Challenges in Choosing the Best Technology

The team's decision to install IM software also illustrates another major challenge of implementing the project: How do we select the hardware and software that will lead to the most effective use of the computers? In choosing to purchase a combination of off-the-shelf technologies, Helen and the team faced the task of finding appropriate user-friendly devices for the various aspects of the project.

Computer Chassis

The physical setup of inpatient-room equipment must provide a way for patients to access the screen and keyboard while lying in bed. Patients and family members also need to have access to the computer while sitting in a chair beside the bed. A design to accommodate these situations was worked out with a leading ergonomic computer cart manufacture at cost.

The carts have a mobile wheel base to which the desktop is secured, and adjustable arms support the flat screen monitor and keyboard. Flat screen monitors are required because of the weight constraints in suspending a monitor over a patient in bed. Although the carts are physically mobile, they generally stay within the patient rooms. The base is designed to have a relatively small "footprint" so as not to interfere with the other equipment and people in the room.

Touch Pads

Because of the limited space and the adjustable angles of the keyboard arm on the cart, a standard mouse would be nearly impossible for patients to use in bed. The team researched and selected a touch pad device similar to those installed as the mouse replacement on many laptop computers. This was a seemingly natural and reasonable solution, but after 3 years of the pilot implementation, Helen found that she received more complaints about the touch pads than anything else. For the most part, patients did not like using them and would have preferred to use a regular mouse. In response, Helen is switching to a wireless keyboard with a built-in trackball, which hopefully will be easier to use than the touch pads. Only time, and the number of complaints from frustrated patients, will tell.

Preparing for Special Circumstances

Some patients have unique conditions or circumstances that can affect their ability to use computers. Patients and families sometimes speak little or no English, and a language barrier might affect their ability to use English-based software and Web sites. During the pilot implementation, the computers did not have special support for other languages, but most patients were able to navigate to familiar Web sites through the English front end. Helen and the team are now translating the basic instructions into Spanish to help native Spanish speakers become acquainted with the technology more easily.

Amish families usually ask Helen to take the technology out of the room completely, and having mobile carts has made it easy for her to honor this request. Families with extremely sick children have also requested that the computer be removed because it is just one more thing to deal with. The team tried to plan in advance methods to accommodate children with other likely difficulties, such as vision and hearing impairments, but the limited number of such cases has made it difficult to find the best practical solutions. As with the touch pads, the trial-and-error process of finding the right technology sometimes is the only way for Helen to know for sure if a particular solution will be effective.

Videoconferencing: 90 Percent Work for 10 Percent Benefit

Helen and Matthew worked hard to install Web cameras on the computers so that patients can videoconference with friends, family, and classmates outside the hospital. For security reasons, they set up the cameras and the network to allow only outgoing video calls, and this task proved to be one of the most challenging aspects of the physical implementation.

Matthew describes the video component of the project as 90 percent of the work for 10 percent of the benefit. Some children have been able to virtually "sit in" with their class at school through videoconferencing, but the cameras are not used frequently by most patients. Nevertheless, video technology has the potential to facilitate highly interactive programs for the children. Helen is currently talking with people from the local library about putting a camera in the library's activity room so that patients can participate in some of their events. With the video infrastructure in place, many more opportunities for education and entertainment may arise in the coming years.

Special Wiring: Avoiding the Hospital Network

The patient rooms had to be wired specially for the Computers for Children project so that it would not interfere with the existing hospital network. Security violations would be much more problematic as part of the main hospital intranet, and the team would also have less control over managing it. Helen needs to filter and monitor the use of the Internet for Web, chat, video, and related components, and it would not be possible to achieve this level of control on the main network.

Because of limited funding for the pilot, only the adolescent and myelosuppression rooms in the current hospital could be wired for the Internet. There are no mobile units to bring to patients in other rooms because there would be no Internet access, and patients usually want computers in order to go online. Even if the team could afford to wire more rooms, Helen would not be able to handle the administrative burden of moving and tracking down computers by herself.

Why Can't I Have One?

Patients who did not have a computer in their room during the pilot often asked the child life staff why they didn't have one. The limited number of configured rooms is especially troubling to children who are moved out of a myelosuppression room and into a room without a computer. Once they know what they are missing, it is even harder for patients to imagine life in the hospital without a computer.

The program is expanding to sixty patient rooms and forty public computers, but the additional technology still will cover less than half of the inpatient rooms in the new hospital building. Helen and Matthew are preparing for the disparities between patient rooms by wiring the new hospital based on uniform geography and type of stay. For example, all patients on the seventh floor will not have computers, while all the isolation rooms on the eighth floor will be wired for computers and the Internet. This implementation will make it easier for Helen to explain to patients that only certain areas and types of rooms are able to have the technology.

Expanding to the New Building

The project has been funded by additional donations to expand to 100 total computers in the new hospital, and UCH will continue to support Helen's position on the child life staff. In order to justify expansion of the pilot to the new hospital, the project team designed interviews and surveys to evaluate whether or not the program has met its intended goals. But in the midst of managing the day-to-day activities of the pilot, Helen was able to conduct only about 40 of the planned 100 to 200 interviews. She did not end up preparing a spreadsheet of the responses because there was not a significant sample size of data. However, many families have expressed gratitude for the computers, and a great deal of anecdotal evidence illustrates the positive impact of the project.

In expanding to the new building, the benefits of the technology will be received by many more patients, but the workload and challenges that Helen currently faces also will be amplified. Doctors and nurses usually compliment the program, but Helen does not know what will happen when *all* the nurses and doctors in the hospital have to interact with the system. During the pilot, several nurses have helped children with basic computer issues, but one nurse said, "I always feel so stupid when they ask me and I don't know what to tell them." Helen also worries that with more computers and more potential problems, children will have to wait longer before she can get to all of the rooms.

She and the team estimate that with more than 150 computers, Helen definitely will need backup to do her job effectively. With only 100 computers planned for the near future, she will do her best to gracefully manage the inevitable challenges and surprises that lie before her.

Questions

1. What challenges can you envision for Helen in trying to manage the additional computers in the new building? How might the other hospital staff respond if the expansion is too much for her to handle alone?

2. The computers will be ubiquitous throughout the patient rooms of the new building, but the project is not a financial or organizational priority for the hospital. In addition to the examples witnessed during the pilot, what future difficulties might arise from this potentially conflicting arrangement?
3. Where would you draw the line between functionality and security? Are the benefits for the patients worth the potential risks of a relatively open system?
4. Should the team be conducting a more thorough and continuous evaluation of the project to ensure that they are meeting their goals? How might they do this effectively without extra manpower?
5. In what ways do the limited support and funding affect the choices in balancing patient freedom and preventative control (and vice versa)? Consider issues related to technology, administration, project goals, or any other area that you feel is important.
6. Pick one or two specific situations from the pilot and explain what you would do and why.

4
Managing Change

Jonathan Becker, Roy Gill, Susan Moy, Veena Seshadri, Dat Tran, Amy Wang, and Jiangi Yang

Background

St. Peter's Health System (SPHS) is a Catholic not-for-profit network of hospitals and clinics operating throughout Kansas, Missouri, Nebraska, and Iowa. The SPHS laboratories within the Kansas City metropolitan area are comprised of three hospital-based laboratories operating within a 25-mile radius. St. Peter's Health Center (SPHC), Lady of Sorrows Medical Center (LSHC), and St. Peter's Cedar Falls Hospital (SPCF) service patients from a variety of neighboring outpatient clinics and nursing facilities in addition to a large inpatient population. In the early 1990s, SPHS began to move toward a more integrated health system. Operating a core laboratory in each of the regional centers is a critical part of such a system. It would consolidate the organization's resources while improving patient care. In fact, many healthcare organizations have already adopted the core laboratory model in response to the nationwide increase in outpatient services and decrease in inpatient laboratory services.

Transition from a Distributed to a Core Laboratory

The Catholic Archdiocese established SPHC in Kansas City, KN, in 1959. Although SPHC is known for providing excellent care in the area, the collapse of rural hospitals prompted management to identify ways to become more competitive. Analysis of data on the quality of service provided at each location demonstrated that inpatient, emergency room, and "stat" outpatient test turnaround times needed to be improved. The success of the core laboratory model, as adopted by the St. Peter's Iowa region as well as by local competitors, provided the impetus for this transition.

The goal of the core laboratory model is to increase efficiency through batch testing. That is, tests on outpatient specimens are not performed as they are received in the laboratory. Instead, they are performed in batches at predetermined intervals (e.g., daily, twice weekly, weekly). Batch testing takes advantage of equipment that can be run more economically with higher labor efficiency, resulting in lower supply and labor expenses.

The labor cost savings gained in routine outpatient testing can then be devoted to hospital-based rapid response laboratories (RRLs) geared toward servicing only emergent and critically ill patients. RRLs, also known as stat laboratories, therefore result in an improvement in turnaround times. In addition to batch testing, analysis of all

routine outpatient testing is performed at one location in order to reduce excess capacity. Specifically, SPHC will be implementing the following.

1. Nonstat tests will be performed in batches at night (after courier runs have been completed for the day) with results available the next day.
2. Each hospital will house a RRL, and the core laboratory will be located at SPHC in the space currently occupied by the nuclear medicine department and the hospital laboratory. Financial analysis has indicated little or no savings if the core laboratory is located in a separate facility.
3. Services such as couriers, supplies, outpatient phlebotomy, field service, and sales will be centralized. These services will also be tailored to meet outpatient physician needs.

Lab Information System Implementation

Traditionally, each facility had been responsible for the selection and maintenance of its lab information system (LIS.) However, in order to achieve the level of efficiency and functionality made possible by the core model, it was necessary to integrate services such as ordering, specimen transport, and results reporting for the entire region. Thus, the first major step of the implementation process was the creation of a selection team whose responsibility was to evaluate available options and to make a final recommendation for a common LIS.

The selection team consisted of representatives from the administrative department, information systems (IS) department, and laboratory department from each of the three hospitals. To make an informed recommendation, the selection team visited each of the three sites to determine each site's hardware and software needs and also to assess the skill level of the personnel. The skill level assessment would serve as the basis for establishing a training program that would parallel the implementation process. Regular team meetings within each hospital were held twice weekly, and meetings between hospitals once a week.

To allow input from laboratory personnel, multiple demonstrations of four potential products were arranged. Although no one system met all the selection criteria, the team recommended that an Omega System product be the new LIS. This system offered clear advantages for outpatient testing and included a much more comprehensive service agreement than its competitors. While it lacked many of the services that the SPHC microbiology department had requested, Omega assured the selection team that a new version of the microbiology module would be released shortly. Omega also promised an on-site programmer for SPHC to facilitate customization changes. The SPHC business office approved this recommendation, and the contract was signed in April 2000.

Establishment of a Training Program

A training program was developed and implemented almost immediately on finalization of the contract with Omega System, Inc. Employees who expressed an interest in being trainers received intense instruction in the use of the system. These "superusers" acted as a resource for other employees and were available 24 hours, 7 days a week. In an effort to encourage employees to complete the training modules, incentives in the form of overtime pay and gift certificates were provided.

Because of the major changes in the laboratory organization, great effort was made to keep the employees well informed. A newsletter, *Lab Lines*, was distributed and posted in the common areas of the laboratories in the three hospitals. *Lab Lines* was the main mode by which management communicated information to employees. Common topics included reasons for implementing a core laboratory, the timelines for both the LIS project and the core laboratory project, and job reapplication procedures.

The administration hired Shirley Lukas as a consultant to ensure timely execution of the LIS implementation plan. Ms. Lukas was chosen on the basis of her project management experience. She reported to laboratory director Susan Roberts approximately twice a month to ensure that the project was progressing as planned. The administration realized that the organization was not accustomed to change. Many employees had believed that they were going to work for the hospital for life. However, in the current drive to improve efficiency by batching tests, cutting full-time employees became inevitable. To ease the transition, the administration decided that the elimination of jobs would be achieved by attrition rather than layoffs. Ms. Roberts believed this would help employees maintain a positive attitude and project a better organizational image.

Difficulties with Change

Plans for implementing the core laboratory model have resulted in a number of uncertainties and, as a result, stress for employees. As part of the reorganization, all positions will have new job descriptions; consequently, all employees will be required to reapply for their positions. As many of the positions will be allocated to the core laboratory (to be situated at SPHC), the majority of the employees at LSHC will have to apply for positions at SPHC if they wish to remain employed by the organization. Further, management has yet to inform the employees about the selection criteria to be used in the reapplication process. Given that the laboratory director is based at SPHC, the employees at LSHC are concerned about favoritism. Not only will some of them have to make the transition to the new facility, they also fear that they will be assigned to less desirable positions and shifts. This has left many LSHC employees resentful of those at SPHC.

In general, employees at SPHC seem more satisfied since most of them will likely remain at the same hospital. However, there are concerns about working in a new environment with new, disgruntled coworkers. They have also heard that LSHC employees "do things differently." This difference places added stress on SPHC employees, as they will have to spend additional time and resources orienting LSHC employees to procedures and cultural norms at SPHC.

According to the original timetable, the LIS implementation should have been completed well in advance of the transition to the core laboratory model. But because of a multitude of delays, the new LIS "went live" the same week that the laboratory reorganization began. SPHC was scheduled to be the first location to go-live with the new LIS. The simultaneous occurrence of the two changes has become a source of both distraction and anxiety.

Despite having the relevant experience, Ms. Lukas was unable to fulfill her duties as a project manager. Very early on, it became clear to Ms. Roberts that the project manager she had hired was ill-equipped to handle the LIS implementation project. Yet, she was unable to act on this impression, knowing that the organization prefers to err in favor of an employee. It was not until after the third delay attributable to

poor project management that Ms. Roberts felt confident in terminating Ms. Lukas. In fact, these delays accounted for more than half of the cost overruns by the organization.

The Current Situation

SPHC prepared well for the changes through careful design and planning of the project. The LIS implementation, which was delayed more than 18 months, is now well under way. There have been a few technical issues with the LIS since it went live, but the on-site Omega programmer and the Omega support staff have been very helpful in resolving these problems. As the employees refamiliarize themselves with the LIS, it is becoming apparent that because of the multiple delays, the expertise gained during their initial training has faded.

Meanwhile, the core laboratory remodeling is in full swing. As the official consolidation date draws near, employees at LSHC are experiencing increasing anxiety, tension, and resentment. They are complaining of favoritism toward the SPHC employees. In contrast, the SPHC employees characterize the LSHC employees as "a bunch of whiners." They grumble about the fact that they will be "bogged down" helping LSHC employees learn the new system. The situation has become so volatile that a consulting group has been contracted to evaluate the situation and make recommendations.

Issues and Recommendations

Main Issues

1. *Conflict between LSHC and SPHC due to a shift in power.* LSHC employees perceive an inequity in power and rewards distribution, as they will be the ones who will have to make all the compromises while they adapt to a new setting.
2. *Poor morale, especially at LSHC.* This is partly due to:
   a. The impending changes in the job status of many employees
   b. The uncertainty caused by the lack of communication between management and laboratory employees
   c. The extra time and effort needed to become adept at using the new LIS.
3. *Poor communication within the organization*
   a. *Communication between the two laboratories.* Even though the management has decided to merge the three laboratories, they have done little to initiate any kind of communication among the laboratory staffs. This will likely pose a greater problem when the actual merger takes place because not only will the employees be working in new job positions but will also have to contend with new coworkers, a new work environment, and a new LIS.
   b. *Communication between management and employees.* LSHC staff have incorrectly assumed that they will get the undesirable positions and shifts. Management could have explained in more detail the process by which they would select employees for the new positions.
4. *Collision of the LIS go-live and core laboratory construction.* The timing of the LIS go-live coincides with the beginning of the core laboratory reorganization. As a

result, the staff has not had time to adjust to the new LIS before they have to contend with structural workarounds and job reapplication procedures, which leads to increases in the stress level.
5. *Need for retraining.* The administration did not anticipate delays in the LIS implementation and therefore did not plan for a refresher training program.
6. *Merging of cultures and practices.* Amalgamation of the two laboratories involves more than merging the two workforces; it depends also on recognition of the differences between these two cultures in order to successfully merge them. In this case, the differing management styles of the two laboratories is the major feature that distinguishes the two cultures.

Recommendations

1. *Delay core laboratory reorganization.* If possible, this would give employees an opportunity to become fully comfortable with the new LIS and work out any kinks before proceeding with another major change.
2. *Institute an ongoing training program.* This would address the need for retraining caused by the delays. It would also provide a mechanism for employees to refresh their skills and reduce their long-term dependence on the superusers, thereby maximizing their output.
3. *Develop suitable forums for communication.*
   a. Distribute surveys to LSHC and SPHC laboratory staffs would allow them to openly voice their concerns and offer suggestions for improvement.
   b. Set up face-to-face meetings to provide a channel for richer vertical and horizontal communication. This would give management an opportunity to reiterate the organizational goals (e.g., improve patient care, keep up with the competition, take advantage of the outpatient market) and rally employees around these goals. To improve communication among employees, throw a party (for both LSHC and SPHC) to celebrate the end of the distributed laboratory model.
4. *Minimize the perception of inequity.* Options include:
   a. Adopting a rotating system of shifts
   b. Compensating those assigned to the night shift with higher hourly wages
   c. Ensuring equal representation of employees from the two laboratories on the night shift.
5. *Arrange orientation sessions.* Offer employees of each laboratory an orientation visit to the other laboratories within the region. This might include tours and sessions on history, traditions, and culture. It should provide:
   a. A peek into the new core laboratory environment
   b. A sense of how the other side works
   c. An understanding of the difficulties faced by LSHC staff
   d. An opportunity to mitigate the insecurity and distrust that has developed between the two laboratories.
6. *Establish a transition monitoring team.* Comprised of a representative employee group, the transition monitoring team would be charged with the job of keeping track of what is happening to people during the change period. It should act as an informal conduit between employees and management. In this way, the team would be able to capture an accurate reading of the mood and concerns of the employees and at the same time provide a sounding board for management initiatives.

Questions

Imagine that you have been hired as a change management consultant by SPHS senior leadership to address the issues described here.

1. How would you proceed in conducting your analysis? What additional information not provided in the case would you request?
2. What recommendations would you make?
3. What models for change described in the literature would you refer to in order to support your recommendations?
4. What would you be sure to include in your final presentation/report to SPHS senior leadership?
5. How effective was the lab's communication and information efforts in dealing with the lab personnel? With the staff at the other three hospitals?
6. Should the lab reorganization have been delayed because the LIS was not complete? Why? Why not?
7. How could the organization have ensured Ms. Lukas' project management competency?
8. Outline a just-in-time training program that the lab could implement.
9. What do you think happened with the microbiology department?

5
Managing Success: An Information Systems Dilemma at Great Plains Health Care

Tracy O'Connor, John Hawkins, and Kathy Hornby

Success can come at a price. For Great Plains Healthcare, the success of their clinical data repository (CDR), particularly in the ambulatory environment, is causing a fundamental conflict between their affiliated physicians and their staff of employed physicians. It is also exposing disagreements and weaknesses within the corporate structure of Great Plains itself.

These conflicts are being played out in the Great Plains western region where the regional director of medical informatics and the regional manager of information systems (IS) are aggressively introducing a scaled-back version of the current informatics system, utilized by the employed physicians, to the region's affiliated physicians. The success of the scaled-back rollout has caused some of the affiliated physicians to request the full software suite that creates data for the CDR.

The issue is not one of technology but of politics and an organizational structure that may have been caught off-guard by the request of the affiliates. For the affiliated physicians, access improves the quality of patient care. However, the employed physicians view this as an invasion of their proprietary system. Finally, some of the corporate directors are nervous about the financial and legal implications. The whole scenario is creating an affiliated-vs.-employed conflict and a corporate-vs.-regional conflict.

Corporate Organization Overview

Great Plains Healthcare, founded in 1955, is a large, complex nonprofit healthcare provider located in Nebraska. It has grown to become the dominant provider of health care and health insurance in the area—providing services through 22 hospitals and 100 clinics. Great Plains Healthcare has a complex reporting structure. The system's corporate structure supports three distinct divisions. The hospital division is responsible for inpatient activities but also manages administrative functions for the entire organization. Human resources, IS, accounts receivables, and other enterprisewide functions report to the hospital division. The health plans division administers insurance plans to organizations and individuals. The physicians division oversees the ambulatory clinics and employed physician network.

Regional Overview

As well as having corporate divisions, the organization is divided into three regions. Within the three regions, approximately 1,450 physicians are affiliated with Great Plains and 250 physicians have elected to become employed by Great Plains. Employed

physicians are paid a base salary plus bonuses contingent on additional patient workload. These physicians also receive benefits such as vacations, insurance coverage, clinic overhead, and office managers. The ratio of employed to affiliated physicians varies with each region. Great Plains has succeeded in employing only a small number of physicians in the western region. Those who have been hired to work in its clinics have not managed to provide significant profit for the organization.

The majority of physicians in the western region are affiliated with Great Plains. Affiliated physicians are not employed by the organization, but admit a large percentage of their patients to its hospitals and utilize other Great Plains clinical resources. Given that the affiliated physicians are the primary users of these facilities and have produced revenue for the healthcare system, the organization would now like to encourage the continued use of these facilities by the affiliated physicians.

IS Overview

In addition to its investment in hospitals and clinics, Great Plains has invested heavily in IS since 1968. It has committed significantly more to systems development (7 percent of revenues) when compared to the national average (3 percent). Building on its clinical IS, Great Plains has most recently developed a CDR. The CDR stores patient-specific information on clinical problems, medications, allergies, past medical history, and immunizations. In addition, progress notes are stored in the CDR. The CDR shares lab results and transcribed text data fields with other Great Plains regional hospitals and also links with outpatient billing and scheduling. Thus, the CDR has become a very effective data management resource for the healthcare system.

In 1993, Great Plains began to use the CDR in its hospitals. Four years later, in 1997, it introduced a physician's workstation into the ambulatory care clinics. This improvement furthered the integration of patient information by enabling physician access to and data entry into patient records from inpatient and ambulatory clinics within all Great Plains facilities.

Like other departments within the organization, the IS structure has evolved as the needs of the organization have changed. At the corporate level, the chief information officer (CIO) reports directly to the vice president of the hospital division. At the corporate level, most of the responsibility for clinical systems planning and implementation falls to the vice president of medical informatics (VPMI). The VPMI is assisted by three regional directors of medical informatics who have regional as well as corporate reporting structures. The western regional medical informatics director, Dr. Lawrence Shue, is a physician with a Ph.D. in medical informatics. He has worked in the region for 4 years and has established the role of medical informatics as credible in the eyes of the employed and affiliated physicians in the region. A year and a half ago, he hired a manager with extensive experience in ambulatory clinical information systems for the purpose of managing the ever-increasing IS demand in the region.

Together, they have been able to make significant gains in physician acceptance of the IS capabilities by working with a group of physicians who make up the regional physician's advisory board. The purpose of this board is to elicit input from the affiliated and employed physicians regarding the direction of IS at Great Plains and to keep them informed about IS resources that are available. This group is comprised of the corporate director of clinical systems, the regional director of medical informatics, the regional chief medical officer, the regional IS manager, one employed physician, and several affiliated physicians. It was at this meeting that the affiliated physicians first

requested access to the CDR. Since 1997, Great Plains has actively recruited both family practitioners and specialists from private practice. One of the incentives offered to physicians, if they agree to be employed by Great Plains, has been access to its sophisticated IS.

When a Web-based results review browser became available in 1999, the healthcare system initially permitted the affiliated physicians to view all patient data, including information from the ambulatory clinics and the hospitals. After protests from the employed physicians, clinic data was blocked, leaving the affiliated physicians with the capacity to view information only from the hospital system. The affiliated physicians found the hospital information so useful they are now requesting that access to the entire Great Plains IS be restored.

The Debate

Subsequent to the affiliate request for CDR access, two opposing groups have developed. The employed physicians at Great Plains are opposed to granting full access to physicians who have chosen not to gain access through becoming employees of Great Plains. The employed physicians have taken a pay cut to work in the Great Plains' clinics, and one of the main compensations offered to them in exchange was access to the clinical IS. These employed physicians have contributed financially, as well as through participation in the physician's division IS steering committee, to development of the CDR/physician workstation components. Granting the affiliated physicians access to the full CDR system would eliminate an important incentive for physician employment and give the affiliates access to the employed physicians' patient information. Providing affiliated physicians with access is unacceptable to the employed physicians who sacrificed income to gain access to the IS capabilities. Furthermore, the employed physicians are now fearful that improved access could more easily allow patients to be seen by affiliated physicians—and possibly cause employed physicians to lose patient volume.

In agreement are the vice president of the physician's division and the director of the physician's division IS, who do not favor the affiliates' proposal. They are concerned that the physician and clinical practice guidelines developed by the employed physicians will be freely available to those outside Great Plains system. Also, there is the feeling that affiliated physicians will be gaining access at a time when the bulk of the startup costs have been covered by Great Plains.

In contrast, the western regional chief medical officer, the western regional CEO, and the administrators of the two area Great Plains hospitals support full CDR/physician workstation access for the affiliates. Their opinion is based on concerns related to physician satisfaction. Providing the affiliated physicians access to the full suite of applications is an idea that has the support of the vice president of medical informatics, who has little patience for politics and tends to do what is right for patient care. His view is that providing affiliate access would improve continuity of care for patients receiving care from both employed physicians and referring physicians. Since the majority of the region's patients are seeing affiliated physicians, improving communication between providers could have a large beneficial effect.

In summary, the regional members, including the medical informatics group, are pushing for affiliated physician access to which the corporate physicians division is opposed. When the opposing groups asked the advice of the corporate CIO, he refused to endorse either opinion, saying that he will abide by a joint decision made by the two groups.

The Dilemma

Dr. Shue, regional director of medical informatics, is convinced of the value of the CDR software. He believes that it can significantly improve patient care and would be an asset to the practice of the affiliated physicians who have requested it. If Dr. Shue moves forward with providing full access to the affiliated physicians, he may have the blessing of the regional offices but not the corporate offices.

Great Plains has never had to deal with the issue of affiliated physicians wanting access to corporate information systems. Its large, complex hierarchical structure creates a relatively inflexible environment for new approaches to problem solving. Traditional structures that were previously effective are not sufficient to resolve current "nontraditional" issues. The current corporate and regional structures develop their own, often conflicting, goals without any structures in place for resolving these disagreements. As well, having regional employees report to corporate offices further compounds these problems.

Though the advisory groups have attempted to improve communication, there are still major gaps in communication between the involved parties. Each advisory group grew out of differing needs. The physicians division IS steering committee was formed to provide input into Great Plains clinic IS used by employed physicians. One of the main reasons the western region physicians advisory group was formed was for Great Plains to communicate better with affiliated physicians. Therefore each serves a different group, one the employed physicians and the other the affiliated physicians.

This dichotomy is a major problem since the resistance to giving access to the affiliates comes from the physicians division. The corporate physicians division has very little representation or official links to the medical informatics group. The employed physicians have not been involved in the discussion and see the issue from one side; that is, they have supported the IS financially, and they fear what they perceive as unfair competition if the affiliated physicians have access to the CDR.

Questions

1. How should Dr. Shue proceed?
2. Who are the stakeholders?
3. What strategy best serves patients?
4. Is what is best for patients consistent with the optimal position for Great Plains?
5. How does the CDR implementation scope and access fit with Great Plains' overall strategic plan?
6. Are there any privacy issues related to the Health Insurance Portability and Access Act (HIPAA)?

Recommendations

This situation involves introducing a change in process to the organizational culture. Up to this point, there has been no organized analysis of all concerns and issues. Furthermore, the current organization has no clear structures or strategies in place to enable the conflict to move toward a win-win framework where all stakeholders can agree on the best method for managing the flow of patient information. It appears that the best strategy, at this point, is for Dr. Shue to convene an advisory group composed

of individuals from all sides of the debate and a facilitator who has no stake in the outcome. The advisory group needs to be given a time frame for the formulation of recommendations. During this time frame, the prior physician's division IS steering committee and the regional physicians advisory board need to disband until these issues are resolved in an effort to unify efforts.

The advisory group membership needs to include:

- *Two employed physicians.* These two would represent the concerns that the employed physicians have expressed about having the affiliates see their data. They could also deal with the contractual matters related to the "carrot" of exclusive access to Great Plains IS.
- *The western regional director of medical informatics.* He is the one who has the highest stake in the decision. It has been a project he has championed for some time now.
- *The regional manager of IS.* She is the only one who has viewed the issue from both sides of the fence. She may be able to rationalize each of the arguments better than the others.
- *Two affiliated physicians from the western region.* These two could represent the affiliated side of the argument and also represent the network from the western region.
- *A neutral facilitator.*

In order for the group to break the previously established patterns of competition for resources, the use of an unexpected strategy might prove helpful in moving toward collaborative problem solving among professionals that is based on mutual values and ideals. The advisory group, with the help of available historical data, needs to examine specific case reports that illustrate the flow of information throughout the region. These specific case examples should be analyzed to determine how data flow can be best managed to maximize patient satisfaction, maximize the quality of patient care outcomes, maximize healthcare provider work flow efficiency, and maximize the efficiency of healthcare delivery.

When a consensus is reached regarding information flow, the advisory group can design strategies for implementation and address specific concerns. The implementation strategies need to address issues such as changes in access options, the cost to its users, financial benefits, security and confidentiality, and a structure to support ongoing maintenance of the agreed-on recommendations.

By creating a process that enables this group of professionals to focus on objective evidence, jointly shared patient care standards, and specified outcomes, it is hoped that the group will emerge with a broader perspective of data management across the organization. From this shared perspective, a solution will begin to emerge that will ultimately evolve into a group consensus on how data management processes can be improved to support the defined objectives. Once these processes are defined, they will provide a framework for the advisory group to utilize when making recommendations.

Section III
Implementation

Introduction

Jonathan Einbinder

In health care, we often do not do things that we should in order to provide patients with safe, high-quality care. Even when preventive or therapeutic measures have been proven to be effective, they are often not employed. For example, many patients with coronary artery disease are not treated with beta blockers or aspirin and do not have well-controlled blood pressure.[1] Recently, a national survey and record review found that nearly half of patients do not receive recommended preventive care or care for acute and chronic conditions.[2] Assessing this situation, the Institute of Medicine has observed that fundamental change is needed to improve our healthcare system and that information technology (IT) should play an important part in this change.[3]

Despite the fact that IT, especially clinical information systems such as an electronic patient record and physician order entry, are increasingly viewed as *essential* technologies, adoption lags. For example, an October 2003 survey by the Leapfrog Group, a national coalition of businesses and employers, found that despite compelling evidence of safety and quality benefits, only 4.1 percent of responding hospitals had computerized physician order entry systems in place.[4] Leapfrog attributes this low rate of implementation to high upfront costs, as well as to "cultural obstacles," noting that "many physicians resist the idea of ordering prescriptions via computer rather than by hand."[5] However, even when order entry systems or other health information systems are implemented, they may encounter obstacles and resistance and may not result in expected benefits or cost savings. Frisse[6] has noted that clinicians and administrators tend to use best-case assumptions about the benefits of IT and do not ask the question, What if these systems do not work?—failing to acknowledge that expected benefits might not be realized because of poor implementation, poor organization, or excessive and unanticipated costs.

A number of key components (hardware, software, peopleware) and skills (technical, project management, organizational) must come together to produce a successful information system implementation. The cases described in this section (and throughout this book) are intended to highlight these components and skills. They present a range of experiences with the selection and implementation of IT:

- *Bar Coding: It's Hard to Kill a Hippo*: Planning to replace stamped patient ID bands and labels with bar-codes
- *Developing an Emergency Department Information System*: Design, development, and implementation of emergency department tracking software and an electronic whiteboard for an academic medical center

- *Implementation of OpChart in West Medical Building*: Implementation of an anesthesia information system at an academic medical center
- *Development of the Scientific Computing Center at Vanderbilt University*: Development of a shared parallel computing resource leading to the creation of a scientific computing center to support a broad range of university researchers
- *Early Implementation Problems of an Integrated Information System Within the White Mountain University Health System*: Selection, planning, and implementation of an integrated information system (clinical and administrative) at an academic medical center
- *Implementation of a Web-based Incident-Reporting System at Legendary Health System*: Selection and implementation of a vendor incident-reporting system (adverse events and near misses) within an academic medical center
- *Mercer Medical Center*: Planning for implementation of a new physician order entry system in a very short timeline (9 months).

While each case is unique and there are quite a number of issues involved in each one, I would like to suggest that readers begin their reading and discussion of the cases with the following principles and questions in mind.

IT Implementations in Health Care Often Represent Significant Change

The importance of change management in successful implementations cannot be overemphasized—that is why a section of this book is devoted to change. Change may be classified as occurring at several levels. Level I change is incremental; from an organizational perspective, it consists of fine-tuning existing processes and is not too demanding.[7] Level II (transitional) and level III (transformational) changes, however, involve the replacement of existing processes with new ones whose end results may not be known. Most, if not all, clinical information system implementations represent level II or III change. According to Michael Beer,[7] the potential of an organization to successfully achieve such change can be expressed by the equation

$$\text{Amount of change} = \begin{matrix}\text{dissatisfaction}\\ \text{with}\\ \text{status quo}\end{matrix} \times \begin{matrix}\text{clarity}\\ \text{of}\\ \text{vision}\end{matrix} \times \begin{matrix}\text{strength}\\ \text{of}\\ \text{change process}\end{matrix}$$

Dissatisfaction with the status quo reflects the unmet needs of users, i.e., to what extent can high standards not be met with existing resources/processes? A clear vision of the future can also motivate change, as can a thoughtful change process that stimulates commitment and buy-in. Success implementation of a clinical information system requires:

- A clearly defined vision
- Consistent and visible support from "powerful" people
- Congruence among people, technology, and culture
- Specific goals, objectives, and benchmarks to define the change
- Clear, consistent, and frequent reinforcement for change at all levels and for the people involved.

In the context of the cases in this book, it is useful to think about what level of change the described IT implementation represents and to use the change equation above to assess the potential of an organization to successfully achieve this change.

What Factors Account for the Successful Adoption of IT?

Forty years ago, Everett M. Rogers[8] established a theoretical framework for the diffusion of innovations, citing a diverse array of examples such as the adoption of hybrid varieties of corn seed by farmers. Recently, applying Rogers' principles to health care, Berwick[9] concluded that three factors account for much of the rate of spread of change: perceptions of the innovation, characteristics of the people who adopt the innovation (or fail to), and contextual factors. Rogers, and more recently Berwick, did not explicitly address the adoption of healthcare IT, but the principles certainly seem applicable and relevant.

With regard to *perception of the innovation*, Berwick notes that perceived benefit is the most important factor. In health care, as in other domains, users compare the status quo with an unknown, uncertain alternative—in order to move away from the status quo, they need to perceive that there is likely to be a significant benefit. This principle is consistent with the change model cited above in which the level of change is directly associated with the degree of dissatisfaction with the status quo. Ironically, with IT, correctly diagnosing the cause of dissatisfaction with the status quo and communicating potential benefits of the new system are places where development and implementation projects often go astray. It is not surprising that Lorenzi and Riley[10] have commented that the part of the development and implementation process that causes the most problems is determining what the user really needs. In Rogers' model, innovations that are simpler (and adaptable) are more likely to succeed. In addition, innovations that can be tested on a small scale first (trial-ability) and where users can watch others change first (observability) are more likely to be adopted.

When studying the case studies in this book, either successes or failures, I suggest that the reader always ask: What problem was the system intended to solve, or what clinical or administrative need was the system intended to address? In the less successful cases, with the benefit of hindsight, we can often see that project personnel did not sufficiently understand or accurately diagnose users' perceptions of the status quo or of the new system.

With regard to the *characteristics of the people who adopt the innovation*, Rogers and Berwick group adopters into several categories (Figure III.1). Information systems implementations may not have much trouble winning over innovators and early adopters, but to succeed, they must reach the majority of users who do not fall into these groups. It may be helpful to think explicitly about whether and how the perceived needs of these different groups may vary and to make sure that the requirements and needs of users across these groups are taken into account. IT projects should be clear about the behavior change they are trying to achieve, i.e., trying to move the group as a whole (focus on the early and late majorities) or trying to move a specific group of users (focus specifically on innovators/early adopters or laggards).

With regard to *contextual factors*, Berwick refers to factors such as communication, incentives, leadership, and management, which are the focus of other sections in this book as well as key elements of most of the cases. Berwick also proposes several rules for healthcare organizations as they ponder how to introduce change and innovation. These rules may also be helpful for thinking about introducing healthcare IT:

1. Find sound innovations.
2. Find and support innovators.
3. Invest in early adopters.

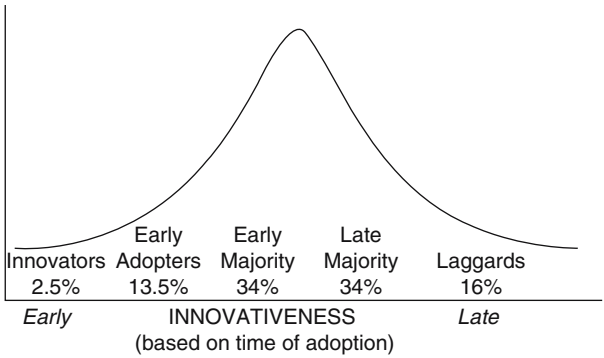

Figure III.1. Everett Rogers' innovativeness/adopter categories. The relative earliness or lateness that an individual adopts an innovation relative to other members of the social system.

4. Make early adopter activity observable.
5. Trust and enable reinvention (changes must be adapted locally to work).
6. Create slack for change.
7. Lead by example.

What Does Success Mean for Healthcare IT Implementations?

It is often not difficult to tell when an IT project has failed and even to assign one or more causes that led to this failure. Failure may result for a number of reasons: technical shortcomings; lack of specific technology competencies; vendor shortcomings; problems with so-called legacy systems; project management shortcomings; inappropriate scope, timeline, or budget; and organizational shortcomings.[10] However, it may be much harder to understand when a project has succeeded and to understand the factors that led to that success. Success can be viewed from a project management perspective: Was the project completed on time, within budget, and to technical specifications? Perhaps, more importantly, success can be viewed from a customer (or user) perspective. Lorenzi and Riley[10] have suggested that a project can be considered successful if it meets the perceived needs of more than 90 percent of end users viewed randomly. This definition reinforces principles introduced earlier in this introduction, namely, that perception of an innovation (how it meets needs) is integral to its adoption and that a broad range of users, not just innovators and early adopters, must see benefit in the innovation for it to be considered successful. Ideally, from an implementation perspective, the project management and customer perspectives are compatible and both have been taken into account. There are clearly defined responsibilities and accountability, realistic objectives, and significant emotional commitment to or ownership of these objectives on the part of all significant parties, as well as specific realistic definitions of project success and mechanisms for feedback and problem solving. Thus, in analyzing the cases in this section, suggested questions for study and discussion are: *What is the definition of success for this system? How will the project team be able to tell if they have succeeded?*

How Does One Go About Changing Clinician Behavior?

A key factor in the Rogers' framework for the dissemination of innovations is the characteristics of the people who adopt the innovation (Figure III.1). Thus, it makes sense to think about how an important class of users of healthcare information technology—clinicians and in particular, physicians—fits into this classification. Consider the following (true) anecdote. At a meeting where a new outpatient radiology order entry system was being presented to a group of clinicians, a respected physician became irate about being asked to use the new system. He pointed out that far too many demands were encroaching on his time and observed that if a lobster is put into a pot of water and the heat gradually turned up, the lobster will not notice how hot the water is getting until it is too late. Noting that doctors are a lot like lobsters, he observed that the water is already boiling! In this case, adding to the heat of the water are decreasing reimbursement, increasing productivity expectations, managed care formularies, and pay-for-performance incentives, not to mention electronic health records, patient e-mail, and a computerized referral system. His negative reaction had little to do with the merits of the new radiology order entry application; however, his perception of the status quo and what might best be called Rogers' "contextual factors" most definitely altered his perception of the new system and its chances for success.

This situation is not too different from the one facing the medical director for information systems in the Mercer Hospital case—how to successfully introduce physician order entry to a skeptical and overwhelmed medical staff. In the early 1990s, in one of the more widely cited articles about a difficult information system implementation, Massaro[11] described the negative response of interns and residents at the University of Virginia Medical Center when a new order entry system was introduced. Both the Massaro article and the Mercer case highlight several important and possibly unique aspects of how clinicians may react to IT, especially when this technology represents a significant change (level II or III) from the status quo. First, computerized order entry alters established work flow. In addition, with order entry, like some other applications, policies and rules are made explicit and strictly enforced that previously were ambiguous or not rigorously applied, e.g., "no verbal orders." To some extent, this conflict reflects and is exacerbated by ambiguous governance policies. In addition, the experience at the University of Virginia illustrates the lack of physician understanding or buy-in of the long-term strategic value of IT. These are some of the challenges in the Mercer case.

A thorough exploration of various approaches to altering physician behavior is beyond the scope of this introduction, but I would like to mention one model of behavior—the behaviorist model—that can be applied to clinicians and IT. This model, first described by B.F. Skinner,[12] asserts that both positive and negative stimuli (also called reinforcers) alter the frequency of a behavior. Applying a positive reinforcer (or removing a negative one) tends to increase a behavior, while applying a negative reinforcer (or removing a positive one) tends to decrease a behavior (Figure III.2). Thus, if the desired behavior is use of an information system, one should search for clues to identify reinforcers of current behavior and use appropriate reinforcers to condition the new behavior. Also, following the behaviorist model, continued reinforcement is necessary to avoid regression to the old behavior (i.e., rejection of the information system).

Dr. Warner Slack,[13] a student of Skinner's and a pioneer in clinical computing at Beth Israel Hospital and Brigham and Women's Hospital, adhered to the behaviorist model and applied this approach to clinical information systems. In response to the question,

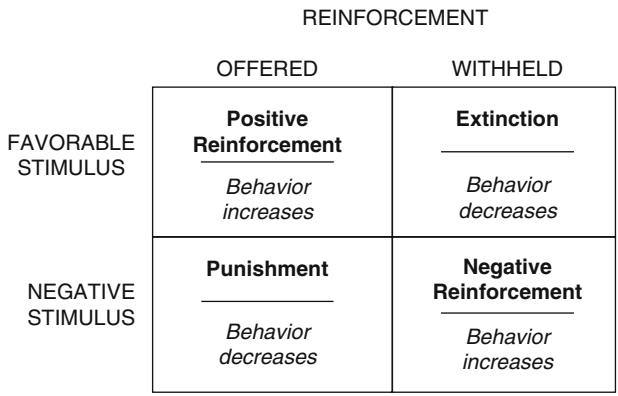

FIGURE III.2. Behaviorist model. Applying or withholding positive or negative stimuli reinforces a desired behavior.

Will clinicians interact with computers? Slack commented: "If the consequences of using the computer . . . are rewarding, its use will be repeated. . . . Clinicians will turn to a well-programmed computer that helps them practice good medicine. . . . It should be easier . . . to obtain a laboratory result from a computer than from a telephone call." In a strict behaviorist sense, a clinician gets immediate feedback (reinforcement) every time she or he uses a computer. If the feedback is positive, use of the system continues. In the behaviorist model, feedback should be immediate—delayed feedback is much less effective as a positive reinforcer. This suggests that adoption will be harder to achieve for IT applications where benefits are not immediate—e.g., the use of computerized medication lists, problem lists, order entry, or in the GEMINI case in Chapter 1, entry of data into an intensive care information system that helps track patient status and predict outcomes.

What Are the Roles of Power and Politics in Information Systems Projects?

Large healthcare IT projects tend to coordinate the activities of diverse groups of highly trained professionals. Especially in larger and more complex organizations (such as academic medical centers), while organizational goals are ambitious, formal authority systems may be weak and there may be conflicts among factions and professional groups. Under these conditions, the likelihood for the use of politics as a means of implementing major decisions is high. Politics can be defined as the domain of activity in which participants attempt to influence organizational decisions and activities in ways that are not sanctioned by the formal authority system of the organization, its accepted ideology, or certified expertise.[14]

A concept closely related to politics is power, which refers to the ability to exert actions that cause a change in the behavior or attitudes of another individual or group.[14] There are many sources of power—formal authority is only one and holds only so long as those who are subject to it respect and accept the nature of this authority. Power can also be derived by controlling key resources, controlling information

flow, or demonstrating skill in dealing with uncertainty. In general, to have power, one must have a sponsor or form alliances with peers or have a power base (subordinates).[14]

Because of the complex nature of many IT projects, as well as the varying factions and professional groups that may contribute to their success or failure, it is useful to acknowledge that politics will play a role and consider how to take this into account when implementing a system. The rational model of management assumes that all groups share common goals, that conflict is unwanted, and that power is derived from formal authority and professional expertise. The political model of management acknowledges that groups may have different aims, interests, and objectives and that the role of a manager is to coordinate these interests.[14] The lessons for carrying out healthcare IT implementations include the following:

- Recognize sources of power.
- Position yourself to be aware of key information.
- Control key resources.
- Politics are expected—so build coalitions and coopt influential persons.
- Use the rational model when goals are well defined and alternatives clear.
- Use the political model under conditions of uncertainty and ambiguity.

In their book *Organizational Aspects of Health Informatics*, Lorenzi and Riley[10] succinctly summarize many of these principles in a section on how to "swim with the sharks." Their advice for successfully negotiating issues of power and politics—or how to survive a swim through shark-infested waters—include the following pearls:

- When swimming with the sharks, do not bleed. Counter aggression promptly and use anticipatory retaliation. Assume all fish are sharks.
- Be patient.
- Maintain a sense of perspective.
- Identify and work with the power people.
- Maintain good communications.
- Avoid isolation.
- Know the "rules of the game."
- Maintain high energy.
- Be directly involved.
- Manage your ego.
- Maintain a sense of trust.
- Maintain your sense of humor.
- User your silver bullets wisely.

In approaching the cases in this section and throughout this book, readers can assess key participants in terms of what kinds of power they have and where they derive their power. In addition, it may be helpful to decide whether the projects described in the cases are operating under the rational and/or the political model and how politics might be applied to derail them or increase the chances of success.

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6
Bar Coding: It's Hard to Kill a Hippo

Margaret Keller, Beverly Oneida, and Gale McCarty

For years, the quality improvement committee (QIC) at University Hospital had been collecting incident reports documenting errors in patient ID, medication administration, and specimen collection. QIC became interested in the possibility of utilizing bar code technology to enhance patient care by decreasing these types of errors. After failing in an effort 2 years earlier, a bar coding project team was built consisting of representatives from admitting, pharmacy, clinical labs, clinical engineering, medical center computing (MCC), hospital procurement, operations improvement, quality improvement, and health unit coordination. The project was defined and divided into three phases for ease of implementation and cost control. The team decided to start with the least expensive and least controversial project, replacement of the "B-plates." These plates are the embossed, credit card–like plates used to stamp patient ID information on all hospital and major procedure documentation and on ID bracelets. The Addressograph typeface embossing machines used to make the patient ID blue plates were known as "hippos," because of their resemblance to the open mouth of a hippopotamus."

Valentine's Day 2001

"One step forward and two steps back . . . ," mused the usually optimistic Janet Erwin, director of value analysis and operations improvement, who was beginning to worry about the timeline she had set for implementation of phase I of her bar coding project. As the strains of her singing Valentine faded and the February 14 meeting began in earnest, she reviewed the phase 1 goal: replacement of the B-plate system of inpatient ID with bar coding technology in order to provide accurate and legible patient ID information at the time a patient presents to the health system for admission or for extended periods of care. The requirements for the bar coding project are:

- Use patient ID technology to support bar code and/or radiofrequency applications to enhance patient safety and to increase staff efficiency
- Limit noise production on patient care units
- Eliminate hand writing of patient ID
- Use technology that supports a secure patient ID band system based on patient age
- Eliminate the need to replace patient ID bands when a patient transfers from unit to unit

- Produce printed patient information on patient ID bands and patient ID labels including the patient's full name, medical record number, gender, account number, and date of birth.

Subsequent phases of the project were envisioned to include medication and lab specimen/collection tracking (phase II); equipment, personnel, and patient tracking; and mother/baby ID (phase III).

Janet had been brought into the project early in 1999 and had worked hard to determine the problems with the current system as well as a technology solution. The entire project had been initiated not only in response to dissatisfaction with the current B-plate system but also because of an overall desire to eliminate errors in patient ID, medication administration, and specimen collection. Bar coding had been used in the lab for 15 years, and in the pharmacy for 5 years, so the technology base was familiar to end users. Janet felt there was no support in the medical center for keeping the current B-plate system, so replacing it with more advanced technology seemed to be a good initial project for the QIC. The discussion today centered on phase I of the total patient ID initiative and whether a solution should be developed in-house or pursued with a third-party vendor. The MCC division was reluctant to support in-house development.

The View from MCC

The quietly commanding voice of Carl Cusak, chief information officer, resonated from behind his desktop, laptop, and personal digital assistant (PDA), all on active screens, as he summarized the reasons why he needed to call "time out" on the bar code project and "regroup" to a prior point in the planning process. "Most projects involving advanced technology and informatics at University Hospital begin with fervor, energy and commitment, but often fail because pertinent points in process development are assumed or overlooked," he noted. Carl spoke with the authority of his experience.

The lack of MCC involvement meant that technical requirements had never been defined, including details such as standards for data input, hardware infrastructure requirements, or a charter document stating the purpose, scope, timeline, or product development requirements. In addition, software specifications and interface requirements were lacking. Carl also felt that little attention was being paid to the substructure and interface problems inherent in bar coding, i.e., the capability of the bar code reader to read the code on a patient's wrist band. The use of radiofrequency technology and the use of hardware such as PDAs into which the bar code could be uploaded via a software program, allowing real-time ID of patients and tracking, were considered, but the benefits and drawbacks were not well researched. Backup strategies for unanticipated breakdowns in the system also had not been defined.

Carl complemented some of the long-standing individuals involved with the bar code project, such as Janet, for their commitment and effort. He noted that bar coding had long been used for applications in the pharmacy, the operating room, central supply, and the lab. Despite these varied uses of bar coding at University Hospital, however, no standards had evolved among these bar coding efforts. Carl admitted that MCC should have taken ownership of these disparate bar coding projects earlier and should have become the major shareholder in bar coding development. However, MCC personnel changes and priority mandates had kept it from assigning the necessary resources to the project.

"I can't believe that the bar coding initiative could still become an in-house development project at this point!" said Chris Matt, a QIC member who could remember when the idea of replacing the B-plates with bar code technology was brought up back in 1996. On the surface, the project seemed to be popular enough with anyone involved with direct patient care to ensure its success. MCC, however, had been so busy with other projects that the perceived lack of immediacy or of a high-level champion had tabled the bar coding initiative in the past.

With an increased focus on all patient safety issues, especially those related to ID, the QIC continued to identify and evaluate examples of potential problems. It seemed that once ID issues were examined, the scope of the concerns grew. Chris noted that the team went from a working goal of all patients having *an* ID wristband to that of all patients having a *correct* ID wristband. It became evident that something had to change to prevent a potential catastrophe. Processes tightened, but the basic difficulties surrounding the lack of clear, accurate, consistent patient ID were now in the spotlight.

On April 13, 2000, the request for proposal (RFP) was developed and distributed to certain third-party vendors for response. Chris was not happy to hear that phase I of the project could still end up being accomplished in-house, despite the RFP responses. If that was the decision, the project could have been completed a long time ago.

Needs of End Users

Charlotte Graham, inpatient admitting director, had been involved with the bar coding project from the start. After all, her area would be affected the most by any change in inpatient ID. Over the years, she had heard the complaints about the current system. She knew well how costly the "hippos" were and how much maintenance they required, and she was aware of the poor quality of many of the imprints. She also realized that the B-plates often did not get to their destination in a timely fashion, as they were generated in admitting and put in a central location for transportation to pick up. Even after pickup, the plates were taken to a sorting area and often awaited transport to the units. Some plates never reached their destination and had to be regenerated. This was especially true for unplanned admissions that were brought directly to the floor or were admitted through a major procedure area. Charlotte realized that while mistakes could not be totally eliminated, there was a need to minimize the areas where mistakes could be made. She saw bar coding as a tried-and-true method of inventory control that could be easily adapted to track patients and match patients to their records, films, or specimens.

Charlotte was disappointed to be back at the point of considering an in-house solution to the problem. If the project was not contracted out to a third-party vendor, it would need to be interfaced with the current admitting information system, which was very old and in need of being upgraded. The admitting information system was currently used to maintain demographic, billing, and visit information on all patients seen at University Hospital. Charlotte also felt that the current admitting information system could not support phases II and III of the project in the future.

In addition to Charlotte and her admitting staff, the front-line people, including unit coordinators, nurses, doctors, therapists, etc., would be directly affected by a change in the method of patient ID. One of their representatives on the project team was Risi Kay, an administrative assistant with experience working on the inpatient units.

Risi felt that despite the fact that most people would be happy to see the B-plates gone, a bar code system with labels would probably require a little more effort. This would especially be true during off-shifts, when unit coordinators were not available, as someone would have to be able to generate additional patient ID labels as they were needed. Just who would be trained to use the new system had not been determined. Time was often in short supply in completing day-to-day patient care activities. Ease of use and an institutionwide consistency of flow would be critical.

The Decision and the Implementation Plan

While awaiting the final word from MCC, Janet mused, "I would be delighted if we could do this project in-house, as long as we could meet goals and project deadlines. . . . It would be so much easier . . . it would help having MCC own this with us."

On March 20, an update meeting was held. It was noted that MCC had successfully generated patient identified bar codes from the admitting information system and had designed a system that permitted additional patient ID labels to be printed on request. They had also been able to generate various font sizes that would be consistent with adult, pediatric, or neonate bandwidths. The RFP for phase I was then canceled. The RFPs for phases II and III would remain open to enable University Hospital to better evaluate the available technology solutions for future phases.

It had been a long time coming, but Janet enjoyed the feeling of satisfaction she was experiencing with a job well done. She finally had her project on the agenda of the information technology governance committee, and with their support she felt that it would become a reality. "I am not going to dwell on the issue that this should have been happening all along, but hopefully the process that we have all had to go through will have a positive effect on other projects that go forward and require everyone to be on the same page and same priority level." Jane sat at her desk and smiled.

Questions

1. How could the MCC group have better worked with the end users on the bar coding project?
2. Develop a plan for moving patient identification to phase II.
3. What strategies could the QIC develop with the MCC to ensure future cooperation?
4. Was bar coding a good first project? Why? Why not?

7
Developing an Emergency Department Information System

Duncan Belser, Dominik Aronsky, David M. Dilts, and Jose Ferreira

It was the summer of 1997 when executive leadership and managers from the emergency department (ED) and the informatics center first teamed up to contemplate implementing an information system to support clinical processes and administrative functions in the ED. Three years later, the same group, with a few new members, by then called the emergency department information system (EDIS) team, abandoned its efforts to purchase an off-the-shelf solution and commissioned the development of a set of custom interfaces to the institution's multitude of existing applications. After two more years, the most central and publicly visible of these components, the electronic whiteboard (eWB), successfully passed its first uninterrupted overnight usability test. After more than 5 years of effort, the passage of this milestone marked a long overdue win for the EDIS team.

Although the project achieved its stated objectives, why had it taken so long? What, if anything, could have been done differently to speed up the process? More importantly, what could be learned from this experience to facilitate other healthcare informatics projects in the future? To answer these questions, we examined the history of the development and implementation of the EDIS from its inception to the implementation of the eWB in September 2002. (See Table 7.1 for the EDIS project timeline.) Through interviews with key project participants, analysis of project documents, and discussions with other relevant stakeholders, it appears that the project was complicated and prolonged initially by the team's inability to find a suitable solution in the vendor marketplace and subsequently by delays associated with designing and rapid-prototyping a custom information system. In retrospect, it is also apparent that the project is best described not as one activity but two that occurred as separate phases marked by distinct differences in scope, approach, goal setting, leadership, and outcomes. This chapter presents the relevant history of each phase and traces the major distinctions between them that we believe show the lessons to be learned from the experience.

Early History of the EDIS Project

By the spring of 1997, service levels in the ED required serious attention. Foremost, wait times were well above industry benchmarks and patient satisfaction was low. Additionally, referring primary care providers consistently complained about poor notification while their patients were in the ED, and few were satisfied with the summary reports provided after discharge. Finally, according to an internal study, 76 percent of

TABLE 7.1. EDIS project timeline.

• July 1997—EDIS steering committee decides to investigate technology solutions to transform emergency department (ED) operations. • November and December 1997—External consultants conduct ED operational review.	1997	Phase I
• January 1998—ED considers piloting an application to replace transcription. • July 1998—Computerization work group produces request for information entitled "Functional Requirements for Patient Tracking System" for circulation to vendors. • July 1998—EDIS team begins investigating vendors of off-the-shelf patient tracking system solutions.	1998	
• EDIS team continues investigating vendors of off-the-shelf patient tracking system solutions.	1999	
• March 2000—EDIS team holds kickoff meeting to discuss purpose, priorities, and issues related to implementing an information system in the ED. • September 2000—EDIS team decides to build an ED patient tracking system that integrates with existing information systems and identifies key functional requirements, proposed data flow, and action steps.	2000	
• January 2001—EDIS team presents data flow diagram for ED processes. • March 2001—Hospital administration approves budget to update network and install hardware in the adult and pediatric emergency departments for EDIS. • Spring 2001: 1. EDIS team gets new project manager with Informatics and ED experience. 2. EDIS team begins meeting with the ED staff weekly. 3. EDIS team presents prototype of an ED information system. • June 2001—EDIS team introduces Web cam to broadcast the dry-erase board to the registration area. • July 2001—EDIS team receives approval to hire a programmer/developer. • September 2001—EDIS team redesigns adult ED registration process by focusing on speed (rapid registration). • October 2001—EDIS team implements rapid registration process in the adult and pediatric EDs (including completing the installation of a wireless network). • Fall 2001: 1. EDIS team hires a programmer/developer to work on the Web-based EDIS as first priority. 2. EDIS team demonstrates early ED whiteboard prototype.	2001	Phase I
• March 2002—EDIS team completes early manual for ED whiteboard application and begins developing user training materials, including Web-based training tools. • April–May 2002: 1. EDIS team presents electronic whiteboard (eWb) Overview presentation to the ED and suggests a plan for a staged go-live, first using existing systems in tandem use, then without original marker board; includes documented contents to maintain and role-based responsibilities. 2. ED nurse educator, assistant managers, and managers conduct user training on the job. • September 19, 2002—eWB application completes first overnight operational usability test. • December 11, 2002—EDIS project manager produces first new reports on ED operational statistics for September, October, and November using EDIS.	2002	

the ED faculty and 58 percent of the ED nursing staff were dissatisfied with the existing technology resources that were in place to facilitate the clinical and administrative functions of the department.

In reaction to these issues, the EDIS steering committee convened a team of informatics and ED staff members (Table 7.2) on July 14, 1997, to discuss how information technology might be applied to ease the operational problems in the ED. The team,

Table 7.2. EDIS Team.

Emergency department (ED) representatives	Informatics department representatives
• Chair of the Department of Emergency Medicine[a] • ED administrative director[a] • Director of adult ED[a] • Director of pediatric ED • Manager of adult ED • Assistant manager of adult ED • Manager of pediatric ED • Assistant manager of pediatric ED • Director of admitting • Director of ED finances • ED nurse educator • Director of ED registration (added in 2001)	• Director of informatics center[a] • Members of the order entry application team • Members of the information systems support team • Chief technology officer • Chief information officer • Information services consultants (to serve as project managers until Spring 2001) • EDIS lead programmer/developer (since Fall 2001 • EDIS project manager** (informatics faculty; since Spring 2001)

[a] Member of the EDIS steering committee.

composed of representatives and executives from a broad number of hospital functions, immediately targeted what it identified as two separate problems. First, they brainstormed a preliminary list of features the department would require in a system to manage its information needs; and, second, the group hired a team of external consultants to conduct an operational review of the ED and recommend key changes to improve satisfaction and performance.

Over the course of November and December of 1997, external consultants interviewed a number of patients and staff and examined most of the department's core processes. In a February 1998 report, they highlighted five key factors that were negatively affecting the service environment in the ED. Specifically, they noted ambiguity among staff roles and a general lack of concern for patient or referring physician satisfaction. They also reported that staffing levels were not well matched to patient volumes, managers could not monitor occupancy levels efficiently in real time, and administration of the cross-function paper-based processes was highly cumbersome. They recommended that the department would benefit from service-oriented team-building exercises, focused discussions around job duties with respect to departmental responsibilities, and, as examined below, implementation of a suitable information system to measure and coordinate its activities.

Regarding the department's need for an information system, the consultants specifically noted that volatility in daily and sometimes hourly demand for emergency services often resulted in gaps between the number of patients waiting to be seen and the number of providers available to care for them. It was primarily these gaps that caused excessive wait times and, consequently, drove down patient satisfaction. However, gaps were compounded by the fact that department managers could not efficiently monitor and adapt to changes in occupancy. Rather, they could only rely on retrospective and time-consuming analysis of historical throughput metrics (admissions, discharges, etc.) for ex post facto guidance in staffing model planning. The right information management system, it was expected, would enable dynamic monitoring of waiting and care delivery areas. Monitoring data collected by the system, combined with rules-based condition triggers embedded in the software, could alert managers to react when something unusual happened, e.g., if, on a hypothetical Friday, demand peaked in the morning rush hour rather than as usual in the afternoon or early evening because of an accident on the nearby interstate.

In addition to the lack of real-time activity monitoring and staffing-level planning capabilities, the consultants observed that data collection for care delivery and administration required an unmanageable and often unorganized volume of paperwork. In fact, they observed, paper-based processes in the ED were so cumbersome that they were a major cause of dissatisfaction to all parties involved and a primary obstacle to preparing documents for referring physicians. Perhaps worse, some paperwork was the limiting factor in the speed of care delivery sequences. For example, in patient registration, lengthy forms had to be completed before triage could be performed—a major source of patient dissatisfaction. In addition, discharge summaries were challenging to create because information was stored in collections of charts and shadow charts throughout the care delivery process. An appropriate information system, it was thought, could reduce the paperwork onus by separating information collection activities from care delivery sequences. Such a resource would centralize information management and enable report production on demand.

With these findings in mind, the EDIS team began discussing possible information technology solutions. Because the institution had considerable experience with building its own clinical applications, the debate quickly centered around evaluating the classic "build-vs.-buy" decision. In many ways, however, these conversations were premature because the question of what to buy or build had never been completely clarified. Some favored implementing a patient tracking system and advocated scouring the marketplace for vendor solutions. Others with a broader interest began defining the feature set of a tool to meet a variety of the department's operational needs. As one might have expected, there were also a few who resisted the effort entirely, expecting that the ED physicians would never adopt such a system.

Eventually, because of the substantial patient satisfaction and care delivery issues associated with the department's long wait and throughput times, the team focused on acquiring a system for real-time activity monitoring and resource management. In what ultimately was a fateful choice, solving the paper-based process challenges became a secondary priority. Instead, the dominant vision became that of a patient tracking system that could be used to capture time-and-motion statistics that would help managers identify those situations when waiting areas grew full or process bottlenecks that needed to be addressed. They planned that ED nurses and staff would keep the system current by recording the time of each patient's check-in, triage, encounter, discharge, etc., and thereby the task of tracking patients through departmental areas would be accomplished. With this in mind, team members finalized their desired functional requirements for a tracking system by early July 1998 (Table 7.3) and began evaluating vendor solutions in late summer.

Despite a rather confident start, success did not come quickly. To the contrary, the group corresponded with almost a dozen vendors for the next 18 months and held numerous meetings to no avail. There were, in fact, major issues with the team's approach that complicated the project. Foremost, it proved impossible to find a system that could be cost-effectively integrated with the array of internally developed and continuously evolving applications already in use throughout the medical center. Although legacy system issues were common to similar information technology projects, they were particularly limiting in this circumstance because the environment was changing at a rapid pace of two or three major clinical application additions each year. Furthermore, the team eventually concluded that vendor dependency would reduce the organization's flexibility to implement software design changes in future versions. Because flexibility was particularly important in the context of such a dynamic

TABLE 7.3. EDIS design process results, July 1998.

Planned features	Expected benefits	Desired tracking statistics
• Computer-generated medical record automatically interfaced with hospital information system • Integrated hospital registration with insurance verification • Computer-generated triage note • Computer-maintained tracking board with automatic warning prompts • Computerized order entry • Computerized nursing notes • Automatic retrieval of laboratory and radiology results • Full electrocardiograph (ECG) recorded in record (not just interpretation) • Automatic coding of diagnosis • Support for continuous quality Improvement (CQI) initiatives • Built-in time out if user walks away from terminal • PIN identification for quick access • Prompts and flags based on preset parameters	• Increased revenue from lost charges • Reduction of emergency department (ED) paper-/form costs • Increased quality of medical information available to primary care providers • Reduced risk due to illegible or incomplete clinical or billing information • Improved use of nurse time • More efficient tracking of patients • Reduced length of stay (LOS) • Reduced patient elopement • Improved ability to retain staff • Improved relations with other hospitals • Increased availability of management reports with increased facility of reporting • Increased documentation of supplies utilized in care delivery for better reimbursement • Security and confidentiality protection to meet JCAHO requirements	• Time of arrival • Time of triage • Time to bed • Time of initial nurse assessment • Time of initial physician contact • Time of disposition decision (admit to hospital or treat and release) • Time of ED departure (discharged from ED or admitted to hospital

Source: Internal memoranda.

system environment, the team was reluctant to make any commitment to an external party.

Perhaps even worse, the market for ED information systems was in its infancy at the time. As such, the risk of losing flexibility for customization was not as significant as the risk of the chosen vendor not being able to maintain its customer service levels or even going out of business in the middle of the implementation. Although this default risk could have been managed through software contract provisions specifying source code escrow arrangements, the possibility of the project collapsing for reasons beyond the control of the team made it difficult to settle on a single vendor. Finally, in addition to the technical and business issues mentioned, more challenging perhaps was the vagueness of the notion of a patient tracking system and how it would integrate with emergency medicine operations. In the planned scenario, nurses and staff were expected to maintain the system in addition to their normal activities. Some feared that this model of patient tracking, with its additional administrative layer, would overtax an already burdened team and reduce satisfaction even further. As a result, documents show that in September 2000 the EDIS team abandoned its efforts to pursue an off-the-shelf solution and began planning to design and build its own system, an effort that would extend the project into the following spring when new leadership would arrive to carry it in a new direction.

Designing the EDIS

From a historical perspective, the spring of 2001 marked a new and second phase in the EDIS project timeline (Table 7.1). At the beginning of this period, the team restructured itself from a collaborative "system selection" team into a project manager–led "system design and development" work group. To mesh the design process with the department's operational realities, the team named a physician informaticist with previous experience in emergency medicine as the project manager and partnered this individual with the director of the adult ED (a practicing attending physician).

The project management duo began by making a number of strategic changes to the project's objective and scope, and they entirely reorganized the team's approach. Foremost, they focused the project on improving overall ED performance—addressing the operational issues identified in 1998—through process analysis and information needs assessment across all ED functions. This was a marked difference from the earlier goal of implementing an off-the-shelf patient tracking system. In fact, this new objective meant reevaluating a number of long-standing processes, many of which had been previously considered unalterable, to identify opportunities where information technology might help to increase efficiency. In addition to advocating process analysis, the pair asserted that an integrated approach to using technology within functions should dictate process redesign efforts. Specifically, the idea of tracking patients by implementing a supplementary departmental system was inappropriate. Instead, the pair argued that tracking data could be collected in the background of any activity if an appropriately designed information system could be integrated with the process. For example, if supported by the right series of screens and dialog boxes, a nurse could use a custom module of the EDIS to record triage information while the system was automatically collecting timing statistics based on specific button clicks. Under this integrated approach, data from triage could be combined with data collected in a similar fashion from other process functions, e.g., discharge, to form the foundation data set for analyzing throughput metrics and identifying improvement opportunities. This model of process-integrated and function-specific components was drastically different from the layered tracking system approach first contemplated by the EDIS team. Implementing this strategy required weekly meetings and rapid prototyping of the process-related software components, but it produced results almost immediately.

The EDIS team had noteworthy success in adopting this new strategy, and no redesign was more dramatic than that of the patient registration function. In fact, the operational analysis from 1998 had indicated that the 20 to 25 minutes required to register a patient caused unnecessary delays and negatively affected patient satisfaction. However, after careful review, the team concluded that registration could be completed in *less than 2 minutes* if the focus could be shifted away from "completing the administrative (nonclinical) data collection" to instead emphasize "getting the patient into the system for treatment" as soon as possible. With this in mind, the team implemented a rapid registration procedure that simplified the registration process from a series of ten computer screens to a single computer screen with only six basic data elements. To complete gathering of the required data, the team implemented a new process by which nurses would use wireless laptops at the bedside only after triage and urgent care needs had been addressed. By letting patients receive the care that they were seeking as fast as possible, this redesign eventually made better use of waiting time and significantly improved satisfaction. Redesign efforts for triage, assessment, order entry, and discharge processes had similar results.

In parallel with its process redesign efforts, the team began to design the EDIS as a suite of integrated software components. To prioritize the development of these function-specific tools, the project managers developed prototypes and encouraged the team to evaluate each one along three dimensions: ED priority, EDIS team priority, and implementation difficulty (Table 7.4). After this analysis, the project managers readily identified the two components that represented their greatest opportunity for dramatic success: the eWB and its notification interfaces. However, to achieve success and have a dramatic impact on the department, they knew they had to carefully manage the associated risks. With this in mind, the new project leadership segmented their design approach to address interfaces separately from system components and focused their efforts on the highest-priority items.

The two highest-priority interfaces that the design team had to incorporate into the EDIS were links to the hospital's longitudinal patient record and its provider order entry system. Because both these major applications were still evolving and because both were being implemented on independent timetables beyond the control of the EDIS team, creating interfaces to them was particularly risky. To manage this risk, however, the EDIS project managers strategically decoupled the success of the interfaces from the project's overall success by stratifying the level of integration required and staging the availability of difficult-to-create features. For example, because the longitudinal patient record had been implemented on workstations in the ED, clinicians could already use its basic functionality to access patient records. However, the EDIS project managers deferred promising the ability to notify ED staff when a new lab report or radiology impression was available in the electronic record until they knew it was technically possible. In a similar fashion, the EDIS project managers carefully planned an interface to the hospital's provider order entry system. However, because order entry had not been implemented in the ED by the time planning for the EDIS began, the team designed an interface that could be activated at a later date but was not a required component of the core EDIS. This strategic separation proved fortunate because, as it turned out, the plan to implement order entry software in the ED was postponed, but EDIS development proceeded without interruption.

The highest-priority noninterface component of the EDIS was to be an electronic version of the department's whiteboard. In fact, the prominent dry-erase board that

Table 7.4. Assessment of proposed EDIS Components.[a]

Proposed EDIS component	ED priority	EDIS team priority	Implementation difficulty
Electronic whiteboard	1	1	1
Real-time notification through interfaces to laboratory, order entry, radiology, and electrocardiograph systems	1	1	1
Rapid sign-on mechanism	1	1	2
Rapid registration	1	1	3
Discharge documentation	1	2	4
Electronic triage documentation	2	2	3
Demographic information access	2	3	3
Management reporting	2	3	3
On-call management	2	3	5
Staff scheduling	4	4	3
Nurse charting	5	4	2

[a] Proposed components were assessed across three dimensions: emergency room (ED) priority, EDIS team priority, and implementation difficulty. Score ranges: 1 (highest) to 5 (lowest). Scores of one (1) indicate highest priority or most difficult to implement.

the proposed eWB would replace was the department's most central and vital tool for managing its operations at a glance. It was a central place to look for information on patient status and flow, occupancy levels and waiting room queues, operational statistics and emergency telephone numbers, etc. With the right information on the board, providers, staff, and operations managers could use it to make decisions about the service they were providing and the activities they were monitoring. Unfortunately, manual processes associated with the maintenance of time-sensitive information on the whiteboard were problematic. Keeping it up-to-the-minute took nurses away from their direct patient care responsibilities, and physicians wasted time looking for patients, checking for lab results, or occasionally ordering redundant tests when the information was not current. Cleaning staff wasted time unnecessarily searching for rooms to clean instead of knowing exactly which rooms required attention, and receptionists often had to physically check a room's status when they needed to admit a patient because the information on the board could not be seen from the reception area. In sum, the manual whiteboard did not enable the vital status monitoring functions that it was intended to support. It was these shortcomings that made the creation of an eWB a top priority for the EDIS team in the Fall of 2001.

The focus that the team placed on developing and prototyping the eWB resulted in total replacement of the manual system in a period of 9 months. One of the first prototypes demonstrated how a network could distribute information to multiple areas of the ED, and it was immediately beneficial. Specifically, the team installed an inexpensive network camera in the clinical area of the department, focused it on the manual whiteboard, and posted its images to an intranet site. Receptionists were then able to view the whiteboard from their desks through a Web browser, eliminating the need for them to run to the back in the middle of an admission. This interim solution based on simple technology brought early relief to the user group most negatively affected by the manual system. At the same time, feedback from the department facilitated the team's rapid prototyping efforts to design and build a Web-based, database-driven software application for a touch-sensitive plasma monitor that would eventually hang on the same wall where the original marker board had been for years. Figure 7.1 shows the transformation from the manual whiteboard to the electronic version.

Today, the eWB is not only different from the original whiteboard in appearance but is also radically different in the way it is populated with information and in the way it makes information available. For example, because of the redesigned rapid registration process, patient names and chief complaints are automatically added to a central database and therefore become visible and editable instantaneously to authorized individuals throughout the department. Patient tracking happens automatically in real time, and special tools to highlight extended waits have increased staff awareness of potential service issues. Notification engines are implemented to keep the eWB information about room status, clinical alerts, and test results updated continuously. The system also automatically tracks the length of stay for individual patients and computes aggregate operational statistics for the department (occupancy rate, waiting room count, average length of stay) that can be queried and presented in performance analysis reports. Furthermore, clinicians, managers, and executive leadership can use the tool's Web interface to conduct off-site monitoring of events in the ED if necessary. On a larger scale, the monitoring capabilities have even been extended to facilitate the department's participation in a countywide biosurveillance program, a capability that was never anticipated. In sum, the eWB has met and exceeded the expectations that surrounded its initial development. These phase II project successes are summarized in Table 7.5.

The marker board-based traditional whiteboard

The Web-based and database-driven electronic whiteboard

FIGURE 7.1. The traditional whiteboard and the electronic whiteboard (eWB). (Reprinted with permission.)

Table 7.5. EDIS project goals and outcomes.

Goals		Outcomes
Decrease physician time looking for patients and checking status of lab results.	→	Physicians see room status at a glance on the whiteboard and can quickly locate patients or receive alerts that test results are available.
Increase staff knowledge of each patient's emergency department (ED) service history.	→	Physicians no longer enter exam rooms, or poll patients in the waiting area, to check if radiology or other auxiliary services have been performed
Decrease inefficient use of time by nurses.	→	Nurses use computer terminals to update the information system from workstations throughout the ED.
Increase staff awareness of patient service time (how long patients have been at the ED)	→	Staff can change priorities to focus on patients based on eWB's up-to-the-minute waiting time
Decrease janitorial time spent roaming for rooms to clean.	→	Janitors now use the board as a task list.
Decrease reception time spent checking rooms for availability.	→	Receptionists now admit patients to the ED and assign rooms without having to leave their desks to check the board.
Enable alerts for emergency operational or clinical situations.	→	eWB automatically reports occupancy level, extended wait times, and uses a color schema to convey its message.
Make operational statistics available to help managers improve performance.	→	The EDIS enables standard and ad hoc reporting for management decision making.

Conclusion

Despite its ultimately successful outcome, considering the total EDIS project duration, extending from its conception in 1997 to the first full run of the eWB in late 2002, a reader might wonder how to evaluate and justify a project with such a long history. As has been described, however, development of the EDIS was a two-phase project with distinct differences between its phases (Table 7.6). In retrospect, we conclude that the success realized after the second phase was fundamentally dependent on the failure of efforts to identify an off-the-shelf solution. Specifically, although one might be disappointed with the first phase of the project because no tracking system or measurable performance improvement tool was implemented to address the department's operational issues, exploration of functionality options and research of the vendor marketplace produced the valuable decision that it was worthwhile to develop a custom solution internally. In fact, it was only with this conclusion from the research that the second phase of the project was commenced. Although it might seem that the due diligence phase of the build-vs.-buy decision was perhaps excessively extensive in this case, it appears that such scrutiny and deliberation were required to assure all stakeholders that investing in the development of another custom application was the best approach.

From a historical perspective, however, it is worth commenting that the "due diligence" phase, phase I, might have been hastened, albeit to the same outcome, if specific changes had been made to the project's goals and organizational structure in the beginning rather than at the conclusion of the first phase. Specifically, the shift in the team's goals from phase I to phase II transformed the project from a generic effort to implement a patient tracking system into a focused initiative to improve the depart-

ment's operational performance by applying information technology to support redesigned processes. Had this focus on outcomes been present in the first phase, less attention might have been placed on finding a "silver bullet" system solution, and the team might have realized the opportunity to improve certain processes (e.g., registration) much sooner.

Also, the second phase of the project benefited significantly from a change in the project's leadership structure (Figure 7.2). In the project's first phase, the organization's strategic elite played a key role in developing the ideas behind what a patient track-

TABLE 7.6. Evaluation of key project criteria for phases I and II.

Comparison	Phase I	Phase II
Needs assessment	Needs assessment was based on an understanding of operational problems in the department and team member evaluation of commercial products.	Needs assessment was based on an analysis of the tools and processes used in performing functions in the emergency department (ED).
Project leadership	The EDIS steering committee led the project and invited ED and informatics staff to participate.	After the decision to build a system was announced, two physicians, one each from the ED and informatics, under the sanction of the EDIS steering committee, stepped up to lead the EDIS project to completion.
Coalition building	The steering committee made efforts to include people in the process of forming ideas for the system selection *but* alienated people from the process by having endless, fruitless meetings.	The physician-led eWB development team rebuilt support in the EDIS project through focused attention on process revision, prototypes, and demonstrating progress in a timely manner.
Objective and scope definition	The EDIS team had a vision to use information technology to help track patients through the ED. Exactly what technology would be used, how it would be deployed, and who would be responsible were questions left for research and debate.	Two informatics physicians would lead the EDIS team to replace the functionality of the ED whiteboard through process analysis and using software already in place in the institution. Additional functionality would be added over time.
Schedule planning and project organization	There was no schedule for delivering a revised EDIS. Research and possible options were considered for 4 years.	The project leaders planned to implement functionality in order of importance and ease of implementation over 18–24 months.
Political sponsorship	The EDIS steering committee was divided over key questions of what could be done and how it would be accomplished.	The project leaders communicated with ED staff and the steering committee to build consensus and support for the project plan and its implementation.
Project process organization	The process of researching off-the-shelf solutions led to unending cycles of discovery and evaluation.	The software development processes followed a rapid application development (RAD) model.
Obstacle-targeting	When proposed solutions were unsatisfactory, more research was conducted.	The RAD model supported building functionality incrementally so that issues could be resolved quickly.
Institutionalization of progress	No solution was identified or implemented.	Process revisions were made to incorporate technology solutions.

Source: Adapted from Hyer N, Wemmerlöv U. A short note on change management: managing the transition to cells. In *Reorganizing the Factory: Competing Through Cellular Manufacturing*. Portland, OR: Productivity, 2002. (Reprinted with permission.)

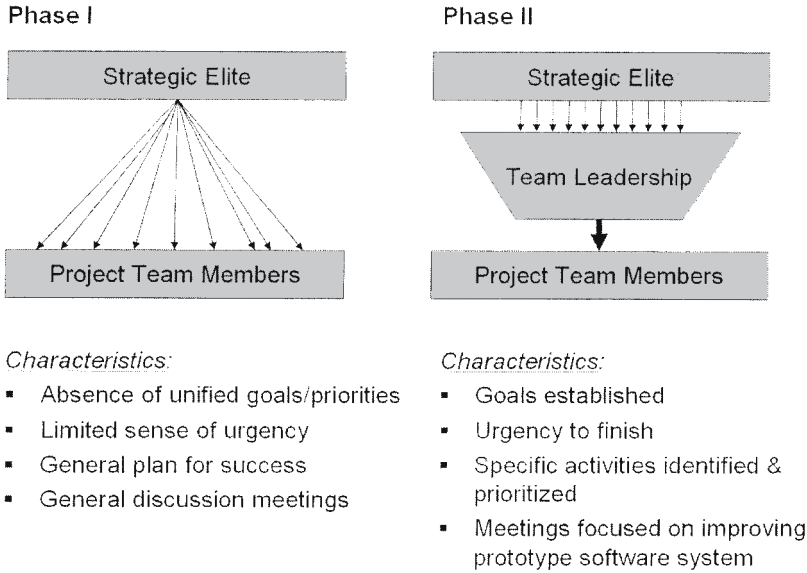

FIGURE 7.2. Changing EDIS project organization structure over time.

ing system might require, and they wisely solicited the feedback of key individuals. However, during this period, no individual or set of individuals played a role in translating the vision of the strategic elite into specific tasks for the team to accomplish. In contrast, during the project's second phase, the director of the adult ED and the project leader from informatics together formed the necessary managerial layer with the delegated authority to perform key functions like clarifying goals, prioritizing activities, and managing risks. As a result of their efforts, meetings were efficient, and energy was focused on the outcomes-oriented activities of process redesign and rapid software prototyping. In retrospect, it appears that the presence of this translation layer was a primary catalyst for the ultimate completion of the EDIS project. Although we can only speculate in hindsight, a similar project management model for phase I might have helped the EDIS team reach the pivotal conclusion to develop a custom solution much sooner.

Questions

1. What problem is the eWB intended to address?
2. Was the project a success? Why or why not?
3. Initially, the EDIS team chose to focus on selecting a patient tracking system. Later, the scope of the project was broadened to include a substantial component of process analysis and redesign. What were the reasons for this change in scope? What are the implications for the project?
4. The EDIS team used a variety of processes and criteria to prioritize their work, ultimately settling on an eWB as the top initial priority. Critique the prioritization process and decisions.

8
Implementation of OpChart in West Medical Building

Nathan R. Hoot and David L. Sanders

"The system is locking up again! Are you kidding me? I swear this program hates me." Walter Sellers glanced over at the patient, who lay on the operating table. The patient was a 12-year-old boy who was being operated on to repair an inguinal hernia. This procedure is generally minor in scope, but any task can become difficult when the tools impede, rather than facilitate, one's ability to work. The pediatric surgeon glanced over to see Walter with his full attention on the unruly computer and his back turned to the patient. This prompted a swift rebuke. "Hey! You need to be doing your job here—you've got an airway to manage!" "Yes sir, I apologize." Walter turned back to attend to the patient's endotracheal tube. He needed both hands free to secure the patient's airway, and yet he also needed both hands available to force the computer into submission. It was indeed frustrating to him, to feel the hot temper of the surgeon directed at him when it was not his fault that the computer would not function properly. "You know, you really should scrap that newfangled computer and just do your charting on paper, like we always have," the surgeon suggested. With a sigh of relief, Walter reached for some paper and said, "That sounds good to me. . . ."

Introduction

This case study describes the implementation of an anesthesia informatics system in a surgical unit at Riverview University Medical Center (RUMC). This tool is one part of a larger perioperative informatics initiative that includes many computer-based modules. All these systems were developed locally with direct involvement by practicing anesthesia staff and are in daily use across the varied surgical units of this large medical center. Developers and users attest that these products have been readily adopted into the clinical practice of anesthesiology and are happily used in the various operating suites within the hospital—with one notable exception. The module of interest to this case study, called OpChart, allows for electronic documentation of patient information during an operation. In the one surgical area where the majority of pediatric and ophthalmologic surgeries are performed, OpChart has not been successfully adopted. In fact, an attempt was made to implement it in these operating rooms 3 years prior to the date of this case study. This effort resulted in widespread rejection of the system in these areas, conflict within the anesthesiology department, and a general feeling of resentment and mistrust toward the OpChart system. These sentiments persist to this day. However, with the advent of the Health Insurance Portability and Accountability Act (HIPAA), the need for electronic documentation during surgery is

now greater than ever, so a fresh attempt at deploying OpChart in this unit of nine operating rooms has been planned. In this case study, the authors explore the unique features of this surgical unit, attempt to uncover the causes of the failed implementation in the past, and evaluate the barriers that must be overcome for successful implementation of the OpChart system.

Background

RUMC is an academic, nonprofit tertiary care center in an urban setting. Located in the Midwest, this health center is comprised of an adult and a pediatric hospital with more than 650 patient beds and an annual volume of about 31,000 admissions. RUMC offers multidisciplinary surgical services that include general, pediatric, cardiothoracic, ophthalmology, trauma, neurosurgery, transplant, and others. There are six distinct surgical units with thirty-nine operative rooms in total. RUMC operates with a surgical case volume of approximately 1,600 cases per month. These include inpatient and elective outpatient operations, as well as emergently required procedures. Operating rooms are available for use at all times thanks to surgical and anesthesia personnel who are on call 24 hours a day, 7 days a week.

The Department of Anesthesiology is responsible for all perioperative patient care and is comprised of a staff that includes fifty attending anesthesiologists, forty resident physician trainees, thirty-five certified registered nurse anesthetists (CRNAs), and fifty-two student registered nurse anesthetists (SRNAs). Perioperative patient care encompasses all aspects of patient management from preoperative assessments until the patient is considered stable in the recovery room after surgery. Clinical responsibilities include a medical preoperative risk evaluation, insertion of any necessary vascular lines, the induction of anesthesia and airway management including intubation, monitoring of patient vital signs during the operation, and transfer of the patient to the recovery room area where a final clinical assessment takes place. First-line patient care and monitoring are performed by either an anesthesia resident physician or a CRNA. All patient care is supervised by an attending physician who is board-certified in anesthesiology and who may oversee multiple ongoing cases at one time.

The Department of Anesthesiology uses a suite of medical informatics tools developed locally by the perioperative informatics group. This set of tools, is known as the Riverview Perioperative Computerized Management Suite (RPCMS). The development group gives the following description of their software.

> RPCMS was developed . . . to bring electronic charting to surgical patient care. The system is designed to be a complete solution providing documentation and management tools for all care providers (nurses, surgeons, anesthesiologists) throughout the entire care process from the initial visit in the surgical clinic through all phases of operative care. In addition to providing for electronic documentation and information sharing, the system was developed to support billing, quality improvement, cost containment, and clinical research efforts.

RPCMS began development in 1995 with implementation of the preoperative module. The outcomes module, which documents postoperative care and supports quality improvement efforts, began clinical implementation next. The anesthesiology intraoperative charting component of the intraoperative module, OpChart, was rolled out in 1996. The patient tracking product was implemented in early 1997 and has received several additions/modifications, achieving its current form in early 1999.

RPCMS makes the life of the user easier. The operating room (OR) schedule, patient anesthesia evaluations, and all past intraoperative reports are available over the Inter-

net. In addition, special equipment needed for the next day (fiberoptic bronchoscopes, rapid infusers, etc.) can be reserved online. User case logs are available along with vacation schedules, lecture schedules, and other useful information.

The informatics development group for anesthesia is led by Phillip Knowles, who is the director of the perioperative informatics group. Although he holds a joint appointment in the Department of Anesthesiology, his primary position is within the informatics center at large. Knowles holds a masters in biomedical engineering. He built the perioperative informatics group and is the principal developer of all the anesthesiology informatics initiatives. As the technical project leader, there are a number of programmers assigned to the projects who report directly to him. These include three current developers, as well as two more who have been hired but have not yet begun working with the group. In addition, one programmer is serving in active military duty. Knowles has the latitude to determine the priority of small projects and to assign specific tasks to the programmers. The group is physically located within the same office space as the Department of Anesthesiology.

Two committees direct the efforts of this development group. The first is the perioperative executive steering committee. Its responsibilities include overseeing the perioperative informatics group as a whole and prioritizing its future development efforts. Its members control the RPCMS development budget, which includes funding for hardware and software development personnel. The steering committee is also responsible for coordinating the integration of the perioperative informatics group within the overall informatics goals of the entire medical center. Its members consist of administration-level faculty in the anesthesiology department, including Phillip Knowles. Another member is Raymond Bryce, M.D. Bryce is an associate professor and the clinical vice-chairman of anesthesiology, as well as the medical director of perioperative services. Also on this committee is Doug McPeak, M.D. Trained in pediatric anesthesiology, he is an assistant professor of anesthesiology as well as the associate director of anesthesia informatics. Second, there is an operations committee to handle the RPCMS day-to-day operating issues.

OpChart Product Description

The OpChart software tool represents the intraoperative anesthesia management component of the RPCMS toolset. What was the most important rationale for the creation of this system? The answer to this question varies depending on who is asked. According to the developer, the primary motive was not electronic documentation but rather to improve the outcomes analysis of surgical procedures at the local institution. The goals of such an analysis included minimizing bad outcomes and maximizing good outcomes, decreasing patient length of stay, and demonstrating trends of improvement. A secondary goal was to facilitate automatic data collection for research purposes, creating a master clinical data repository. A number of publications have already resulted from this collected data. Additionally, having clinical data consolidated into a central database allows a degree of information availability not possible with a paper chart, whereby only a single, easily misplaced, copy of a chart exists. John Eaves is a CRNA who worked at RUMC during the time of OpChart development. According to him, the impetus for change was to cut down on paper storage, to enhance access to old patient charts, and to create an easily accessible database. Similarly, Sarah Koehler, also a CRNA, suggested that the drive to move to computerized record keeping mainly involved the desire to eliminate paper trails, to capture charges in a

punctual fashion, and to allow easier access to lab results and other relevant patient information.

During a surgical case, OpChart use begins when the patient is brought into the OR. A new case can be opened using either a blank document or a premade template. Basic information about the case is maintained, such as the start time. Real-time charting of vital signs then begins, and the user updates the values for heart rate, blood pressure, temperature, respiratory rate, and oxygen saturation every 5 minutes for the duration of the procedure. All information about anesthesia administration is logged into the system, including drugs given, doses, and routes of administration. Any intravenous fluids or drug infusions given can also be added to the case information. Information about airway management is also entered. The user may elect to monitor certain values as the operation progresses, such as hematological parameters or other laboratory values of interest. Special dialogs are available where the user can enter information pertinent to any abnormal or emergent events that arise, or any unexpected delays that are encountered. Last, the electronic charting is completed in the recovery room. At this stage, a final vital signs entry is recorded, a postoperative assessment is performed, postoperative orders are entered into the system, and the chart is closed.

Development of the OpChart system was begun in 1996, and its first clinical deployment occurred at the Riverview Clinic (TRC) as a pilot site in 1997. From there, it was also deployed in an orthopedic outpatient surgery unit, in West Medical Building (WMB), in gynecological ORs, and in the main Riverview University Hospital (RUH) operating suites. All these implementations went smoothly with the exception of the one in WMB, which will be described later in detail. Of note, the system has also been successfully deployed at a private nonteaching hospital in Fairview, located about 1 hour from RUMC. The system is presently being used in twenty-eight operating rooms at the local institution, not including the operating rooms located in WMB. The intended users of the system include attending physicians in anesthesiology, resident physicians, CRNAs, and SRNAs. The decision of whether to use OpChart for any given case is made by the attending physician at the time when the patient is brought into the OR. During the course of a case, the primary end user of the system is generally a resident or a CRNA. Only one individual can use the system at a given time for each case, but the designated user can change during the course of longer operations, with a maximum of three users associated with any particular case.

As the system was being implemented, users were trained in the OpChart system through in-service instruction consisting of group classes. Some test patient files and real charts from old cases are available to these users for training purposes. End user feedback is obtained through a forum, open to all RUMC users of OpChart, which typically meets once or twice a month. The frequency of these meetings is adjusted according to user attendance, and some time periods passed without forum meetings because of low attendance. The official front line of support for the OpChart system comes from the local medical center help line. The help line is a general user support desk that services all clinical informatics applications. This center therefore serves as a general relay center for messages regarding issues with the system. According to the help line, any computing problem that interferes with the ability of a clinician to deliver patient care is labeled a "critical problem," and consequently calls from OpChart users who have an ongoing case are given the highest priority. From the help line, a request for help can be relayed to an on-call anesthesia support person, although passing along the issue like this causes a concomitant delay. As backup, a system analyst or programmer is also on call and can be contacted for support. It should be noted, however, that most users prefer to obtain informal technical support from other end users, par-

ticularly those who are most savvy with technology. In fact, while the authors were interviewing Charles Bertram, a CRNA "superuser" of OpChart, he fielded a phone call from another system user who needed assistance. Moreover, Bertram assembled the only comprehensive documentation for OpChart, in the form of a user guide that was released in January 2003. He undertook this documentation project under his own initiative.

The overall user sentiment toward the software is positive from the staff members who work in the adult operating suites. Resident physicians obtain the most varied exposure to OpChart since they rotate through different surgical services and experience it in a variety of environments. As a result, they are reportedly comfortable with the system and do not have problems using it in these different areas. One resident interviewed in the outpatient surgical area stated that he liked the system because of the ease of transfer between users in the middle of an operation. He also noted that it eliminates the need for the interpretation of handwriting, which is sometimes ambiguous and may lead to medical errors. Charles Bertram reported that he likes the system because he can pull a record from prior surgeries for a given patient, check the status of the airway in those cases, and see how it was managed. When he finishes an operation and closes the chart, he is satisfied knowing that the charting is "100 percent complete." A few users have complained about specific aspects of the system. For example, it cannot interface with the monitors that display vital signs, so the user must read the monitors and enter this data into the system manually. Also, some of the available templates are a bit limited because the template does not include intravenous drips, drug selection is limited, and there is no option to customize which vital signs will be monitored. One particularly common complaint is that the system is slow and unresponsive when it is querying the central server for information. This slowdown can lead to a great deal of waiting when the system is overloaded, and delays in the OR can cause frustration for the entire team.

WMB and the Initial OpChart Implementation

The focus of this case study is the implementation of OpChart into an operating suite consisting of nine rooms located in WMB, a building adjacent to the main hospital. The case load for this area includes most pediatric surgical cases, including pediatric subspecialty cases such as orthopedics and ear, nose, and throat. Adult ophthalmology operations are also performed at this location. The only pediatric cases not performed in WMB are pediatric cardiothoracic procedures, which are done in the main RUMC operating suite. Six rooms are designated for pediatrics, two rooms are reserved for ophthalmology, and the remaining room is used for either type of operation. The WMB operating suite has its own dedicated preoperative rooms and postoperative recovery areas. Procedures are scheduled Monday through Friday from 7:00 A.M. through approximately 4:00 P.M. to 5:00 P.M. The anesthesia staff who work in WMB are specially trained for pediatric care, and the vast majority of them work only at this location and do not rotate through any other surgical areas of the hospital. The notable exceptions to this are the anesthesia residents, who rotate monthly among all the surgical areas.

Each surgical suite within the medical center is unique, having its own clinical focus, management style, and local culture. The operating suites in WMB are perhaps even more unique than most. Anesthesia department members at large and the individual staff who work there have expressed a number of ways in which they differ from other

surgical locations. First, the primary clinical focus in WMB is on pediatric patients. Operations performed on children require that closer attention be paid to the patient, and as a consequence, less time can be spent on other things such as electronic documentation. Significant attention must be paid to airway management, as pediatric cases generally use uncuffed endotracheal tubes which are more prone to becoming dislodged during an operation. Second, in WMB, cases take less time on average to complete. This means there are more operations being performed in each room per day and that efficient, rapid turnaround time between cases in an OR is essential. This turnover rate is dependent on many factors, and the speed with which the anesthesia staff can finish charting one case and begin charting the next may be, but ought not to be, a rate-limiting factor.

Finally, there appears to be a different culture in the work styles of the pediatric specialists. Many of the attending anesthesiologists are very opinionated and particular about how charting should be done. As previously mentioned, OpChart allows for customized user templates which serve as a basis for clinical documentation. It has been observed that some anesthesiologists in WMB have strong feelings about not using the same templates used in other areas. For example, some request that no information about emergency situations be included in the templates and that the airway management details be documented without the use of a premade template. Despite these differences, there are important aspects of the care delivered in WMB that are shared by other locales. As previously mentioned, pediatric cardiothoracic surgery is performed in the main hospital OR, and OpChart is used for documentation in all these cases.

In 2000, the majority of the operating rooms at RUMC were using OpChart for their intraoperative documentation. Because the operating suite in WMB was already using some of the RPCMS applications to perform preoperative and postoperative assessments, this location was next on the implementation schedule for OpChart. The first step of the implementation involved the installation of hardware in each of the nine operating rooms. Some users attended an informal 1-hour "in-service" training session led by Dr. McPeak, the clinical lead for the project, as a means of introduction to the system. However, there was no mandate at this point that the system be used during operations, nor were there any official training classes or dedicated support staff. No timetable for the planned implementation was generally publicized. At this point, many of the users who had little experience with OpChart (attending physicians and CRNAs who work only in WMB) began to experiment and use the system on their own, attempting to use OpChart for some of their cases.

Although they were already using other RPCMS components, the introduction of OpChart did not go smoothly. Over the course of several weeks, a general feeling of contempt for OpChart developed among the users. Objections to the system were legion—however, they can be classified into a few broad categories. First, users felt that OpChart did not integrate well into the clinical work flow. The extra time needed to initiate and complete the charting between cases added delays to the room turnaround time. These delays were extremely unpopular with all the staff but especially with surgeons who desire to finish their cases as quickly as possible. Unfortunately, the impact of this time delay was greatest for shorter operations, which are very common in pediatrics. Also affecting short cases was the amount of time it took to document vital signs on the computer vs. the traditional paper-based system. A second complaint was that OpChart was not well suited for use with pediatric patients. Because more careful attention must be paid to managing a child's airway than an adult's airway, pediatric CRNAs commented that having to use the computer required them to have their hands off the patient for too long. Also, the database of drug information in OpChart did not

contain many common medications or the doses used in pediatrics. The system did not enable weight-based dosing for many medicines, did not allow medications to be given per rectum, and did not allow for dosing in quantities of micrograms. The result of these problems was frustration during charting and a necessity to revert to paper-based charting when obstacles were encountered. A third shortcoming was that many technical issues were encountered during the implementation. The computers used had only a mouse as a means of input, and there was a very limited surface on which to roll the mouse. One user noted that OR rooms elsewhere in RUMC were equipped with touch screens that allowed faster data input. Furthermore, a number of software bugs were mentioned as a problem. Computers momentarily paused or crashed and might require up to 10 minutes to remedy. This led to unacceptable delays in the operation and an overall mistrust in the reliability of the OpChart system. A fourth objection was that training and support were very limited. Although there was no official mandate to begin using OpChart, users felt that they were not adequately trained by the 1-hour in-service instruction. No additional classes or tutorials were available for further training, and although users trained in OpChart at other sites seemed pleased to lend assistance, they were not always available to help. Technical support was provided by the help line, although as noted previously, these staff members did not have sufficient knowledge to troubleshoot RPCMS and there was a time delay in contacting a systems expert. This delay of even a few minutes was unacceptable when a problem occurred during an operation. A final category of complaints related to the specialized culture of WMB in general. The personnel who work in WMB are focused on two types of cases: pediatrics and ophthalmology. Overall, they seemed to be resistant to a change in their work flow, and there was a belief that their current charting methods were adequate and that no change was needed. It was reported that one ophthalmology attending physician forbade the use of OpChart while he was operating. Many users felt that OpChart was a good application but that it was designed to be used with long adult cases and that it was not suitable for the type of work performed in WMB.

After several weeks of nonmandatory implementation, the resistance to OpChart in WMB reached a boiling point. One CRNA at the time noted that it was felt that the system was being imposed on them from the outside and that all the problems had led to a "climate of skepticism." Some users had suggested to the administration ways to make OpChart more usable in WMB. However, these changes were not made. Overall, both new and seasoned OpChart users felt that the implementation should end. "No one was against stopping," stated one member of the staff who remembers this event. The implementation was finally halted by Dr. McPeak. For the time being, OpChart would not replace paper-based charting as the preferred method of documentation in WMB.

A Second Effort at WMB Implementation

Although the initial deployment of OpChart in the WMB operating suites failed, a second initiative is under way to implement the tool in that location. The current plan for implementation involves a general rollout in November 2003. The hardware required for OpChart deployment was already present in the operating suites prior to implementation, and the software was rolled out in all the rooms at once—both the dedicated pediatrics and the adult ophthalmology rooms—with no pilot site. This implementation began approximately 3 weeks before the time of this writing. As before, the project manager for this effort is Dr. Doug McPeak, who is an expert in

OpChart and informatics. Two superusers, George Gibson and Charles Bertram, are serving as program champions. They are both CRNAs who have extensive experience in both using and troubleshooting the system. Dr. Steve Hays, an attending physician in anesthesiology, is not a project champion per se, but he is very familiar with the system, so he is assisting the implementation by providing assistance whenever possible to the CRNAs working on a given case. The help line staff is also responsible for supporting this second installation, although none of them is specifically assigned to the project. Last, the application developers are also available to support their product for the WMB personnel. System education once again consisted of 1 hour of in-service training led by Dr. McPeak. The switch to OpChart use is mandatory, although there is provision for paper-based charting at the discretion of the attending anesthesiologist. Moreover, it is permissible for users to "bail out" to paper charting in the event of computer hardware failure or application error that cannot be reconciled prior to the end of the operation. At present, the software is being used in approximately 50 percent of the procedures performed in the WMB operating rooms. Paper charting is primarily used for quick-turnaround cases of 15 minutes or less.

Some issues that created resistance to change in the initial implementation of OpChart in WMB have been recognized and addressed. Some of the specific technical changes that the users have requested have been implemented, including an area to record patient body weight, the capability for weight-based drug dosing, dosing in micrograms, and new routes for administration that are useful for pediatric caregivers. Some hardware issues have been causing users trouble. One user noted: "Have a network that is capable of handling [OpChart]. I know it is not that simple, but it seems that the more traffic, the more traffic tie-ups. I am not a computer guy, but the network and the servers need to able to handle the traffic, whether it is 6 A.M., 12 noon, or 8 P.M." The perioperative informatics group has been proactive in addressing these issues. For the one OR in which users have been experiencing extreme hang-ups and freezes, they are rewiring the network cables to that room at their own expense. Moreover, they are bringing in a computer known to be good to test it in the room and see if the problem is with the computing hardware instead of the network. One user notes that it remains difficult to attend the official OpChart forums, but more peer support is available at the present: "It is hard to attend the Gas Chart Forums that are held in the Control Room. Often, they are held at 6:30 A.M.—those of us working in the WMB usually have 7:00 A.M. starts and are unable to attend. Other informal meetings are held during the day—I'm usually in a busy room. This time around, people have been around to listen." Another user likewise notes the improved user support but wishes that the WMB operating rooms did not have to go live all at once: "We have provided a lot of feedback. I feel like we have been listened to and several things have been changed. However, I feel like it should have been implemented in one room first with a small number of people to try it and find things to be changed, before it was started in all the rooms."

Of note, a few issues might arise in the plan for implementation of the system. No formal mechanism has yet been developed to evaluate and learn from this implementation as it progresses. Dr. McPeak reviews the surgeries that were done with the paper-based system to discern why they were not done using the OpChart system. Also, users were not well informed about the timeline for change. One user said, "I'm not sure that I know the timeline for the change." Another commented that the change will occur "when a system is available that meets the end user's needs for charting, speed, and reliability. When any of these are missing or lacking, it creates much frustration to new users and old ones as well." In other words, it will happen "when the system is ready."

Also, training again consisted of only 1 hour of in-service instruction, this time from Dr. McPeak. Charles Bertram suggested that it might have been even more useful if training involved a 2-hour one-on-one session with him or some other superuser who has more time available to spend with individual users than an anesthesiology attending physician. Another user suggested that the training that was conducted might be inadequate: "At the in-service there were problems with people signing on and a problem with the instructor being able to show us everything they wanted to, not because of time, but because it could not be done where we were being taught." Also noteworthy is the fact that the end users of the system have very little stake in the implementation of OpChart in the WMB operating suite. Additionally, the benefit that would be achieved by a successful deployment of the software will be reaped by the hospital and WMB administrators, but it will not directly serve the end users of the system.

A number of issues have already arisen in the presently ongoing implementation of OpChart. Not all users are enthusiastically putting forth an effort to aid the system's adoption. One particular user at the site very quickly bailed out to the paper-based system on two occasions out of frustration. As a general rule, some people are very resistant to this change in WMB. Some staff members believe that for short operations, using OpChart will increase the documentation time and thus lead to slower OR turnaround time, which will create more costs to outweigh any of the benefits achieved by the system. There is a belief that they do not need to change because current documentation techniques are adequate. Indeed, one CRNA has informally threatened to quit if OpChart use is made mandatory. Possibly as a result of the prior failed implementation, some negative feelings already existed before the present implementation ever started. A sentiment of "I don't want to do this" exists. One CRNA reported that for some users, "If they can find any excuse to change to paper, they will." Some attending physicians are also resistant to OpChart—in particular, surgeons don't like to see a CRNA with their back turned to the patient. Some of them have a perception that it takes away from their ability to care for patients. Surgeons expect the anesthesia staff to be patient-centered, not computer-centered, during an operation—particularly during pediatric operations. As one user summed it up, "Kids just need to be watched a lot closer, period."

Some technical issues also appear to be barriers to adoption. The speed of the computers remains a common complaint. The system appears to be slow, causing a great many lock-ups. One user points out how this slows down their work flow: "The longer and busier the day, the longer it takes to start and to chart . . . 5 to 10 seconds here, 30 seconds there, 2 or 3 minutes to boot-up, 10 minutes to reboot in the OR may not seem like much time, but with shorter cases and quicker turnovers between cases, it really slows us down." Another user laments the ever-recurrent "fickle hourglass" that appears on the computer screen when it is processing—"I swear that it knows when one is trying to finish a chart or start a case." One operating suite is notoriously slower than any of the others, but as mentioned earlier, this issue is being addressed. Also, users are frustrated by the slowdown that occurs when one is required to wade through multiple log-in screens at the beginning in order to access the system. They would prefer to enter their user name and password once and then have complete access as needed. This issue has been raised with the Department of Anesthesiology administration as well as with the help line.

Ergonomic issues are again a point of contention in the OpChart implementation. Some users wish that they were more flexibly mounted. One comments, "I find that I am having more neck pain even though I have tried to position the computer to help

me. For adult eyes, a few of the attendees spend a lot of time on the room workstation when they could use another workstation—what about laptops or something that is more portable?" One user feels that the computers are poorly mounted: "The mounts are not stable. To stay in one position, you have to have a support under them." Some computers may be difficult for the user to reach during an operation, and users need to keep two hands on the patient as much as possible. Thus, input devices remain an issue. There is very little room for moving the mouse. One user seems to be envious of the input abilities in other areas: "The computers do not have touch screens, unlike many of the computers in other places. . . ."

Support for the end users will play a key role in determining the success of the present OpChart implementation, and some users currently have an issue with insufficient support. Moreover, the help line, which serves as the official front line of support for OpChart, is not trained in the use of the system. As one user noted, "On day one we had good support, day two was only one person and we asked for that. We do not have the ability to talk directly to a clinical person with a problem. We have to call the help line and talk to a nice person, but they have no clue as to the frustration you experience when error screens pop up and you are trying to take care of a patient." Because the OR is a pressing environment where delays may carry significant consequences, users would like to have on-site support available. "I do not feel like we as clinicians should have to call the desk, report the error messages, tell what we were doing immediately prior to the message coming up, and take care of a patient at the same time. It distracts us from the patient. A computer 'guru' should be here in the operating rooms to handle problems." Finally, the relay mechanism for support, whereby the help line pages the on-call anesthesiology support person, can be frustrating to users because of the delay it causes. "Being told hang on, I will page someone, I will call you back, etc., does not help when a case is finishing." Users are relatively helpless to accomplish their designated clinical tasks during this time period if they are reliant on support to help them continue using the computer system. This may further encourage reversion to the paper-based system.

Evaluation and Conclusion

In this case study, the authors have described efforts to implement a medical informatics system in a suite of operating rooms used for pediatric surgery and adult ophthalmic surgery. Although this system has been readily accepted by all other surgical units within the medical center, successful adoption in this one area has been elusive. Although they care for a specialized patient population with a different case mix from other surgical areas, there is no single factor that stands out as the most direct cause for the failed initial deployment. Both short operations with a rapid turnover and pediatric cases are performed in other surgical areas where OpChart is used successfully. In addition, rotating anesthesiology residents who are already accustomed to using OpChart in other surgical areas seem to be able to use it effectively in WMB as well.

The difficulties encountered during OpChart implementation in the WMB operating suite seem grounded in two main areas: technical issues and cultural issues. The technical limitations of the system led to the opinion that the application is not well-suited for use in this area, and that the system lacks some functionality that would have made it better suited for use in this environment. These complications were exacerbated both by a relative low level of training and preparation of the users for implementation, and by technical support that has been insufficient for a demanding surgical

environment. Nonetheless, some of these limitations likely existed and were overcome during the OpChart adoption in other areas. Thanks to ongoing development of the OpChart software, some of these technical issues were addressed prior to the start of the present implementation, but other problems still remain—particularly those with hardware and network slowdowns and with difficult OR ergonomics. Cultural and organizational barriers seem to be another significant barrier to acceptance of the OpChart system in the WMB operating rooms. The highly specialized, self-sufficient pediatric anesthesiology staff members have demonstrated a low perceived need for the documentation tool. They became fixed on the system's imperfections and ultimately viewed the product as a potential liability rather than as a beneficial tool. A negative bias toward the software persists after the first deployment. Finally, the staff members seem to view the proposed implementation of OpChart as being imposed on them by outside forces. They have no sense of ownership of the project because the implementation is being forced on them by those higher up in the RUMC hierarchy. This sentiment likely further increases their resistance to adoption.

Three years have passed since the first incident of failure, and now another attempt is being made to bring OpChart into WMB. Many obstacles still remain in the path of successful adoption of the software. This unique blend of cultural and technical roadblocks may prove to be difficult to conquer. However, none of these problems are likely to be insurmountable given time, patience, and responsiveness on the part of all parties involved. The future of the current OpChart implementation in WMB hinges on the ability of the administration, developers, and end users to recognize the difficult issues, lying in the path to success and to find a means of overcoming them.

Questions

1. What problem(s) was OpChart intended to address? Who perceived these issues to be problems?
2. What factors contributed to OpChart's poor reception in WMB? Could they have been anticipated or mitigated?
3. From a behaviorist point of view, comment on the positive and negative reinforcers that influence users of OpChart. How were these reinforcers different in WMB?
4. What would you do to increase the probability that OpChart will have a successful reimplementation?
5. What extra costs would you incur in order to address user complaints?
6. What are the implications of another unsuccessful implementation? What are the sunk costs already incurred?

9
Development of the Scientific Computing Center at Vanderbilt University

Lawrence Fu

Background

When Jason Moore[1] came to Vanderbilt University in 1999 as a professor in the Department of Molecular Physiology and Biophysics, he knew that he needed a parallel computer (a computer with more than one central processing unit, used for parallel processing) to conduct his research. His research involved the statistical analysis of genetics, specifically the study of gene-gene interactions and the implications for disease risk. The work he wanted to do would require computational power that could be provided only with high-performance computing (HPC).* The first step he took toward this goal was to apply to the Vanderbilt University Medical Center for a Vanderbilt University discovery grant.[2] This program was a mechanism to stimulate the development of new ideas and allow investigators to develop them for future external federal funding. He received $50,000 to build a parallel computer.

Instead of simply starting work on building a system, he decided to find out if any other researchers at Vanderbilt were working on developing a parallel computer. After talking to other researchers from all over the campus, he discovered that Paul Sheldon,[3] a professor in the Department of Physics and Astronomy, had done more work than anyone else in this area. Paul's area of research was elementary particle physics and the study of the physics of heavy quarks. He had worked on the development of a workstation farm called Vanderbilt University physics analysis cluster (VUPAC).[4] A workstation farm is a cluster of workstations loosely coupled to provide a very coarse parallel computing environment. Initial support for VUPAC was provided by a National Science Foundation (NSF) academic research infrastructure grant with matching funds from Vanderbilt University. Additional funding by the NSF and the Department of Energy later facilitated upgrades, administration, and maintenance.

Jason and Paul decided to work together and develop a shared resource which they called Vanderbilt multiprocessor integrated research engine (VAMPIRE).[5] Paul remembers: "Jason and I quickly realized that we pretty much wanted to do the same things. We had similar goals and similar amounts of money to do it. Basically, it was a meeting of the minds, and we realized [that working together] was the right way to do it. It was an interesting thing to try." Additional funding for the project was provided by a second Vanderbilt University discovery grant and from the startup funds of

*This type of computing requires scientific workstations, supercomputer systems, high speed networks, a new generation of large-scale parallel systems, and application and systems software with all components well integrated and linked over a high-speed network.

another physics investigator. This Vanderbilt University discovery grant came approximately a year after Jason's initial grant, but this time it came from the university side rather than the medical center. All together, the group had secured about $150,000 to accomplish the project.

Developing VAMPIRE

Since the group had limited funds, financial costs played a major role in hardware and software decisions. All hardware including the central processing units (CPUs), hard drives, and networking cards were purchased on the Internet for the cheapest prices possible. From the beginning, they knew that they wanted to use Linux for the operating system, but deciding on the specific build and distribution took some time and effort. Information technology services (ITS), the campus agency responsible for overseeing the information infrastructure of the university as a whole, provided much helpful assistance by supplying personnel support for this decision and other technical details. Another software issue was providing a mechanism to share the resource effectively with many users. Two different packages, MAUI[6] and OpenPBS,[7] were used. Both of these are freely available HPC cluster resource management and scheduling systems. Unfortunately, these options did not provide all the functionality that was needed and were not significantly supported by their developers. However, the fact that the software was free outweighed the shortcomings.

While Jason and Paul were the leaders in making these types of decisions, Alan Tackett[8] played a critical role in the technical development of VAMPIRE. Alan's research background is computational physics, and he came to Vanderbilt in 1998 as a postdoctoral research fellow in physics. In 1999, he heard about the VAMPIRE effort getting under way and became involved. With previous parallel computing experience, he ultimately took the lead on technical details. He was instrumental in providing technical expertise and input for key hardware and software decisions. Another contribution Alan made was leading the outreach efforts to attract new investigators. He routinely met with research groups, learned about their work, and explained to them how a parallel computer could aid them in their research.

Finding physical space for the VAMPIRE system was not a difficult task. ITS, besides providing helpful input, volunteered space in one of its raised-floor air-conditioned rooms within the Hill Center, where ITS was located. Jason notes that "ITS was instrumental throughout the whole process. Having a group on campus that was willing to support us with space and resources was key. ITS was incredibly helpful. If ITS hadn't been involved, space would have been a bigger issue."

In the spring of 2000, the group, along with the help of graduate students and postdoctoral research fellows, assembled VAMPIRE. A 2-day pizza party coincided with the activities. It required about 48 hours for the group to assemble by hand the parallel computer with fifty-five dual-processor nodes. Since that time, VAMPIRE has been operational 24 hours a day. There have been some hardware failures such as losing a few CPUs, memory sticks, and hard drives, but these types of issues are expected for a system of this size.

In the beginning, only a few other investigators were involved. They made contributions to the system in exchange for access to VAMPIRE. One such person was Walter Chazin,[9] professor of biochemistry and director of the center of structural biology. Another group that was involved early on was the nuclear physics group. The number of investigators started at five in 2000, grew to ten in 2001, and continued to grow to

sixteen in 2002. The popularity of VAMPIRE grew as others heard about its usefulness. There was no formal mechanism for attracting other researchers, but word of mouth was particularly effective. Initially, Paul and Jason knew of a few people with whom they wanted to talk, but others simply approached them after hearing about the effort from others. One person who helped publicize VAMPIRE and brought people together was Chip Cox, director of the Vanderbilt Internet 2 project. After the initial setup, additional funding resulted from the participation of new investigators. Two engineering professors contributed a large sum of money. One provided $250,000 as part of his startup funds, and another $250,000 came from a U.S. Navy grant. At this time, Ron Schrimpf[10] joined the effort and would play a large role in the further maturation of VAMPIRE into a larger system. Ron, a professor from the Department of Electrical Engineering, contributed a large number of nodes for VAMPIRE through one of his department's research programs. His research deals with the interface of physics and the semiconductor aspects of electrical engineering. He requires the use of heavy-duty computing for simulations, and his role represents the perspective of a major user of the system.

Growing VAMPIRE into the Scientific Computing Center

The success of VAMPIRE alleviated many initial concerns about its viability. There were questions about whether different research cultures would clash, whether they could all agree on hardware and software decisions, whether it was possible to create a fair sharing mechanism for all users, and whether there would be synergy among the users. VAMPIRE proved that all these concerns could be handled. Jason believes that VAMPIRE was key in making the idea of an even larger computing facility seem feasible: "VAMPIRE was critical because it showed that an interdisciplinary team of investigators from across the entire university could come together and work on a project. It brought the School of Medicine, School of Arts and Sciences, and School of Engineering together on a single project. It got us talking to one another. That in and of itself is a tremendous achievement for the university. . . . VAMPIRE provided a focal point for bringing together investigators. It was a successful pilot project that showed that we could all work together towards a common goal." Building on the achievements of VAMPIRE, Paul, Ron, and Jason developed the idea for a scientific computing center (SCC). It would not merely be a larger system accommodating more users but would also entail educational outreach efforts to introduce inexperienced users to the world of HPC.

Paul agrees that VAMPIRE was essential to the development of a more comprehensive computing center for the university: "In our minds, we were going to see how this [VAMPIRE] went. This was a test case to see if we could work together. Always in the back of my mind, I knew that I was going to need significantly more computing. There was never any question in my mind that I was going to have to find some way to get it. Exactly how much wasn't clear. Once we got things together and working and moving forward, we realized that we could work together, and it was a great idea. It always seemed to us that we were going to grow. There was talk very early on of a large system. It wasn't the SCC, but there was talk of a large facility. The SCC and its idea developed and grew over time."

Another important lesson learned from VAMPIRE was that the education outreach efforts and attracting new users were possible. Paul emphasized this point: "We real-

ized that the whole education outreach efforts and low barriers to participation were possible. For example, Alan interacted with other research groups on campus, talking with them, and working with them. He also taught a class[11] with Greg Walker[12] from engineering about methods of parallelizing applications. . . . We realized that there was a lot of interest on campus. There weren't just going to be a few dedicated computer nerds using it. There were a lot of people on campus who could benefit from this with a little bit of help." Ultimately, the SCC would not merely cater to a few users but would aim to serve the university community as a whole. In Jason's words, "We wanted to set up a center that will span the entire university and reaches out to all people doing computational work in every department. We eventually hope to get people from music, law, and business using the system."

Obtaining Funding

Once the concept of the SCC was developed, the next step toward making it a reality was to secure funding. However, initial attempts to find funding were unsuccessful. Two requests were made to the NSF through its major research instrumentation[13] (MRI) program. This program aims to increase the scientific and engineering equipment for research by supporting large-scale instrumentation investments. Awards typically range between $70,000 and $140,000. Both applications for the SCC asked for $1.5 million but barely missed approval. In addition, Jason in 2001 submitted an application to the high-end instrumentation program[14] of the National Institutes of Health (NIH). It received good scores and good reviews, but it did not get approval for the $1.5 million amount that he requested.

Besides external federal funding, internal funding through the university was possible. The university's Academic Venture Capital Fund[15] (AVCF) was established to launch major new transinstitutional initiatives in order to advance Vanderbilt to the front rank of American research universities. The application process required submission to at least one of two strategic academic planning groups (SAPGs), which included one for the medical center and one for the university central. In the event that a proposal involved both the medical center and the university, simultaneous consideration would be conducted by both SAPGs, and this was the case with the SCC proposal. If SAPG approval is given, proposals are forwarded to the integrated financial planning (IFP) council for further consideration, and the final step for approval is a recommendation to the university chancellor for funding. One of the central requirements for a successful proposal was for it to satisfy a set of ten prespecified selection criteria including the following:

1. The proposed effort is in accord with the Vanderbilt University chancellor's five basic goals for academic excellence and strategic growth:
   - We must renew our commitment to the undergraduate experience at Vanderbilt.
   - We must reinvent graduate education at Vanderbilt.
   - We must reintegrate professional education with the intellectual life of the university.
   - We must reexamine and restructure economic models for the university.
   - We must renew Vanderbilt's covenant with the community.
2. The proposed effort will help advance Vanderbilt to the front rank of American universities. To offer only two examples, this could be accomplished by bringing

together existing institutional strengths in a new and distinctive way, or by proposing a creative way to strengthen a critical area that limits Vanderbilt's ability to move forward.
3. The proposed effort enhances the learning environment and opportunities for undergraduate, professional, and graduate students and recognizes the need to recruit and retain an intellectually, racially, and culturally diverse campus community.
4. The proposed effort will require a significant investment in graduate education, and, if successful, will improve the national ranking of one or more graduate programs.
5. The proposed effort involves a broad range of faculty rather than a few individuals and will foster greater collaboration among the schools.
6. The proposed effort will strengthen disciplinary integrity and expand the interdisciplinary range of departments.
7. The faculty leadership is already in place.
8. The proposed investment will strengthen the core disciplines.
9. The proposed effort is bold, requiring significant intellectual and financial investment, with anticipated gains commensurate with the magnitude of the investment.
10. The proposed effort shows clear promise for generating the funding needed to sustain itself after the initial period of AVCF support (of no more than 5 years).

In 2002, the first proposal was submitted to the AVCF but did not receive approval. It was an administration-driven effort led by the director of ITS at the time. Then in mid-2003, a second proposal spearheaded by Jason, Paul, and Ron was submitted to the AVCF and received approximately $8.2 million in funding for the SCC. One important distinction to note between the different sources of funding is that federal funding would have provided means solely for building the computer. It would not have covered any other aspects of the SCC. On the other hand, the internal AVCF funding provided capital for data storage, data archiving, data visualization, and personnel related to outreach and support efforts.

Details About the SCC

The approved AVCF proposal explicitly laid out the administrative and organizational structure for the SCC. Jason, Paul, and Ron were the principal investigators and make up the steering committee, while Alan served as project administrator. The steering committee is responsible for all major decisions but will seek input from other committees. There are four other committees:

1. The investigators committee consists of all faculty members who are using or will be using the system. It currently contains approximately fifty investigators from the university. This internal advisory committee is chaired by Walter Chazin, Peter Cummings[16] (chemical engineering), Mark Magnuson[17] (molecular physiology and biophysics, assistant vice chancellor for research), and Nancy Lorenzi[18] (biomedical informatics, assistant vice chancellor for health affairs), and it will provide a diverse array of opinions.
2. The external advisory committee consists of three or four individuals from outside Vanderbilt in order to provide an objective perspective.
3. The technical advisory committee, chaired by Jarrod Smith[19] from the Department of Biochemistry, will make hardware and software recommendations.

4. The users committee will communicate the needs of the daily users such as graduate students. It is chaired by Greg Walker, a professor from the Department of Mechanical Engineering.

There is an organized reporting structure in place to facilitate communication between committees. Alan, the project administrator, submits quarterly reports to the steering committee. The technical advisory committee provides an evaluation of current operations as well as recommendations for future infrastructure through quarterly reports to the steering committee. The external advisory committee provides biannual reviews to the steering and investigators committee. The steering committee submits annual reports to the investigators committee for approval, and it also provides the annual report to Dennis Hall,[20] associate provost for research, and Lee Limbird,[21] associate vice chancellor for research.

Within the proposal, three types of targeted users are enumerated:

1. Experienced investigators who use parallel computing regularly will be able to immediately take advantage of the center.
2. Users who regularly do computing may have never had the resources to do parallel computing. These users know about parallel computing but never have had the opportunity to take advantage of it.
3. People who do not know about parallel computing and are not aware that it can help them in their research are still able to use the resources.

In order to aid the second and third types of users, the SCC will employ an education and outreach staff. Informational and tutorial sessions will provide assistance to researchers on how to take advantage of HPC. In Ron's opinion, "the educational activities in a way are more important [than the computer]. We're going to have hardware, and we need hardware. If it sits there by itself without anyone helping new people use it, it's not going to have a big impact on the culture of the campus. What will really be transformative about the center is the other side of it [education outreach], which will help people get involved." In addition to the outreach staff, there will also be an operations staff, which will maintain the hardware and software resources, and a scientific staff, which will include visiting scholars and center fellows.

By identifying the three types of potential users, the SCC emphasizes catering to the needs of researchers. One of the core philosophies of the center is that it is an investigator-driven resource. Jason believes that this idea is central to the ultimate success of the SCC: "From the start, this has been a grassroots effort. This has been an investigator initiated project. We said we needed this resource, and we're going to put together the funds to get it started. This was our project. We started it, we organized it, we put it together, and we made it work. Our philosophy is that nobody knows better what we need for our research than us. It's going to be a center run by the investigators for the investigators." Paul echoes this sentiment: "I don't think it makes sense any other way. Investigators are the ones with the stake in it and motivation to make it work. . . . I think the day it stops being that is the day it starts falling apart."

In order to allow simultaneous use by many people, the SCC follows a relatively straightforward sharing mechanism. Investigators gain access by contributing resources, such as CPUs, to the center. The use of these resources is guaranteed to them whenever they want them. However, people do not use their resources all the time. Consequently, the pool of excess resources can be split among all other users. So far, this arrangement has worked smoothly. The beauty of this simple agreement can be

summarized in Paul's words, "You can buy thirty machines and get access to a thousand machines."

Current State

At this point, the SCC has not yet grown to its full size. It currently contains 400 processors and ranks as number 199 among the top national HPC clusters.[22] Eventually, the SCC will possess 2,000 processors or 1,000 dual-processor nodes. The first major hardware purchases will occur in January or early 2004, and there is a rolling schedule for hardware purchases. Each year, one third of the processors will be added, so the system will not reach full capacity for 3 years. Afterward, the oldest third of the nodes will be replaced each year because the processors typically have a 3-year life cycle before becoming obsolete. While VAMPIRE originally consisted of commodity-priced parts assembled by the group, the SCC will purchase hardware from a third-party vendor who will assemble and test the system.

Besides the processors, supporting infrastructure was another consideration of the proposed budget. The groundwork has been laid for a large tape archive facility with a $75,000 tape library purchase. A disk storage system has been chosen that can sufficiently handle the large amounts of data that will be generated. It will be flexible enough to handle growing user needs. Furthermore, the budget allocated funds for specialized visualization hardware that will enable real-time analysis of large, complex data sets with immersive display technologies.

The SCC's budget calls for an initial large investment in equipment. In subsequent years, the funds will shift a greater percentage to personnel and will reach a steady state of personnel and equipment costs. After 5 years, the center hopes to be able to sustain itself financially because the AVCF provides funding for a maximum of 5 years. To reach this end, the steering committee plans to hire a financial director in the beginning of 2004. The director's responsibilities will include overseeing the finances as well as driving the outreach efforts. The ideal candidate will have management, financial, and accounting experience. In Jason's opinion, the financial independence of the SCC will be the biggest challenge to the center. He realizes that this will require much effort but is optimistic: "I think it will work since there are so many people at the university who will use the center. There will be a lot of funding coming into the center, and we should be able to recover most of the costs to keep it going."

Another major consideration for the future is how to accommodate the needs of so many users. When VAMPIRE was in its beginning stages, involving only a few investigators, Paul recalls that the small group had good communication and a loose organization. They saw eye to eye on most issues. However, as the SCC grows larger, decisions become more complicated: "When everything was small and friendly, it was easy. Now, it has to be big and professional. We have to work for a lot of people. In some cases, we have competing needs and issues. What do we do first [in ramping up the system]? What do we emphasize? Should we spend the personnel and resources this way or another way?" One current example of varying needs of users is the following: One individual requires each CPU that he utilizes to have 4 gigabytes of random access memory (RAM) instead of the customary 1 gigabyte. According to Jason, the steering committee, with input from the technical advisory committee, must answer such questions as, "Do we want to have every node have 4 gigabytes? Is it cost-effective to do that? If it's too expensive, can we have 10 percent of the nodes have 4

gigabytes? How feasible is it to have one part of the system have an increased amount of RAM?"

So far, the SCC has been able to bring together a diverse community. An increased rate of scientific discovery by university researchers should be possible because previously prohibitive computational work is now possible. Other anticipated benefits include enhancing education for students, and the center can serve as a recruitment tool for new faculty. Those who played a major role in its development undoubtedly have learned many lessons along the way. Paul admits that "there a lot of little things that I would have liked to have done differently. I wish I'd understood better that tape systems are such a headache, but it wouldn't have mattered since there would have been other technical issues. I wish that we had all understood better how best to get this project going. . . . This was the first time I ever took on a project of this magnitude. You learn things about management along the way . . . how to handle the people involved in the project and the people who will benefit from the project."

However, future unanticipated obstacles may arise because the SCC is still maturing and has yet to achieve its envisioned size. The steering committee is well aware of the fact that what works on a 55-node cluster will not necessarily work on a 1,000-node cluster. Paul notes that "If you have 100 different groups, each may be able to contribute in only a special way since NSF [or whichever funding agency] says that they can only spend the money a certain way. We have this infrastructure we have to pay for, and we have to somehow find a way to allocate it back to the users. We've been successful so far, and everybody's been happy."

Questions

1. The initial phases of development with VAMPIRE went relatively smoothly. What factors contributed to this success?
2. What were key factors in making an interdisciplinary project of this size work?
3. Were there any decisions that you would have made differently?
4. Are there any potential issues you believe that the steering committee may not have considered?
5. If another university were planning to set up a similar computing center, what are the most important lessons that they should learn from the Vanderbilt University example?

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10
Early Implementation Problems of an Integrated Information System Within the White Mountain University Health System

Gabrielle N. Ciesla, Joseph J. Connor, Thomas H. Dudley, Jr., and Michael L. Keens

Ms. Brown was his third patient of the day, and Dr. Thomas Hammill was already frustrated and behind schedule. A general internist with interests in geriatrics and medical informatics, Dr. Hammill enjoyed the days he was assigned to the outpatient clinic. Despite the increasing patient load, he was frequently able to spend a few extra minutes with his elderly patients, something that was rewarding for both patient and physician. "But not today," he thought, as Nurse Condon informed him that Ms. Brown's medical record was nowhere to be found.

Ms. Brown was a frequent visitor to the clinic. She was 71 years old and boasted a long list of ailments including hypertension, diabetes, heart disease, and debilitating arthritis. On any given day she took eight to twelve different medications. Ms. Brown told Nurse Condon about her visit to the heart doctor 2 weeks prior, a referral made by Dr. Hammill. Ms. Brown also mentioned a recent visit to the emergency room (ER) for lightheadedness. The ER doctor gave her some new medications, but she could not remember the names. Anyway, she was feeling much better now.

Dr. Hammill saw Ms. Brown and despite the fact that she looked surprisingly well, he was concerned that no one was able to locate a copy of her medical record. He had always been bewildered by the patient record storage and retrieval methods for the health system. Patient charts were stored in a central medical records department for the hospital and outpatient clinics. Nevertheless, the medical records department often failed to locate these charts. This week alone, the clinic had had to deal with five unavailable patient charts. As a result, most of the clinics keep local "shadow records" for their patients.

Dr. Hammill reviewed Ms. Brown's shadow record to piece together her medical history. He conducted a thorough physical exam, made a phone call to the cardiology clinic, and retrieved her laboratory data via the medical information system (MIS). Dr. Hammill now had enough information to develop a treatment plan. But he still was not sure about her recent ER visit. It seems that they were not able to locate her records either. He could try back after 3 P.M.; perhaps the evening shift could be of help. There was no time to wait. He had to move on; other patients had to be seen.

It was 12:09 P.M. when Dr. Hammill hastily left the clinic. He was late for his meeting but knew others would also be late, except for Richard Solomon, the chief information officer (CIO) of the health system. Solomon was beginning his second year as CIO. He

was a strong leader known for his military-like approach to planning and problem solving.

Solomon is charged with leading a multidisciplinary team through the process of implementing a new integrated information system (IIS) into the White Mountain University health system (WMUHS). It is a vast undertaking, but Solomon understands the challenge.

Background

At the heart of the health system is White Mountain University Hospital (WMUH), a 600-bed tertiary care facility that offers an array of inpatient, outpatient, and emergency care services. WMUH also provides extensive outreach services throughout the region with more than 500,000 patient visits recorded annually. The hospital had recently been recognized by *U.S. News and World Report* as one of the "Top 100 hospitals" in the nation for the second consecutive year.

In the early 1980s, the WMUHS initiated an MIS projected to deliver more efficient patient care, operational cost savings, and an enhanced strategic position in an increasingly competitive market. This information system provides clinicians with laboratory results retrieval, physician order entry, and nursing documentation capabilities. The implementation spanned nearly ten years and although it was plagued with difficulty, a working system evolved.

By the early 1990s, the vice president for WMUHS introduced an information sciences council to begin the process of coordinating the many disparate information services scattered throughout the health system. But by 1995, the group had accomplished very little. During this time several other parallel initiatives were introduced. One such project, funded in part by the National Library of Medicine, focused on creating an integrated advanced information management system (IAIMS). This system was conceptually appealing but lacked the organizational support to progress on its own.

Changes at the senior administrative level occurred, resulting in a different approach to information management. An information systems development task force (ISDTF) was initiated for the purpose of working on a plan to assess the information needs of the health system and to develop a program to "fulfill the mission and vision of the health system." Following months of work by various committees, it was concluded that the WMUHS required reorganization to functionally develop an integrated patient care delivery system across a continuum of service centers. The final report and its recommendations prompted the board of directors to hire an independent consulting firm to assess the health system and offer additional analysis. The consultants concluded that a systemwide information system governance structure should be developed to create a more centralized process for the enterprise.

In October 1997, the WMUHS issued a request for proposal (RFP) for selection of an integrated information management system. Two oversight committees, the governance committee and clinician advisory board, led the selection process with input from four additional committees focused on system components and work flow models (patient access, patient care, billing, financial and data repository, and infrastructure). Together these groups would direct the selection process and development of the implementation plan.

Seven vendors responded, and after an exhaustive process, a finalist, RDI Systems Corporation, was selected. In an effort to achieve project efficiency and effectiveness,

Table 10.1. Phases of the integrated information systems (IIS) implementation.

Phase I	Phase II	Phase III	Phase IV
Master index	Web-interactive access	Nurse charting	Patient accounting
Scheduling		Managed care	Physician billing
Registration	Ambulatory	Inpatient	Cost accounting
	Clinical		
Results reporting	Orders	Orders	
Web view–only access	Documentation	Documentation	
	Clinical rules	Clinical rules	

a four-phase plan was introduced (Table 10.1). This schedule was projected over 7 years. Many advantages would be realized in phase I, yet true integration of the clinical systems would not be seen until phase III, with financial integration occurring in phase IV.

Environmental Pressures

Issues such as how to respond to managed care while remaining financially viable and how to identify and prevent medical errors, were current topics of concern for the WMUHS. The health system was struggling to meet increasing governmental regulations and patient expectations. WMUH's revenue was decreasing while operating costs remained high. The high operating costs were attributed to escalating drug costs, personnel shortages, and patient debt. The lower than expected operating margin had prompted a direct mandate from the WMUH board of directors to increase revenues and decrease costs for the health system.

Increasing managed care penetration had also contributed to decreasing revenues. Contracts between local employers and the WMUHS had resulted in cost savings for the employer at the expense of the health system. WMUHS was also financially constrained by decreasing Medicare and third-party reimbursements.

There was also increasing pressure on health systems nationwide to reduce the number of medical errors. A November 1999 report by the Institute of Medicine indicated that as many as 44,000 to 98,000 people die in hospitals each year as a result of medical errors. It cited medical errors as the eighth leading cause of death in the United States. In response to these findings, President Clinton had ordered the Quality Interagency Coordination Task Force to make recommendations on improving the quality of health care and protection of patient safety. In February 2000, the task force released its report.

One section of the report attributed the majority of medical errors to system failure as opposed to individual negligence or misconduct. The report stated, "The key to reducing medical errors is to focus on improving the systems of delivering care and not to blame individuals." Research cited in the report demonstrated that system or process improvements could significantly reduce the number of errors and improve the quality of care delivered.

The Meeting

After a quick dash through the hospital cafeteria and crowded halls of the primary care center, Dr. Hammill arrived at the Calhoun conference room. Looking at his watch and noticing he was 25 minutes late, he quietly opened the door and crept into the back of

the room without drawing much attention to himself. Some of the clinical department heads and information technology staff were attending this special meeting, and Dr. Hammill was surprised to see such a turnout.

The clinician committee met monthly with the CIO for status updates and to discuss information associated with the IIS project. A special invitation was extended to department chairs along with a number of clinicians who were concerned with the progress of the IIS project. The CIO hoped to address physician concerns related to the new system. The intent was to provide a structured forum to discuss the IIS implementation. Many clinical departments had experienced past failures with information systems and approached the IIS project tentatively.

As Dr. Hammill entered, a lively discussion was already taking place. Dr. Mark Weber, department of medicine chair, was confronting Richard Solomon, the hospital's CIO. "How is my department supposed to function without a viable integrated system in place? You keep saying IIS is going to help transport this hospital and my department to a higher level of cost-effective quality care, but that I will have to wait seven years, if not more, for full integration. I just can't wait that long, Richard; I have patients and needs that must be met now, not seven years from now."

Dr. Susan Perkins, chief of cardiology, chimed in, " Mark, you always have the option to buy your own system. We did; and the system was designed to meet all of our specific clinical needs."

Dr. Weber replied, "Internal Medicine does not have the same financial resources as Cardiology. We are a poor department, and a significant portion of our patients are indigent. Where are we going to get the money to buy an information system? Richard, I need a system now."

"Believe me Mark, I understand your concerns. We are all concerned about the timeline for this project. It is an expansive undertaking from the IT perspective. There are so many systems in this institution that must be integrated. Compromises have to be made to accomplish any IT project on time and within budget. If you can bear with us through the early phases, we can develop the infrastructure needed to make this project a success," replied Solomon.

Before Dr. Weber had a chance to respond, Samantha Hornsby, project manager for the patient access committee responded, "I understand the skepticism and frustration present in this room. There appears to be significant doubt about whether the project will actually succeed. I realize many of you have doubts about this project. That's why everyone wants their own system now, rather than waiting to see if it's (IIS) going to happen. Because we are only in phase I, it's really too early to predict what's going to occur—and it's too early to tell how this will impact the individual departments."

"This is all well and good," noted Weber, "but this project, which is intended for clinical and administrative use, has had a lack of involvement from clinicians in defining system requirements from the beginning. It's as if this system was forced upon us from the start without any consideration given to the needs of our departments or our practice patterns. How can you sit there and say our patients and staff will 'just have to wait' until IIS is fully operational . . . this is absurd."

With tensions and voices rising, Richard Solomon replied, "Dr. Weber, clinicians chose this system! A number of physicians logged thousands of frequent flier miles traveling across the country reviewing systems. The vice president, Dr. Thorp, emphasized clinical needs as a priority in selecting a system and I believe that's what we have done. There are so many disparate systems in this hospital that it is a wonder our departments are able to relay any information to one another. IIS will establish a hospitalwide system that will facilitate departmental communication, improve information

retrieval, and create greater efficiencies in our financial systems. We need to move forward together."

Dr. Hammill wanted to join this discussion and highlight the problems of the internal medicine staff and clinic. However, it was clear that he would not be able to say a word as tempers flared. He was beginning to doubt the effectiveness of the meeting. What was supposed to be an informational meeting was quickly turning into a heated debate on IIS itself. His pager began to vibrate.

As he quietly left the meeting, he heard Solomon exclaim. "No, we have made the right decision for this institution. The infrastructure must be in place before you can integrate the process. There are always going to be critics and skeptics, but we must look past these temporary inconveniences and look toward the bigger picture of an advanced, integrated, hospitalwide system."

As he walked back to the clinic, Dr. Hammill pondered the events. Solomon was right; doctors had been involved in the decision process. How had this happened? The selection process had been thorough. Everyone had been given a chance to offer input. He shook his head, "How is this ever going to work?"

Addressing the Clinical Needs of the Institution

Prior to the decision to use the RDI system for the IIS project, the patient care committee, comprised of physicians, nurses, therapists, and other clinicians, was responsible for defining clinical requirements for a new system. Clara Tate, a nurse and manager in the information systems department, served as the chair of the patient care committee. Tate stated, "The group stayed together and worked hard to accomplish its goals. The result was a well-defined document listing clinical system specifications." Workshops were also conducted to get user input from people who were not on the committee. These workshops served as a forum for educating users about the concept of an integrated health information management system and to evaluate the systems being considered.

Although the selection process was intuitive and conducted reasonably well, not all the committee members were pleased in the end. Many felt that the final vendor choice made by the selection team was driven more by personal agendas than the findings of the committees. As Tate stated, "You could look around the room at the group on the selection team and know exactly what system they wanted and were pushing for."

With the vendor selection finalized, the planning stages of the implementation were initiated. The project would be broken into four phases (Table 10.1) with the majority of clinical applications slated for implementation in phases II and III. The earliest clinical components would be installed within 5 years with full implementation expected in 7 years.

Many department chairs wanted a clinical information system implemented in phase I to resolve problems physicians encountered in their practice, such as those experienced by Dr. Hammill while treating Ms. Brown. In fact, some clinical departments had decided not to wait for IIS and had implemented systems designed to meet their immediate needs.

There was concern within the institution about the implementation of these departmental systems. Some departments generated more money than others and could afford to purchase individual systems. However, there were other departments that did not have funding to pursue such initiatives. The internal medicine department has very limited resources because of the high rate of indigent care they provide. This depart-

ment provided approximately one fourth of the "medical" care for the institution and demonstrated a great need for an IIS. The director of practice management services stated, "A rich department can bypass the system and get what they want because they can afford it. A poorer department has to wait for the medical center. It seems that our incentives are very misaligned."

The biggest concern among physicians in the implementation process was the project timeline. The clinical components of IIS were not scheduled for implementation until phases II and III. It was anticipated that the clinical aspects of the system would not be fully functional for 7 years. Because a significant number of physicians perceived IIS to be the complete solution to all their clinical operational needs, this timeline was considered unacceptable.

Returning to the Clinic

"Whatever you are preoccupied with will have to wait," said Nurse Condon to Dr. Hammill when he returned to the clinic from the meeting. "They finally found Ms. Brown's chart, and there appear to be some potential adverse drug interactions between the prescriptions you wrote today and those written in the ER when they saw her last. You had better look at this right away so we can call Ms. Brown and alert the pharmacy."

Dr. Hammill quickly reviewed Ms. Brown's medical record and confirmed Nurse Condon's suspicion. The nurse departed immediately to contact Ms. Brown and the pharmacy.

The doctor slumped quietly in his chair for a moment. He thought about the meeting. "Physicians think that information technology is what they need to solve their problems. But is it really? Maybe there is another way to satisfy some of the immediate information needs." He pondered some more, "Can Solomon rally the support he needs to make the implementation successful? Only time will tell."

Analysis

Overview

The situation at WMUH is problematic and raises some interesting questions. We are initially introduced to the problem of information access through the eyes of a primary care physician, Dr. Hammill. The health system's lack of an IIS highlights a major deficit within a U.S. top 100 hospital. We also experience firsthand the dynamics between physicians and administration. The CIO has been charged with the task of directing the implementation of an IIS. Yet, he is challenged by the demands of physicians who feel disconnected from a program that directly affects their work. Will WMUHS be successful in its mission? Let us explore the possibilities.

Teaching Objective

The purpose of this case study and teaching analysis is threefold: (1) Illustrate and discuss the importance of leadership in establishing a vision for an institution. (2) Discuss the role of differing cultures within an organization and how their values affect a systemwide implementation project. (3) Discuss the need for developing and communicating an effective strategy for change management.

In this case, the vision of an IIS does not have the full support of the physicians and other end users. It appears that there are various cultures at WMUHS that have difficulty seeing beyond their own world to understand the values of other cultures, thereby making it difficult to develop a change management plan.

What is less clear is who is responsible for developing a strategy that will allow these different cultures to envision a common goal and implement a plan for change. Arguably, Richard Solomon should not be responsible for such a task. Solomon's role is to serve the information technology (IT) mission of the organization, not to act as the change leader for the entire organization.

To begin the discussion, let us ask a few questions:

1. What are the needs the system is intended to address?
2. Who are the stakeholders?
3. What are the needs of the stakeholders?

These questions lead us to a discussion of the implementation troubles experienced by WMUH. This discussion will focus on understanding the problems encountered by physicians as well as administrators and will cite current management theory in support of such a discussion. Finally, given the previous discussion of problems, we will offer suggestions to make the implementation of IIS at WMUH a success.

Part I

1. What Are the Needs the System is Intended to Address?

In order to examine the information needs of WMUH, an outside consultant was hired to assess their current situation and future needs. The consultant concluded that a systemwide information structure should be developed to centralize IT at the hospital. As CIO Richard Solomon states, "There are so many disparate systems in this hospital that it is a wonder our departments are able to relay any information at all. IIS establishes a hospitalwide system that will facilitate departmental communication, improve information retrieval, and create greater efficiencies in our financial systems."

From the organizational point of view, there are several needs that the IIS system was intended to address:

a. Bringing together disparate systems
b. Facilitating departmental communication
c. Improving information retrieval
d. Financial system efficiency
e. Controlling cost
f. Maintaining and increasing quality patient care.

2. Who Are the Stakeholders?

The key stakeholders in this system are administrators, physicians, caregivers, IT developers, support staff, and patients. Each will rely on the outcome of the technology implementation, and each will be affected by the change.

3. What Are the Needs of the Stakeholders?

Each group has a different need and thus a unique cultural outlook. The IT development and support staff want an integrated system that is user-friendly, optimally interfaces with a central data repository, and exhibits improved network/application

connectivity. The patients want better scheduling and registration, with a more comprehensive medical record system that integrates outpatient and inpatient care. The physicians/caregivers prioritize clinical encounter documentation, integrated online patient records, order entry/results retrieval, and evidence-based clinical decision support. Finally, the administration values scheduling and registration of patients, linking inpatient and outpatient care, collecting data in a central repository, and improving the financial systems of WMUH. In their opinion the financial system is a significant concern for the hospital, without which the institution would surely suffer.

Part II

What Are the Problems?

There is concern among the physician users that the system is not addressing their needs first. As Dr. Mark Weber, chairman of medicine stated, "How is my department supposed to function without a viable system in place? I have patients and needs that must be met now, not seven years from now."

1. Vision—Did the Leadership Define Their Vision and Effectively Communicate It?

The IT vision was developed by the ISDTF and reinforced by an independent consulting firm. As defined by the leadership, the IT vision is to reduce the number of disparate, heterogeneous systems and form a tightly integrated system that will facilitate departmental communication, improve information retrieval, and create greater efficiencies in clinical, administrative, and financial information systems.

Arguably this vision has not been communicated to all the physicians. For example, the cardiology department has purchased its own system and is suggesting that the general medicine department go out and buy a system that will meet its needs. This would increase the number of heterogeneous systems present in the health system and further serve to divide the departments.

The leadership's IT vision is not shared by all the physicians. As Peter Senge,[1] author of *The Fifth Discipline*, states, "Building a vision that is shared answers the question: what do we want to create here, what is our vision for the future? If the vision is not shared you will get compliance and not commitment." The key for the leadership is to get the departments committed to the IT vision. The best way to do this is to meet with a small group of department leaders and sell them on the benefits of IIS. The task is to make these important individuals realize the benefit of an integrated system in the current healthcare environment. Once they are committed, they can then market the system to their staffs. If the leadership can develop the IT vision into a shared vision, the IIS project will have a better chance of succeeding.

2. Cultural Values—Who Is Defining/Monitoring the Needs of the Institution Overall? Are They Focusing on Its Problems and Priorities?

The values and beliefs of one group or culture within an organization may differ greatly from those of others. The resulting difference places enormous pressure on the leadership to find a common ground. At WMUH, the leadership bears the responsibility of understanding the various cultures within the organization and therefore should actively pursue a plan that "weaves" these cultures into a cohesive team.

Dr. Weber perceives an immediate need for a clinical information system, and he doesn't want to wait 7 years for it. He feels he must get this point across to Solomon so that his needs are fully understood. But should Solomon be the one to deal with this problem? Dr. Hammill's inability to access Ms. Brown's medical record is also a serious concern. He too wants Solomon to understand his needs. Solomon, on the other hand, is trying to convey his own needs—the needs required to fulfill the mission of implementing the IIS plan. Whose needs are more important?

Part of the problem lies in the different views these cultures value. Charles Friedman[2] describes four types of cultures that exist in modern medical centers:

- *Professional/medical culture.* Physicians, nurses, and other healthcare professionals
- *Scientific culture.* Investigators, faculty, and staff of departments
- *Technical culture.* Personnel involved with information systems
- *Entrepreneurial/management culture.* Work related to business and financial components of the medical center.

Each culture has its own priorities and missions, and as Friedman states, "Conflict resolution can prove to be especially difficult because the beliefs rooted in the individual cultures often transcend logic and usually cannot be influenced by evidence." The professional/medical and scientific cultures value patient care. They believe that the information system should be centered on the patient and that the administrative/financial components should be secondary, added on the back end of the phase-in project. The entrepreneurial/management culture values competition for resources and believes in the development of a core infrastructure as a prerequisite to a clinical system. The administrative/financial part of the project phase is important as well, because if you cannot pay the bills you cannot remain in business very long. These differing needs, coupled with the importance of the financial structure, create conflict that must be dealt with effectively by the leadership.

3. Stage of Organizational Development

WMUH is moving from a decentralized stage of organizational development into a centralized stage of organizational development. What conflict occurs because of this change? How can the leadership fix this problem?

According to Larry Greiner,[3] identifying and understanding an organization's stage of growth can help to explain its practices. Greiner defines five distinguishable phases of organizational development:

- *Stage 1: Creativity*—The organization is born and fights for survival.
- *Stage 2: Direction*—The organization becomes formalized and embarks on a period of sustained growth under directive leadership.
- *Stage 3: Delegation*—The organization decentralizes to accommodate the needs of various portions of the organization.
- *Stage 4: Coordination*—The organization recentralizes to achieve greater coordination and control.
- *Stage 5: Collaboration*—The organization develops an organizational form tailored to its particular needs and aimed at overcoming the bureaucracy inherent in stage 4.

WMUH is at stage 3, delegation (more widely thought of as decentralization) moving into stage 4, coordination (a more common term is centralization). In stage 3, which has a decentralized organizational structure, individual departments have their own objectives. A heterogeneous information system fits this environment well because a department can find a system that best meets its individual needs.

However, in stage 4, which has a centralized organizational structure, the objective is for the organization to move to an integration of systems. An IIS fits this organizational structure best. The conflict present at WMUH stems from individual departments continuing to seek the best IS for their needs without regard for the institutional informational needs.

4. Communicating the Plan

The opinion leaders may support the system, but they are not adequately communicating and marketing this support to other staff members. The best way to deal with the time concerns is by communicating the reasons behind the implementation timeline. Items to consider for improved communication include the following:

a. Inform end users about system expectations.
b. Include end users in communications and decisions regarding changes.
c. The end user must be committed to the success of the system.
d. The leaders must support the system and push or pull through various times of success or failure.
e. End users must "see and know" results rapidly.

The scheduled phase planned for implementing the clinical phase of the project is a difficult situation for WMUH. The leadership could begin with the end users and change processes so that when the information system is introduced, it is an easy transition. Time could be used as a benefit instead of being viewed as a risk. The opportunity to communicate and inform the users, coupled with seeking their input, could help eliminate the fears end users may have about the system.

5. Change Management Plan—Physicians Continue to Feel Left Out of the Loop

Lorenzi and Riley[4] describe a five-stage model for change management that serves as a foundation for organizational development.

a. Assessment
b. Feedback and options
c. Strategy development
d. Implementation
e. Reassessment.

The assessment phase is represented by an informational component that informs the organization of the proposed change (process). Also included in this phase is a component of information gathering whereby user perceptions, concerns, and suggestions are collected. The feedback and options phase represents the analysis of collected data with the presentation of data to the organization's decision-making (administration/board of directors) level. Implicit in this phase is the ability of the organization to learn (and therefore change) from the information collected. The strategic development phase represents the level of effecting processes. The implementation phase refers to actual implementation of the process, and the reassessment phase allows for postimplementation assessment and feedback.

Other factors to be considered by an organization include:

a. Determining the level and type of change to be considered.
b. Defining the organization's structure and its impact on the process.
c. Defining and understanding the organization's cultural and political philosophy.

d. Identifying the participants in the change process
   i. Those making change decisions (administrators)
   ii. Those facilitating the change process (managers)
   iii. Those affected by the change (workers, users, and customers)
e. Identifying promotion and resistance factors.

The application of change management at the WMUHS appears fragmented and poorly organized. Although the WMUHS attempted to put the informational component of Lorenzi and Riley's assessment phase into action, the process does not appear to have functioned well. Though not expressed, communication of the IIS project and phased implementation were carried out over a reasonable period of time and by various methods (media). Despite this, physicians continue to feel "left out of the loop." This response highlights the lack of an "information gathering" component in the assessment phase. If WMUHS utilized a formal method of gathering user data (information regarding perceptions, concerns, suggestions, etc.) and subsequently employed a system of analyzing and presenting this information to the decision-making level of the organization, it would appreciate less resistance to the current system. One can argue that this process is in fact in place. Even so, the components of assessment and feedback require an organization that is able to learn. Given this background information, WMUHS appears to be a complex, moderately conservative organization with a political/administrative composition and an organizational history that do not express this ability to learn (change). Unfortunately this lack of ability also appears to permeate the institution beyond the administrative levels, as noted by physician comments. It appears that even Dr. Weber is unable to learn (understand) the need for infrastructure development as a prerequisite for full integration. The implementation and reassessment phases of the model are relatively unimportant in this case because of the obvious absence of the prior phases.

Part III

Solutions?

The problems we have identified—defining vision, weaving together individual cultures, aligning the incentives for centralization, and developing a change management plan—are the responsibilities of the senior administrative leadership. This case exclusively highlights the role of the chief information officer CIO because he is the only individual in the senior leadership taking charge of this implementation. In this case, the chief executive officer (CEO) and other executive members are absent from all proceedings and planning. This transforms a complex situation into one of increased tension and difficulty. Given the aforementioned absence of other senior leaders, as well as the problems identified in this case, what can WMUH do to improve the success of the IIS project implementation?

First, the CIO, CEO, and other executive members should hold meetings with department leaders. By communicating the defined goals of the organization and gathering support for the IT vision, other vital members of the project can serve to enhance the credibility and goals of the IIS. With the CEO and CIO both taking active roles, senior leadership can hopefully address the concerns of all those involved in a way that demonstrates to other departments the willingness of *all* senior leadership to work together toward full integration.

Second, the executive leadership, most specifically the CEO and CIO, should be sensitive to the cultural values of each department. By understanding the culture of each department, senior leadership will possess an innate ability to understand specific departmental needs and issues. By gaining the support of departmental leaders, the leadership will be in a better position to communicate their vision to other staff. The department leaders should look for change agents in their departments and develop a plan that will cater to the staff.

Third, the senior leadership has a vital role in the success of this project and should encourage teams to:

1. Communicate and inform users regarding changes being considered and/or developed.
2. Seek input from department leaders and push and pull through various times of success or failure.
3. Provide appropriate feedback to users regarding their concerns/suggestions.
4. Foster an understanding of the importance of communication throughout all levels of the organization.

Senior leadership must also align the incentives for departments. Anything that allows departments to act independently without regard for the mission and vision of the institution should be restructured. The CEO and CIO should work closely with the clinical advisory committee. They should empower that committee to make the necessary changes, as well as give the committee direction and a sense of purpose. The clinical staff should know they will not be allowed to bypass the decisions of this group (the clinical advisory committee). The CEO should be an advocate for the committee, making it known to the board of directors that this group must be given decision-making authority.

Finally, senior leadership, as well as the board of directors, must accept the fact that there may be a loss of productivity during this phase but realize this is a short-term loss in favor of a long-term gain. All involved must continue to communicate the IT vision and strategy for the institution. A process of conflict resolution should be adapted so that individuals will feel that their concerns are being addressed in a fair manner. A committee representing the various cultures at WMUH should be directed to develop a process to resolve conflicts that arise.

In closing, none of these suggestions will guarantee the success of the IIS project at WMUH. However, without the commitment of senior leadership to promoting an atmosphere of open communication and change management, one can certainly envision a future of difficulty, if not failure.

Questions

1. What clinical and/or administrative needs is the IIS project intended to address? Who perceives these needs to be a problem?
2. What is the definition of success for IIS? From whose perspective?
3. WMUH is a large, complex organization with many professional groups and factions. In addition, IIS is an ambitious, long-term, expensive, high-risk project. These conditions provide ample opportunity for the use of power and politics to derail the project. Does CIO Richard Solomon have the power or political resources to make IIS succeed? If not, how should he handle this situation?

4. Comment on the needs of Dr. Mark Weber, department of medicine chair. Is he being unreasonable? How should Richard Solomon approach Dr. Weber?
5. RDI, the vendor for IIS, was selected after a fairly thorough evaluation process that involved a number of clinicians. Yet Dr. Weber perceives that the system is being forced on his department without consideration of its needs. What might account for this perception?

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11
Implementation of a Web-Based Incident-Reporting System at Legendary Health System

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Incident Reporting

Research results demonstrating that medical errors occur frequently and can be associated with serious adverse outcomes have spurred interest in preventing them.[1,2] It has been argued that by studying how medical errors occur, medical institutions can identify breakdowns in system processes that cause them to happen. The knowledge obtained can then be used to modify medical practices and work flows to reduce the risk of error recurrence.[3]

Incident reporting (IR) is a process by which personnel submit a structured report of any action that caused or might have caused an adverse outcome. Examples of incidents that should be reported include a patient falling out of bed, a malfunctioning piece of medical equipment, and administration of an incorrect type or dose of medication. This approach to identifying and studying errors originated outside medicine but has now been used in medicine for several decades.[4] The most frequently cited argument for IR is that the study of "near miss" events identifies factors that might, under other circumstances, lead to an adverse event. In addition, IR serves to alert administrators to problematic managerial situations and problem personnel and creates a detailed documentation of events surrounding an error. It is common for medical institutions to perform statistical analyses of IR data over time to detect potential problems in specific departments or care processes.[5]

Partial computerization of the IR process in medicine occurred decades ago, typically with the completion of initial reports on paper by those involved in the incident and subsequent data entry into computerized systems by clerical staff.[6] More recently, IR systems have been developed in which the entire process is computerized: IR by the personnel involved, communication of the report to the appropriate administrators, and a response-planning process and subsequent aggregate data analysis.[5,7,8]

Computerized incident-reporting systems (CIRS), it has been argued, can make the IR process more efficient and enhance compliance with reporting policies. In addition, it increases the flexibility of the process (for instance, the set of collected data elements can be modified without distributing new paper forms).[8] In addition, collecting discrete data (e.g., requiring users to choose the type of incident from a fixed list rather than writing in free text on a paper form) can facilitate aggregation of the results. Furthermore, computerized IR allows automated transmission of the report and associated documentation and commentary to the appropriate recipients.[5] To date, however, there is little published data on whether CIRS achieve their intended goals any better than

paper-based IR systems and how their implementation affects the organizational dynamics of a medical institution.

Background

Legendary Health System (LHS) is a nonprofit healthcare organization based in Michigan. It is one of the largest healthcare systems in the state. LHS provides an integrated network of healthcare services, including acute and critical care, inpatient and outpatient treatment, community health education, and a variety of specialty services. It also offers continuing medical education and graduate medical education programs.

LHS was formed in 1989 by the merger of St. Joseph's Hospital and Medical Center and the Ann Arbor Community Health Plan, a community-based health services organization. LHS includes five hospitals and a number of primary care clinics, as well as a clinical laboratory and research facilities. LHS's stated mission is to enhance the quality of life by improving the health of the communities it serves by providing and managing comprehensive, accessible and integrated healthcare services that emphasize clinical excellence, value, and human sensitivity.

LHS is governed by a board of directors and managed by the president and chief executive officer (CEO). There are five main divisions, each headed by a senior vice president. These divisions are clinical operations, legal services, financial, information systems, and medical. Each senior vice president reports directly to the president and CEO, except in two cases where the division heads report to two different people in different departments. The chief of medical informatics reports to both the chief information officer (CIO) and the chief medical officer (CMO).

LHS's Quality Management Programs

LHS has a continuous quality improvement (CQI) program in place for managing the quality of its operations. The CQI program was implemented in 1991 and is founded on four values: (1) satisfying customers, (2) leading and empowering people, (3) preventing errors, and (4) managing with data. The CQI philosophy focuses on treating errors as systemic issues rather than assigning blame to individuals. It is recognized that errors are complex and unavoidable, but that their frequency can be reduced. This is done by first examining the situation and defining the problem. Next, effective solutions are developed. A plan is then deployed to correct the problem. Finally, the result is evaluated and, if need be, the steps are followed through again.

IR has been integral to the LHS' CQI approach to error prevention. Prior to 2001, the LHS error-reporting system consisted of structured reports completed on paper forms that were scanned into the hospital computer system. This system did not allow managers to have immediate access to reports concerning adverse events. Reporting was also limited and difficult to track. In addition, there was no established mechanism for collecting quality improvement suggestions.

In 2002, LHS began using a Web-based IR system. The stated purpose of this project was to improve the safety of the work environment and medical care processes at LHS by using "root cause" analysis to rapidly identify and correct systemic problems that might otherwise result in adverse events. The application was chosen by a multidisciplinary group, which considered a total of five vendor systems. The vendor system selected had the following positive attributes:

- Web-based, allowing access from any computer on the LHS network running a compatible Web browser client
- Robust security architecture
- Support for aggregate reporting to track trends in IR data
- Automatic routing of incident reports to appropriate personnel, including managers of relevant departments.

After a 90-day pilot, a phased rollout of the CIRS began—intended to entirely replace the old paper-based IR system at LHS.

The CIRS Implementation

All healthcare employees required to complete internal reports were expected to use the CIRS. Users underwent a 45-minute training session conducted by the quality management department staff; managers received additional training. User-specific log-ons were used, precluding anonymous reporting.

The LHS administration expected that adoption of the CIRS would improve employee attitudes toward IR and foster a culture that would embrace the CQI approach to error prevention because of the following assumptions:

- Increased ease of data entry compared with paper internal report forms
- Increased speed of resolution of issues raised in internal reports
- Increased feedback to employees regarding process changes made in response to internal reports.

However, the CIRS generated mixed reactions among LHS employees, with clinical personnel decidedly less enthusiastic than administrative personnel.

CIRS Implementation Challenges

Leah Overhill is the director for quality leadership; her responsibilities include quality data management, managing the quality improvement specialists, and infection control. Her prior outstanding performance in a lower-level role in infection control led to an expanded role in quality control. She has had little previous experience in quality control or information technologies, yet she was charged with spearheading the CIRS selection and implementation process.

A year after the launch of the CIRS, Overhill is pleased with the CIRS implementation, as are her colleagues in the quality management department. They have an easier time making statistical analyses of error reporting, and they can actually track errors to find the causes. They recognize some shortcomings in the implementation, however. The demands for user support are greater than anticipated and have exceeded the technical support resources allotted, resulting in users having difficulty getting help in using the software. In addition, the IR process, just as before the CIRS implementation, still does not include any formal assignment of responsibility for handling resolving issues raised in incident reports. This is unchanged from the situation prior to installation of the CIRS.

In addition, Overhill has become aware of growing user dissatisfaction with the CIRS. Many feel it is more time-consuming than the old paper-based IR process, though this complaint seems to decrease with duration of use of the system. In partic-

ular, older employees with little computer experience have found the CIRS difficult to use. The system is not installed on the same computer workstations as other clinical applications, so there are separate workstations for it. Many employees complain that they are too few in number and that it is inconvenient to find one when needed. In addition, many employees complain that they see no end result from the IR process and doubt that incident reports have any real impact on the issues identified in the reports.

In retrospect, Overhill has realized that the product selection and implementation planning processes did not involve the end users of the system. In addition, she regrets not having taken a proactive approach to soliciting user feedback once implementation started since she learned of user dissatisfaction only "through the grapevine," long after it began. What options does she have to address the less than ideal implementation of the CIRS?

Analysis

Overhill's Options

1. Abort the CIRS project and return to paper-based incident reports.

   Pros: This would have the advantage of "cutting the losses," minimizing the loss of tangible and intangible resources should the project be destined to fail. It also might temporarily improve the reputation of the quality management department with clinical staff.

   Cons: This might be perceived as a personal failure of Overhill and affect her chances for professional development. The benefits derived from the CIRS would be abandoned.
2. Choose another CIRS.

   Pros: To the degree that some of the difficulties encountered might be specific to the CIRS application (the need for user support and cumbersome data entry procedures), this might alleviate the problem. In addition, a "fresh start" might provide at least a temporary change in attitude among the employees.

   Cons: The employees and the administration might perceive this option as reflecting disorganization on the part of Overhill and her department. Implementing another CIRS does not fundamentally address the employees' discomfort with change and the employees' perception of how management uses IR data. Implementing a different system might be met with the same outcome.
3. Adopt an approach of "benign neglect," continuing the implementation as scheduled without any new or modified tactics to ensure its success.

   Pros: This might be a politically expedient approach. If the employees adapt to the system, Overhill will have achieved her goals without an additional expenditure of resources. If they do not, it is possible, given the size of the organization and the communication gaps between upper-level administrators and rank-and-file employees, that Overhill could still present it to her superiors as a success. Cut off from the lower-level employees, it is unlikely that senior management would ever become aware of the problems surrounding its implementation.

   Cons: If Overhill is truly motivated to contribute to the mission of her organization, this approach will likely be ethically problematic for her. In addition, she takes on the risk of encouraging employees to reduce IR efforts—leaving her with no source of data from which to report.

4. Try to salvage the CIRS project as follows.

   Directly address the problem of accountability. Currently, no one is specifically charged with the responsibility for facilitating process improvement. Overhill should implement an accountability structure with guidance and input from her senior colleagues and at least some of the managers. Options for this include:

   - A stable IR resolution team that would include managers (and possibly others) from different departments, who would have dedicated time to perform this task, in collaboration with employees and managers in the departments where any particular CIR originated.
   - A system for assembling a temporary, self-organizing, multidisciplinary team for each computerized incident report submitted, which would be responsible for addressing issues raised in the incident report. These teams might be constituted according to a fixed "recipe," e.g., the individual who filed the report, the manager from the corresponding department, and a dedicated employee from the quality management department, which could potentially be Overhill.

   There should be a formalized process of feedback whenever an error is reported. When employees see that error reporting does make a difference, maybe they will be more likely to report incidents. Fortunately, CIRS software provides the ability to support many communication requirements.

   - There have been several significant successes with the CIRS already. For instance, the system facilitated a solution to a long-standing problem that the paper-based system never caught. These successes need to be communicated, loudly and repeatedly, to the entire LHS community so that the potential value of the system is understood.
   - Increased resources for training and user support, especially for employees who are uncomfortable with computer technology in general. It might be possible to achieve this without additional expense by recruiting some employees who are more facile with the system to champion it and support other employees who are having difficulty.

   Overhill should explore the options of adding more workstations or making it possible to run the CIRS software on all the LHS computers. Easier access would encourage more employees to use it.

   - Develop ways to reward reporting without rewarding the incidents that lead to reporting. This would be challenging but might be structured as a reward to IR report filers for suggesting solutions to systemic problems should the suggestion be adopted. Another option is to focus the reward at the unit level to foster an atmosphere of cooperation among unit members. This will improve morale and enable the teamwork necessary to correct errors due to complex issues of work flow.
   - The CQI approach toward IR, with its nonblaming, nonpunitive approach, should be communicated more effectively to the employees to reduce fears that individuals might be targeted for mistakes made. This could be achieved in multiple ways—through newsletters, posters in employee break rooms, and meetings with employees.

   Pros: This approach would result in an effective, usable CIRS if successful. It builds on the financial and human resources that have already been invested in the CIRS project. In addition, it would be counterproductive to waste the institutional momentum that has been generated to initiate this implementation. None of the difficulties with the CIRS project are insurmountable. If Overhill is able to make the project a resounding success, with enthusiastic adoption by the employees, it will be

much more likely to advance her career than a begrudging, dissatisfied acceptance of the system.

Cons: The steps detailed above will increase the visibility of the CIRS project to both administration and employees. Should the project fail despite her efforts, Overhill's career could suffer a severe setback.

Overhill will be addressing some of the basic difficulties with IR in general (like lack of feedback to originators of incident reports). Thus, she will not merely be salvaging a troubled information technology implementation but will also be furthering the quality improvement goals of her department and the overall mission of her organization. The current difficulties with the CIRS represent both a risk and an opportunity for Overhill. The current situation, if managed poorly, could lead to cost overruns, demoralized staff, and a system failure. Managed well, a new CIRS could be used to significantly improve care at LHS, and that is the best possible outcome for Overhill.

Questions

1. What is the stated purpose of the IR system?
2. What does the LHS adminstration expect that adoption of the IR system will achieve?
3. What do you think the definition of success should be for this IR project?
4. Who are the intended users of the IR system?
5. What do clinicians think of the IR system?
6. Overhill heads the CIRS selection and implementation. What are her strengths and weaknesses in this role?
7. What are the attributes of IR that are different from clinical IS used for direct patient care? What are the implications of these differences with regard to how implementation should take place?
8. What would you do in Overhill's position?

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Appendix 11.1: Survey Questions

1. How often do you use CIRS per shift? When are your shifts (day, swing, night, weekends, etc.)?
2. Is the current system better than the old one and if so, in what ways?
3. What was the training like? Was it adequate? Is the system easy and convenient to use? Are you comfortable using it?
4. Does the system interrupt your work flow? If so, how much and in what ways?
5. Do you see an improvement in quality due to the current system?
6. Do you receive feedback concerning quality outcomes you were involved in? If so, when, how much, and what kind?

12
Managing Change: Analysis of a Hypothetical Case*

Organizer and Moderator: Joan S. Ash
Participants: James G. Anderson, Paul N. Gorman, Rita D. Zielstorff, Natalie Norcross, Jody Pettit, and Patricia Yao

Case Presentation

Mercer Medical Center has been successfully competing for business because of the strong visionary leadership of chief executive officer (CEO) E. Joseph Burns. However, the pressure has been relentless to constantly update expensive systems and equipment. The latest lawsuit has brought this forcefully home yet again. The publicity will undoubtedly have a negative impact on the public's perception of Mercer and on critical negotiations with the area's largest employer, Syntel. Medical director of information services (MDIS) Kathryn Reed has just left a meeting where she and chief information officer (CIO) Barry Marks were informed that it is critical that the timeline for implementation of the new physician order entry (POE) system be moved up. They now have only 9 months instead 2 of years to make this happen. And make it happen they must.

Background

Mercer Medical Center is a 450-bed community hospital in a large metropolitan area in the Pacific Northwest, with 650 medical staff and a residency program. It is part of an ever-growing health system that has been successful in competing with two other major health systems in the city. Managed care penetration is increasing, and Mercer has bought up small private clinics as well as having its own managed care insurance plan. To remain competitive in the marketplace, Mercer has gone after contracts with the high-technology firms in "Silicon Forest," as the area is known. These contracts are sought after because these companies tend to employ lots of young, relatively healthy people who, overall, use fewer healthcare dollars—a critical advantage in this area of high managed care penetration.

One such company, Syntel, a leading manufacturer of processing chips for the computer industry, is currently in negotiation with Mercer for a managed care contract. Interestingly, Syntel has recently announced its plans to get more involved in the healthcare arena. The medical industry, top executives say, is due for a consumer-driven

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*This presentation and discussion were part of the Cornerstone on Managing Change, one of four Cornerstone sessions included in the program of the AMIA Annual Fall Symposium, Washington, DC, November 6–10, 1999. All names of organizations, individuals, and software systems are fictitious, with the exceptions of Stanford University and Edward H. Shortliffe. Reprinted, with permission, from *The Journal of the American Medical Informatics Association* 2000;7(2):125–133.

technological revolution that will result in advances that have already changed the business world in retailing, banking, and investing. The prevailing sentiment is that the health industry is lagging behind the corporate world. Questions about the hospital's information system arose during negotiations. Mercer's information services are comparable with those of the other health systems in town, with the exception of its POE system. One of the competing medical centers has announced its plan to deploy a new POE system. Syntel was impressed by this innovation and queried Mercer about its plan for a POE system. Mercer's CEO, loath to be upstaged by the other health system, told Syntel that they also plan to implement such a system in the not-too-distant future.

The Pressures

Two years ago, the hospital attempted to implement a nursing documentation system called Physician Manager, and it ended in a disaster of grand proportions. The medical staff had opposed this system from the time they previewed it. It was implemented without any consideration of physicians' opinions. After only 2 days of operation, it had to be abandoned because there were so many technical problems. A substantial amount of money was wasted, the CIO nearly lost his job, and the information services department's image was severely tarnished. More recently, another system, called CareReviewer, was deployed and the medical staff was challenged yet again by unwelcome technology. In general, information service systems are seen by medical staff members as adding to their workload when these systems should be making jobs easier. Physicians are increasingly being pushed to see more patients in less time and with less compensation. Managed care is driving down their salaries. Professionals who had previously enjoyed a great degree of autonomy are now feeling like cogs in the healthcare machinery, working to make more money for the top executives. All these pressures are driving physicians to the breaking point.

The corporation is under pressure as well. Negative publicity from a recent lawsuit could damage Mercer's position in the market and its managed care contracts. A 35-year-old woman, a promising new talent at Syntel, was admitted to Mercer, through the emergency department, for high spiking fever and rigors. Blood cultures, blood for a complete blood cell count, and appropriate samples were drawn in the emergency department. The doctors were about to administer antibiotics when the patient's blood pressure dropped; she was rushed to the intensive care unit with a presumptive diagnosis of sepsis. The ordering systems in the emergency department and the intensive care unit were separate, so new orders had to be written. A sleep-deprived physician who had been up for 27 hours quickly scrawled a stat order for ampicillin/sulbactam (a potent antibacterial medication). The order was issued in triplicate, with one copy going to the pharmacy. The pharmacy read the medication as Acyclovir (an antiviral medication) and filled it as such. A registered nurse from the float pool quickly hung the intravenous medication, and it was administered. A seasoned intensive care unit nurse recognized the size IV medication bag as being the wrong size and caught the error, but 2 hours had elapsed. Unfortunately, the young woman's pressure continued to drop, and she suffered irreversible brain damage.

Information Services Leadership

After the PhysicianManager system failure and the resulting uproar from the physicians, the board of directors created the position of MDIS. This person would be a

medical information specialist who would work closely with the CIO and develop an alliance with the medical staff. Kathryn Reed, M.D., was appointed because of her excellent informatics background. After receiving her M.D. and M.B.A., she earned a Ph.D. in medical informatics from Stanford University. Under the guidance of Edward Shortliffe, one of the pioneers in medical informatics, Kathryn proved to be a formidable student. She was hired as the MDIS reporting directly to CIO Barry Marks. The goal was for these two people to work together, the CIO to bring management discipline to the complex organization, and the MDIS to work with the medical staff to both stimulate effective user input and build support for technology improvements. It was hoped that these efforts would go a long way toward overcoming the organizational and political barriers in the organization.

Physician Computing Council

Reed eventually received enough funding to hire six people devoted to supporting physician computing. She created positions for two technical specialists, a network analyst, two support technicians, and a support person for her department. She focused all these resources on meeting the needs of the physicians and being their trustworthy ally in the organization. She established a twelve-member physician computing council to create a venue for presenting new ideas, brainstorming, and having physicians "test-drive" programs before they were introduced throughout the organization. She also hoped to gain their support and have this group champion ideas to other physicians.

Reed is acutely aware of the dangers of imposing a system on unwilling users. She has worked hard to gain the respect and trust of the medical community by being straightforward and honest and having no hidden agendas. By keeping the users' needs foremost in her mind, she sets a high standard of customer service for everyone in her department. She has also had to overcome automatic distrust because she is seen as part of the hospital administration and because she did not advance from within the existing medical staff. Reed demonstrates her commitment to "walking the talk" by going the second mile herself. When introducing e-mail to the medical staff, she offered to help them get hooked up at home by personally visiting each one at home. By doing this, she was not only building trust but was also making a first step toward getting physicians to use information technology on a personal level and seeing advantages to the system. She is further building relationships through the training program she has created. Nurses have been challenged to teach physicians one-to-one to use the current information system to look up patient data. For the nurse who manages to teach the most physicians, she offered the unorthodox incentive of an all-expenses-paid trip to Hawaii.

Managing the Change

Implementing a POE system has been identified as a future goal, and Reed is working toward that step by step. She knows that this will be a challenge at Mercer, given its previous history. She also knows that such a system will cause dramatic change in the organization and that such change will naturally be resisted. Her research has shown her that the whole organization can expect to be stressed by several aspects of POE implementation:

- Changes in established work flow patterns and practices.
- The strict, literal interpretation of rules by the computer or the inability of the system to identify intent.

- The ambiguity of governance policies.
- The lack of a clear understanding in the physician community of the long-term strategic value of the information services initiative.

Reed is also familiar with the experiences of other hospitals in implementing POE systems, and she is determined to learn from them. She has seen how profoundly organizations change when new technology comes along. New organizational structures are configured. The vision developed by the administration takes time to percolate into the hearts of personnel at all levels. Integrating the vision into the strong culture of the medical staff requires senior, respected, and powerful members of that staff to viscerally and intellectually believe in it too. Such champions must be able to sell the vision to others and respond to any pressures with innovative methods. Reed has been making progress in developing such champions. The physicians on her physician computing council seem to be coming along nicely. They are beginning to understand the potential of this technology and are able to speak convincingly in support of a POE system. However, considerable skepticism remains, even in their minds. From them, Reed knows that physicians want a system that:

- Is fast (subsecond response time).
- Is easy to use, requiring a minimum of training.
- Has help available 24 hours a day either on line or by telephone.
- Has a consistent system interface.
- Will affect patient care positively.
- Is accurate and reliable.

Physicians' needs must be thoroughly addressed prior to implementation if there is to be any hope that they will use the system. The ability to review a patient's record on demand is powerful. Once they realize that their time is being maximized as they use a POE system, they will then be motivated to use it. The innate desire of physicians for information is a factor in motivating them to use a clinical information system. Essentially, ensuring ongoing use would require meeting their efficiency needs through productivity and ease of use.

Opposition would naturally be expected to any change that challenges assumptions and routine behaviors of practicing physicians, and Reed knows she can expect mighty opposition from that group especially. She hopes to manage the expected change by carefully leading the medical staff to acceptance of the new system. She plans to work on substantial physician involvement and leadership in the process of application development, focusing on speed and convenience and showing a willingness to identify user needs and reflect them in the system. By having physicians on the development team, Reed is looking to establish the physician champions who will lead the rest of the medical staff into smooth adoption of the POE system.

What Should Dr. Reed Do?

Reed now finds herself in a difficult position. The CEO is pressing hard for a fast implementation of the POE system. Critical negotiations and public perceptions are dependent on making it happen. Reed is convinced that the corporation is not ready for this change. Without physician support, such a system will be doomed to failure. She sees all her hard work in building trust and credibility going up in smoke if she forces the system on the organization without taking the time to do it right, and time is what she now does not have. What should she do?

Comment by James G. Anderson

Assessing the Motives

The rush to implement the POE system is driven by all the wrong forces. The first is competition: Mercer Medical Center wants to negotiate managed care contracts. It is competing with other managed care providers in the area, so basically the implementation is being driven by this as a primary motive. Also, there is a secondary motive here: public relations. Having a state-of-the-art POE system will be a good promotional tool for negotiating these contracts. The unfortunate thing, of course, is that a system that has been implemented too hastily increases the risk of failure, of errors, and of increased staff resistance. We have already described the instance of the case of the young woman who was injured because two systems—the emergency department system and the intensive care unit system—did not articulate. Certainly, hastily implementing a new system is likely to lead to more failure and more errors and more distrust from the physicians. We have also heard that the physicians are angry and upset about managed care and already feel that they were not consulted adequately in an earlier implementation, and this hasty implementation is likely to increase staff resistance.

Failure

What do we know about failure? Many published case studies illustrate failure: failure to demonstrate improvement in patient care;[1] failure because a system was unable to demonstrate savings in operating costs;[2] failure because there was not adequate training and preparation of residents and house staff and, as a result, the new system increased patient waiting time and staff overload;[3] failure of a system that was put into a private practice because none of the physicians had intimate knowledge of the system or took part in the decision making;[4] and failure because physicians opposed a system that interfered with traditional practice routines.[5,6] All these cases demonstrate the folly of rapid implementation without adequate participation of the medical staff. In fact, these failures are likely to result in lawsuits. These failures have a key element: a lack of physician involvement in and acceptance of clinical information systems. Without that, we are almost guaranteed failure.

Ensure Physician Involvement

What can Dr. Reed do about it? She seems well aware of the problems she will have with the staff. The first thing she can do is to ensure broad physician involvement in the selection and implementation of the system. It may be too late in this case, but systems without the sponsorship of the medical staff are likely to fail. One strategy, of course, is to enlist the support of influential physicians. In one study, we identified and recruited influential physicians on the medical staff of a university hospital in order to increase use of a POE system. As a result, the hospital experienced an increase in the use of the system by the medical and house staff and a reduction in order entry errors.[7] A second major factor here is to make sure the system provides immediate benefits to users. To do that, you need to identify key features that users will need on a daily basis and stress both short-term and long-term benefits. It is not sufficient to merely say that the hospital will benefit by being at a better competitive advantage and that the new system will bring more to the bottom line. There clearly have to be tangible benefits

to the individual clinical users. I worked with Carolyn Aydin and the people at the Kaiser Permanente Medical Center in San Diego in the implementation of the CompuHx system, which was a computer-based health appraisal system.[8] It was a fairly successful medical system implementation, not only because the medical director was strongly behind it and we had support from the medical staff, but also because it provided tangible benefits to the examiners who were taking in patients, collecting medical history data, and entering physical examination data. There were clear benefits to the users in this case.

Assess Work Flow

Another major factor that you should consider in advance is how the system will affect routine practice patterns and professional relations. Study current work flows and identify the processes that the computer can improve, especially those that it will have an impact on. One technique for doing this, which was used effectively in a recently published study,[9] is to use surveys and interviews of every organizational unit and professional group to identify training needs, potential problems, and areas where support is needed. In the study, this was done not just one time; it was done before implementation and repeatedly during implementation, so that the implementers could head off problems before they arose.

Behavioral Change

Another factor is to anticipate and be prepared to manage a host of behavioral and organizational changes caused by the implementation of this system. Unfortunately, as much as we talk about them and look at past implementations, every organization is different and has a unique culture. One technique that has been used effectively is to introduce the system in stages, possibly in one unit or in one department, instead of all at once throughout the organization.[10] Provide specialized training to each group of users. Physicians frequently want to be trained by other physicians, and they will not attend continuing medical education types of programs or in-service training. It is likely that physicians are going to have to have one-to-one contact with other physicians who are experienced in using the system if implementation is to be successful. Provide technical assistance on a 24-hour basis. If you do not do this, there is likely to be frustration, anger, and failure.

The Ethical Challenge

If we are going to successfully develop and implement a system, it must be fast, flexible, easy to use, and reliable. The ethical challenge here is this: If the physicians really believe that the system requires 18 months and not 9 months to implement, then to protect patient welfare, safety, and institutional morale they need to tell the administration that the administration is wrong. They need to refuse to do the job poorly.

Comment by Rita Zielstorff

Force Field Analysis

The Mercer Medical Center case depicts a situation that is not uncommon when automated systems are implemented, when diverse, often conflicting forces taken together

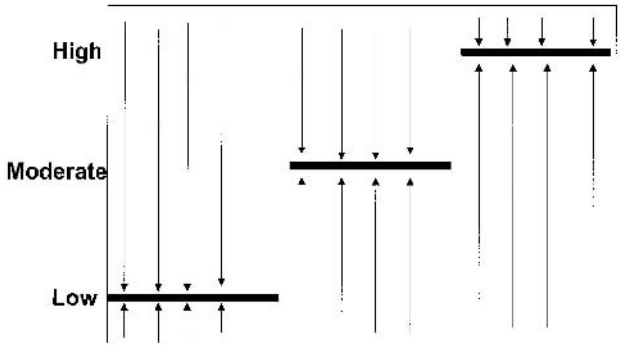

FIGURE 12.1. Kurt Lewin's classic force field analysis model. The likelihood of success is classified as low, moderate, or high. The arrows symbolize the forces that have an impact on each possible outcome. The downward arrows represent forces that drive the likelihood of success down; the upward ones represent forces that drive the likelihood of success up. In this adaptation of the model, the length of each arrow indicates the strength of the force it represents. Adapted from Lewin.[11]

affect the likelihood of success of a planned change. Confronted with a situation like this, the change agent must analyze the nature of these forces and work to change them, or at least accommodate them, to achieve the desired goal.

One method that I have found useful for doing this is to use Kurt Lewin's classic force field analysis model.[11] The parameter of interest in the Mercer Medical Center case is the likelihood of success of the POE system. Figure 12.1 shows the general model. In Figure 12.2, the circled arrows represent forces that indicate a low likelihood of success, whereas the circled arrows in Figure 12.3 indicate a high likelihood of success.

So how does this apply to Mercer Medical Center? First, we identify the forces themselves and determine whether they are positive or negative in their impact on the likelihood of success. Next, we determine how to manipulate the forces so that the negative ones are weakened and the positive ones are strengthened.

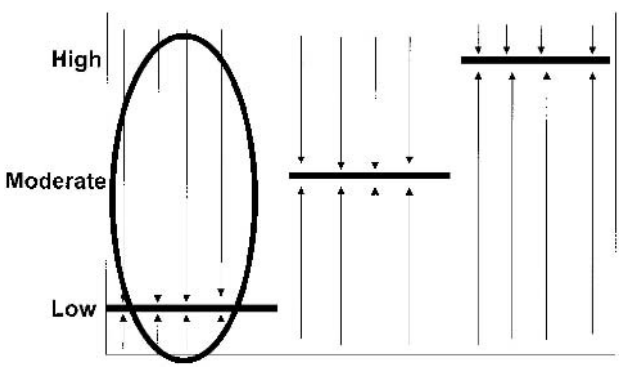

FIGURE 12.2. Adapted Lewin model. The area inside the oval shows that the forces driving down the likelihood of success are strong, while those driving it up are weak, resulting in the likelihood of success being low.

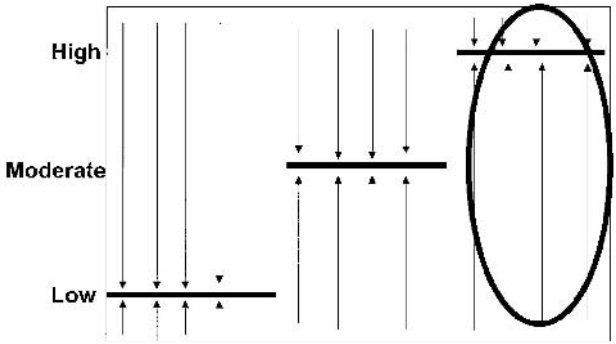

FIGURE 12.3. Adapted Lewin model, showing weak downward forces and strong upward forces, resulting in the likelihood of success being high.

Analysis of Forces at Mercer Medical Center

It is important to point out that the forces themselves are neither good nor bad. They are only positive or negative with respect to whether they influence the likelihood of success of the POE system. Table 12.1 summarizes the forces in play at Mercer Medical Center. They include a competitive environment that leads to the perceived need for rapid deployment of the POE system, a CEO who seems unaware of the risks involved in such a course, a skeptical clinician population that has been burned by a previous mismanaged implementation, a strong MDIS, a physician computing council headed by a sympathetic leader, and several others. After carefully examining each force that is expected to affect the likelihood of success, we can categorize them as positive or negative, as shown in Table 12.2. Having done that, we can figure out how to weaken the negative forces and strengthen the positive ones.

Example of Weakening Negative Forces

Let us look at one of the forces categorized as negative: an unenlightened CEO. This person has responded to pressure by making a promise to implement the system within 9 months, a highly risky proposition. It might be possible to weaken this factor by giving him information about previously failed attempts at implementation. For example, two articles by Massaro[5,6] provide useful descriptions of lessons learned in a failed implementation, with all of its ramifications. Other tactics might include surveying other

TABLE 12.1. Forces in Play at Mercer Medical Center.

Unrealistic time frame
Unenlightened CEO
Pressure from Syntel for rapid implementation
Promises of implementation by competing hospital
Skeptical clinicians, but fragile trust is building
Strong administrative support for implementing POE
Existence of physician advisory group
Creation of position of Director of Medical Information Systems
Desire for safe care among all participants
A "good" system capable of delivering the functionality needed to provide value to clinicians

Table 12.2. Forces Classified as Positive or Negative.

Positive	Negative
Strong administrative support	Unrealistic time frame
Director of Medical Information Systems	Unenlightened CEO
Physician advisory council	Pressure from Syntel for rapid implementation
Beginning trust among clinicians	Competing hospital promises implementation
Desire for safe care among all participants	
A "good" system	

hospitals like Mercer to find out about their experiences; hiring a consultant who is experienced with the selected POE system, to provide a quick assessment of how much time is actually needed for implementation; asking the vendor about their experience with implementing such a system at similar hospitals; or reminding the CEO of the considerable disruption that occurred when the practice management system was implemented at Mercer.

The aim is to make the CEO aware of the risks of a hasty implementation and the consequences of failure. In this case, the consequences of failure could include further negative publicity for Mercer, possible withdrawal of the Syntel contract (or at least failure to renew the contract), and further weakening of Mercer's competitive position for acquiring other contracts.

Example of Strengthening Positive Forces

One of the forces we classified as positive is the beginning trust among clinicians that has been nurtured by the MDIS, Dr. Reed, who created the physician computing council. This trust could be strengthened by being absolutely honest about the strong motivating factor for implementing the system as quickly as feasible: competition for contracts that underpin the survival of the medical center. After all, two thirds of the physicians (and probably most of the nurses) are on salary. If the medical center fails for lack of business, these employees and many others will lose their jobs, and patients may have a harder time getting care. Rallying around a common goal and capitalizing on the support of opinion leaders could foster a "can do" environment, a culture where everyone identifies with the need to get the system up and is willing to make compromises to do so. The implementation is then seen as something that is done not to them but with them or, better still, by them. This is, admittedly, hard to pull off, but the insight and sensitivity shown by Dr. Reed and her colleagues are very strong positive forces that can be leveraged to strengthen other, weaker positive forces.

It is not always possible to mitigate every negative force or strengthen every positive force to the degree that one would like. However, using tactics like these can usually at least alter the likelihood of achieving the desired goal.

Comment by Paul N. Gorman

The Language Used

We are talking about two things here: implementing systems and caring for patients. It is interesting to look at the language used in this discussion about managing change. These are some of the words and phrases used in reference to the implementers, the advocates of change: They show "strong leadership" in the organization, an organiza-

tion that is "competitive and innovative"; they are people of status, people who are "chief officers" and "directors" of various kinds; they are characterized by "movement" in various directions, by "vision," "value," and "integration." Other words used to describe them are "champions" and "early adopters," conjuring up images of people carrying standards as they ride forward on their white horses. These are some very positive terms.

Looking at the language used about the implementees, the people on whom the change would be imposed or inflicted, we see words describing their "objections," "barriers," "resistance," and "reluctance." We are told that they would "fight it." These are not people of status, these are "staff"—"medical staff, nursing staff, hospital staff." We are not told about what they think but about how they feel. They feel like cogs, they feel distrust, they feel tension, they feel fear, and they are not ready. They need education and they need training, presumably from the implementers. These differences in language are important because they suggest implicit constructs or models about people. In fact, they set up for us a nearly adversarial relationship, an us-vs.-them relationship. The words describing us are positive and proactive; those describing them are mostly negative and reactive. We embrace the new; they cling to the old. We are thinking and cerebral; they are feeling and affective. We use logical scientific rationale for change; they are resistant, irrational, and unscientific. The words do imply our forceful way of changing the way we think and changing the way we act. They may set us up in a really counterproductive relationship.

Is Resistance to Change Rational?

The next point has to do with whether resistance to change is irrational or unscientific. To quote David Miller's essay in *Science*:[12] "But science is more than the sum of its hypotheses, its observations, and its experiments. From the point of view of rationality, science is above all its method: essentially the critical method of searching for errors." It is not argument, it is not logic, it is not hypotheses; it is a critical method of searching for errors. In medicine, this has been especially important. The history of medicine is littered with good ideas that were bad for patients. If you know about using oxygen for babies in the 1940s, it was considered an obviously beneficial therapy. It was difficult to organize randomized trials for this therapy because of the ethical dilemma of depriving patients, babies, of such obviously beneficial treatment. For those of you who are not familiar with the story, the trials showed that oxygen causes retrolental fibroplasia and blindness.

The ethical dilemma was very difficult to get past in that case. There are many other examples. During the 1950s the left internal mammary artery was tied off because it was thought that this would be good for coronary artery disease. Nowadays, we use the left internal mammary artery to bypass to the coronaries because it is so useful not to tie it off. We have used massive doses of steroids to treat things like acute respiratory distress syndrome and cerebral hemorrhage. It was rational; it made perfect sense that it would work, but it did not work and in some cases it was harmful. In the 1970s and 1980s, the pulmonary artery catheter, the Swan-Ganz catheter, really swept the nation because it was so rational, it made such good sense that this catheter would help people, would help us manage patients in a rational way. But in the 1990s, proponents of this test called for a moratorium on its use until trials had shown that it was beneficial, because none had.

Advanced cardiac life support protocols, if you have ever seen the old ones from the 1970s and 1980s, were mostly based on theories, and today we scoff and laugh at the

kinds of treatments that were included in the early protocols, because now we do not think they are right. In medicine, it has been very important that we make sure that what makes sense is actually good for people. Sackett,[13] in his typical fashion, put it this way: "Reports with enthusiasm generally lack controls, while reports with controls generally lack enthusiasm." That is the rationale that underlies evidence-based medicine. We have got the same problem with technology. To quote Michael Crichton:[14]

> We live in a culture of relentless, round-the-clock boosterism for science and technology. With each new discovery and invention, the virtues are always oversold, the drawbacks understated. Who can forget the freely mobile society of the automobile, the friendly atom, the paperless office, the impending crisis of too much leisure time, or the era of universal education ushered in by television? We now hear the same utopian claims about the Internet. But everyone knows science and technology are inevitably a mixed blessing.

Gregory Bateson[15] has pointed out a logical rationale for clinging to the old:

> It is very easy to fall into the notion that if the new is viable, there must be something wrong with the old. . . . What is always important is to be sure that the new is not worse than the old. Other things being equal, the old, which has been somewhat tested, is more likely to be viable than the new, which has not been tested at all.

What Is a Clinician?

The above argument shows that not changing has a rationale. It is not necessarily irrational, and it might be a very rational approach. Let us now talk about what we mean by clinical or clinician. The word *clinical* can mean different things to different people. For example, a clinical assistant professor is not a real professor. It is a title we give out to people so that they will come and teach at a medical center. In Chicago, a radio report told how a policeman was describing an assailant who stuck an automatic weapon in the window of his squad car and began firing. The policeman was asked what the man looked like. He said the man looked "cold and clinical," which is different from how clinicians imagine themselves looking. We all have different views of what a clinician might be. In our research on information needs, we have tried to come up with an operational definition, and these are some of the features that we use: Clinicians possess specialized knowledge, they have received some kind of experiential training, and they have a direct relationship with a person one calls a patient or sometimes a client. They make decisions about patient care; and they act in the patient's best interest, not Syntel's, not the CEO's. They integrate diverse information into decisions, and they function within time and resource constraints. For those of us who design information systems, the central task is the use of the information systems. The patient care problem and problem resolution are secondary things. For physicians and clinicians, the main problem is to resolve the patient's problem, and they take the shortest path to the best resolution of the problem. Sometimes that includes the information system and sometimes it doesn't. Those flying on airplanes are not avoiding trains; they are taking the shortest or easiest path to a destination. When physicians do not use computer systems, it may not be sabotage or avoidance but simply a matter of taking the shortest, most direct path to the goal they are trying to accomplish, which is usually a goal for their patients.

Understanding this can help us work with them a little better. Annas[16] pointed out, in the *New England Journal of Medicine* in 1995, that metaphors matter and that language has a powerful effect on how we think and act. He suggests that we can invig-

orate the debate by adopting a new metaphor, and one of the things that we might do as we think about how to change healthcare processes with information systems is to think about how we use language, and refine the metaphor to make ourselves more effective.

Constructive Engagement

To summarize, language suggests implicit constructs, and if we reexamine the model, we might be able to frame the debate in a more productive way. Second, skepticism is scientific and rational; it is not reactionary or irrational or affective or feeling. It may be that people have feelings about computers, but there is also a scientific or rational reason to stick with what works. The clinician's task is caring for patients, not using a computer. If we understand that, we can understand how to help them use computers more effectively. Finally, "constructive engagement" might be the way to view this process, and that requires time. Nine months might not be enough, and physicians need to say that if it is the truth. The process requires time, effort, patience, and understanding.

Audience Discussion

Joan Ash: In summary, the ethicist has said that the physicians should probably take a stand. The implementer has done a careful, practical force field analysis to identify the strengths of the various influences on the likelihood of success, and the clinician has stated that not changing may actually be a rational thing to do. Audience, what would you do?

Member of the audience: The question emphasizes the point that the senior executive is telling the experts in systems implementation, the people who know how to do things, what to do. This represents the wrong people making the wrong decisions. This is micromanagement, actually mismanagement. You never hear the term *mismanagement*; we do not usually phrase it as such, but in medicine we look at mismanagement of patients very carefully.

Paul Gorman: There is a difference between failures in those different domains and between the models in those different domains. First of all, with respect to failures, there are failures in business, failures in information systems, and failures in medicine. In business, most businesses fail. The failure rate of small businesses is enormous, and business is the most Darwinian of worlds: It is the survival of the fittest. Failure is something that happens all the time; you get some more money, acquire some more capital, and move on. Failure is frequent. The business model of what failure means is a little different from ours. In information technology, similarly, failure happens all the time. You write a program, it crashes, you change it, you fix it, and you write a better program.

In medicine, failure is different, in that somebody either gets worse or dies. I don't know that we fail less—we hope that we fail less—but failure matters in a very different way; it matters as it does to aircraft operators. Failure has different meanings, and I think the differences make people think differently. The management model, the information technology model, and the medical model are very different. Librarians also have a different way of thinking about things, and when these cultures come together it takes a lot of work, a lot of time, a lot of talking to get to where you under-

stand one another. Often, you're using the same words and talking about something different, or you're using different words and talking about the same thing. It takes a fair amount of time to get to that point. This computing council idea is one of the key ways to get there, and it usually takes more than 9 months. I agree that the idea that you can just tell information technology people how to do something if you're not in information technology is not the best course.

Joan Ash: Don't we have an obligation to teach these CEOs our point of view? We could provide some sort of training or education for them so that they would be better at making those decisions, or at least they could let the right people make the decisions.

Member of the audience: Where in the structure of the hospital environment and through the approval process does the clinical point of view come in, and where should it come in?

Paul Gorman: Some technologies that get into hospitals don't affect work flow much, like telephones. No one pays much attention to what kinds of phones get purchased. Part of the problem is that we used to think about computers that way. They're just devices: Buy a bunch of them, install them, and keep them running. Yet they're much more like the real tools of the trade, the bronchoscope or the catheter that the cardiologist uses. The cardiologist wouldn't dream of having someone else specify what catheter to insert into a coronary artery to do an angioplasty. Computers are now tools that affect the way we work every bit as much as that, and we don't have a model or structure that has the people who use those tools engaged in specifying what the tools are or how they should be used. One of the comments about the Mercer Medical Center scenario is that no one is actually asking for physicians' input about whether or when to install the system. They want buy-in and not input, and those are very different things.

Member of the audience: When Nancy Lorenzi[17] gave her overview, she pointed out how important communication is. I was struck during the discussion by the lack of involvement of the CEO. There's a glass wall here, because the CEO has been allowed to make these decisions, yet communication hasn't taken place.

Member of the audience: The analyses have been a bit hard on the CEO. It seems that the issues of competition and public relations aren't things that can be ignored. My CEO is puzzled but not irrational. The best thing that Dr. Reed can do is cancel the meeting. Then she needs to engage the CEO productively. I would challenge the CEO to come into the rescheduled physicians' meeting and lay out the case to get everybody moving in the same direction. Let the physicians go back and explain why it can't be done in 9 months and lay out a pilot implementation, work out the details, try to solve the competition issues, and solve the Syntel issues. We can get everybody engaged in the challenge of accelerated implementation through pilots in 9 months and further roll out in 12 months. This is taking the force field analysis and beginning to engage the people. We can't ignore the CEO's point of view.

Jody Pettit: Our assignment in writing the case included making a recommendation. Part of our suggested strategy was to actually do just what the last person said—increase communication and get everyone working on a solution together. We propose the creation of a new, smaller, multidisciplinary planning group of six to eight people, including at least two physicians and a representative from Syntel. This group should be charged with specific goals and a tight timeline. Dr. Reed should provide a facilitator and all the resources necessary to meet the goals. She should also create a comprehensive communication plan to keep everyone in the organization informed all along the way.

Conclusion

The Mercer Medical Center case offers a real-world scenario illustrating many of the points raised by Lorenzi and Riley.[17] Organizations need to become learning organizations if they are going to survive and adapt to change. The environmental influences outlined in the Mercer case are not very different from those pressuring many organizations. The panelists and members of the audience suggested different strategies for dealing with Dr. Reed's dilemma because they represent different stakeholder groups. However, there was a common theme underlying all of the recommendations—communication. The stakeholders must come together, engage in constructive problem solving, create a common strategy, and actively take charge of the change.

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Section IV
Economics

Introduction

Robert T. Riley

Economic Impacts

The true techie says, "If it can be done, it should be done!" The true bean counter says, "Show me a detailed cost-benefit analysis—and I don't want to see any of those phony soft benefits included!" In economic terms, today's optimal health informatics strategies lie somewhere between these two extremes. Healthcare systems everywhere are facing increased economic pressures; therefore, our informatics endeavors must recognize and adapt to these pressures.

Key Historic and Organizational Points

Before looking at some basic economic approaches and tools, we need to recognize several key historic and organizational points that strongly affect the economic struggles occurring within many of our healthcare organizations.

Information and Health Care

Many healthcare organizations have been slow to realize just how critical information and its proper management are to the modern healthcare organization. As an example, hospitals in the United States typically spend 2 to 4 percent of their revenue on information systems, while organizations in other industries typically spend 5 to 15 percent. Even in the late 1980s, there were still a few hospitals in the United States that could not produce an itemized, computerized bill on demand—let alone a revised one.

While computerization has lagged behind other industries in the administrative areas it lags even further behind in the clinical areas. It is a general axiom of informatics that computers produce their greatest productivity benefits when they reach the hands of those on the "factory floor," i.e., those people in the system who actually produce the organization's goods or services.

Physicians—the historic driving force in the clinical area—have traditionally valued most highly the information they receive by word of mouth from other physicians. For a variety of reasons, many have been slow to utilize systems with significant potential for providing information in written form from alternative sources, and this has slowed the "factory floor" implementation.

Weak Accounting Systems

Quality decision making requires quality inputs. Many healthcare organizations have accounting and tracking systems that were never designed to provide sound cost and operational data. Systems have typically been designed to ensure fiduciary accountability and meet mandatory billing and reporting requirements. To compound the problem, one of the biggest challenges for any complex organization is the accurate costing of diverse products and services. As a result, many healthcare organizations today cannot accurately determine whether they are making or losing money on particular services.

The Pace of Change

"But we just bought the one we have two years ago!" is often the complaint. Many decision makers have difficulty accepting the economic aspects of today's rates of technological change—whether in informatics or in other health areas. Regardless of logic or economic analyses, these "bill payers" often have a negative visceral reaction to replacing an expensive physical unit that they still psychologically regard as new.

Historic Investment Benefits

Many noninformatics managers, especially financially oriented ones, are disillusioned by the mediocre measurable benefits from the money that has been poured into the informatics area over the years. Where are the miracles we were led to expect? Stanford economic historian Paul David[1] has explained this phenomenon. When major new technologies are introduced, they are first applied to the existing paradigms—organizational structures, market structures, legal frameworks, workforce skills, etc. The full benefits of a new technology are realized only as the total framework or paradigm slowly shifts to allow these benefits to take effect. At the same time, paradigm shifts might well not be possible without the new technology. The full benefits of information systems in our healthcare systems will accrue *only* after our healthcare systems have undergone massive transformations, which in turn cannot happen without these new information technologies. In health care, we are much closer to the beginning of these massive transformations than to the end.

Budgets As Power

A joking remark about American males is, "He who dies with the most toys wins!" For living bureaucrats, the winner is often perceived as the manager with the biggest budget or the largest staff, the library with the most books, or the hospital with the most beds (or increasingly in the United States, the hospital with the most insured patients). Bigger is better; therefore, any technology promising that the job can be done with a smaller budget, less staff, fewer books, or fewer beds normally encounters resistance from everyone except the bean counters. For example, as the information function has become decentralized in recent years with the advent of distributed systems, many traditional centralized data processing managers have stubbornly—and even bitterly—resisted a decrease in their direct budgetary power.

Cost-Benefit Analysis

Regardless of what the process is called, virtually every informatics program or project must survive some form of cost-benefit analysis. What will this system cost? What will it do for us? Will the benefits to the entire organization exceed the cost and by how much? As with many management terms, there is no standardized definition of the term *cost-benefit* or of the analytical process. Twenty different organizations could perform such an analysis in twenty different ways. Despite these differences, we need to examine a few key points common to all cost-benefit analyses.

Analysis vs. Rationalization

Organizational life becomes easier when we finally internalize the following observations: Most organizational decisions are made at the *emotional* level, and logic is subsequently used to justify or rationalize them. Nevertheless, decision makers defend to their dying breaths the belief that decisions were made on a completely rational basis. As a result, cost-benefit analysis in many organizations has become *cost-benefit rationalization*, "massaging" of the data until a desired outcome is obtained. We know that we need this new system, and we also know that our recommendation will be challenged. Therefore, we will ensure that the cost-benefit data for the system appears very positive.

For example, one hospital chief executive fell in love with a particular informatics system he felt would give him national prominence if it were implemented. Despite the extremely questionable technology involved, the staff was charged with producing a study that would make the proposed system appear to be the answer to all their problems—including some they didn't even have! The chief executive then moved on to greener pastures, leaving the hospital with a glowing cost-benefit analysis in the files and the hospital staff saddled with a mediocre dead-end system.

This is not the way to run a quality organization, but it is all too common. Unfortunately, we may be forced at times by organizational pressures to "play the game." Still we should always be clear in our own minds as to when we are analyzing and when we are rationalizing.

Hard vs. Soft Costs and Benefits

In any significant cost-benefit analysis, we face the twin problems of measurability and uncertainty. *Measurability* refers to the difficulty in determining exact measures of economic value for subjective variables—especially on the benefits side—such as staff morale and improved quality of services. The terms *hard* and *soft* are often used to represent the ends of the measurability spectrum. In addition, there is *uncertainty*, which refers to the difficulty in accurately predicting the values of variables that may be quite measurable after the fact, e.g., hardware costs 3 years in the future or just how many staff we will be expected to service the hardware 2 years from now.

Early health informatics implementations tended to be in the accounting area, paralleling the trend in other types of organizations. These early implementations appeared to have attractive levels of measurability and certainty: The processes to be computerized were highly structured and well known; there was typically only a small, disciplined group of users; and the benefits were typically predicted as definite monetary savings resulting from labor displacement, i.e., hard benefits. In reality, the costs

often overran estimates by huge amounts, and many of the cost savings were never realized. Still, viewed in advance, cost-benefit analyses in this era had an aura of "fiscal responsibility" about them that appealed to the bean counters.

As health informatics implementations move more into clinical areas, the traditional levels of measurability and predictability inevitably fall. How do we assess the economic value of various types of improvements in patient care? How do we predict all the direct and indirect costs that this complex implementation will ultimately incur? Dr. Michael Bourke[2] also makes a parallel point for heavy investments in a technical infrastructure, e.g., a backbone network. This infrastructure investment may enable massive future progress in a wide variety of specific applications areas, but we may find it very difficult to measure and/or allocate its precise benefits. In Bourke's terms, an investment with the lowest "directness of benefits" and "quantifiability of benefits" might well have the highest "potential impact of benefits."

Probably the most neglected soft issue on both the cost and benefit sides is the time and/or inconvenience costs imposed on various groups coming into contact with the system. Time costs or inconveniences imposed on employees are often rationalized by saying, "That's what they are paid for." Costs to users or customers have also often been ignored. A classic example is the waiting time imposed on patients by many physicians who use atrocious, self-serving office scheduling models.

By this time, you might logically conclude that we view cost-benefit analysis as a useless tool. Not at all. What alternative do we have? We ultimately have to make a judgment as to whether a proposed step is worth more than it costs. Otherwise, we can simply resort to tossing a coin or using a Ouija board.

Realistic Cost-Benefit Judgments

We must face the reality that our limited current financial technologies—coupled with the high uncertainties of a fast-changing world—dictate that our informatics cost-benefits analyses require managerial *judgments*. There are no techniques that can mechanically produce accurate numeric values and generate "automatic" decisions. We inevitably face a mass of data of widely varying quality that we try to organize as best we can into useful information. However, at some point we must tighten our belts and say yea or nay, with our decision based on much poorer information than we would like. It will always ultimately be a judgment call, given that some will be easier than others.

It is essential that we list in a subjective sense the wide variety of cost and benefit areas that we anticipate will be involved. This is typically quite impossible. The problem is to assign reasonable economic values or ranges of values to these cost-benefit impact areas. One process that can help in producing reasonable rough estimates is the modified Delphi process described by Lorenzi and Riley[3] in *Organizational Aspects of Health Informatics*. Group processes such as this can be very effective in assessing values in ill-structured, amorphous situations. Ultimately, we may have to feel or think that there will be a cost or benefit in some area but have no way to judge, estimate, or even guess its magnitude.

The true value of this overall process is often more in the reduction of subsequent unpleasant surprises than in the specific cost or benefit estimates developed. A Pandora's box discovered and opened in the cost-benefit stage is far less dangerous than one discovered only at some later project implementation stage.

A Few Basic Economic Tools

During his Pentagon days in the early 1960s, economist Alan Enthoven[4] commented that most of the economic analysis tools used in the Department of Defense (DOD) were taught in introductory economics courses; however, the DOD had to hire Ph.D. economists to perform analyses because their analysts didn't really believe in the techniques and acquire a vested interest in them until they had a Ph.D. in the subject. Forty years later, Enthoven's comments are still relevant. We can perform some very powerful economic analyses in the health informatics area without resorting to arcane techniques or complex mathematics, always keeping the following basic tools and concepts in mind.

Sunk Costs

In economic analyses of what actions to take, s*unk costs are irrelevant.* The only relevant issue is a comparison of the *future* cost-benefit options. Unfortunately, past expenditures are often not irrelevant in psychological or organizational terms. Abandoning a poor prior decision may be a personal admission of failure, or we may fear that it will diminish us in the eyes of others. Influenced by these forces, we may continue to pour good money after bad.

Fixed and Variable Costs

When analyzing or forecasting costs, we need to make a distinction between which costs are relatively fixed, regardless of the volume of activities, and which costs vary with the level of activities. Part-time staff and consulting services are examples of variable costs. An equipment lease is a fixed cost.

Average vs. Marginal Cost

A key economic cost concept is the difference between average costs and marginal costs. Assume that we have a system with fifty users that costs $1 million annually. Our *average cost* per user is then $20,000, a straightforward computation. The *marginal cost* is the cost of adding one additional user. This cost might be much less than, equal to, or much greater than $20,000, depending on the relationship between fixed and variable costs. In the informatics area, marginal cost is especially important whenever we encounter "modular" scenarios—or in economic terms, discontinuous cost functions. Suppose that a particular communications "box" costs $5,000 and will support up to sixteen users, with each of the users costing an additional $200 for a "card" to be added. The marginal cost of adding a fifteenth or a sixteenth user is relatively small—$200 in each case. The marginal cost of a seventeenth user is relatively large because it would cost $5,000 for a second box plus $200 for a card, for a total of $5,200. Of course, the marginal cost for the eighteenth user would again be only $200. On the software side, vendor pricing schemes for site licensing often create similar cost scenarios.

Diminishing Marginal Productivity

If it were not for the law of diminishing marginal productivity, we could grow food for the whole world in a flower pot. If we have fixed amounts of any resource and keep adding more and more of other resources, we will reach a point where the marginal

Table IV.1. Example of marginal cost analysis.

Percent of cases handled without intervention	Total cost ($)	Marginal cost of performance improvement ($)
80	2,300,000	—
85	2,500,000	200,000
90	3,000,000	500,000
95	4,000,000	1,000,000
100	6,000,000	2,000,000

productivity of the additional resources starts to decline. The benefit we receive from additional units of input declines steadily. The marginal productivity can even turn negative when the original fixed resource is overloaded enough by the new resources; e.g., putting too many additional programmers on a project actually delays its completion, or giving people too much training can actually decrease their productivity.

Marginal Analysis

Marginal analysis is a practical tool for examining the impact of the law of diminishing marginal returns. Suppose someone proposes a system that will cost $3 million and will process 90 percent of our transactions without human intervention. The marginal analyst says, "Wait a minute. What would 85 percent cost? 95 percent?" Table IV.1 shows a common cost pattern for this type of situation; however, the "correct" decision as to what percent age level should be selected is strictly a managerial judgment. Marginal analysis merely provides a more intelligent basis for this judgment.

Case Introduction

The case presented next discusses the financial evaluation process for the implementation of a clinician decision support tool (sometimes referred to as a clinical dashboard) in a primary care setting at Vanderbilt University Medical Center in Nashville, TN. This case reflects the current thrust to use information technology to address the escalating costs within today's healthcare systems. Some of the information included also gives a feeling for the magnitude and complexity of modern healthcare information systems.

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E3 at Vanderbilt University Medical Center

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When he became chief operating officer of the Vanderbilt Medical Group in 1999, David Posch realized clinical volume staffing ratios were high in comparison to those of other outpatient groups, but appropriate given Vanderbilt's present work processes. Facing growth opportunities, the finances of Vanderbilt University Medical Center (VUMC) would deteriorate without proper intervention. A strategic financial plan was developed by the organization to increase patient volume and revenue by 5 percent and to decrease expenses by 2 to 3 percent per year. About the same time, the Vanderbilt University board of trustees approved the "10 by '10" plan that the School of Medicine had developed. This plan expects the School of Medicine to be ranked in the top ten of U.S. medical schools by 2010. To attain this goal, an improved financial performance would be significant.

Posch thought that a redesigned operational work flow was essential "to get the fat out of the system." He created a clinic redesign team—an internal multidisciplinary team with people from the clinic operations, the quality office, and the informatics department.

The clinic redesign team planned to analyze each clinic's operations and recommend process improvements based on Dartmouth-Hitchcock's Clinical Microsystems. The team started with one of the smaller clinics to test their methodology. The components of the methodology are highlighted in Table 13.1. Although the team's efforts resulted in improved efficiency, costs were not substantially reduced as the macro processes remained fundamentally the same; however, altering the micro processes would mean tremendous savings.

Enter the Partnership with Informatics

Seeking process improvement, Posch approached the director of the informatics center, Dr. William Stead, about clinic redesign and automation. Posch asked Stead, "Can we incorporate information technology in different ways to remove costs, remove labor, or change the ratio of labor to work?" Removing paper processes by using an electronic medical record in outpatient areas would greatly cut costs, Stead said. With paper processes eliminated, the institution would have a blank slate on which to rework its procedures for maximum efficiency. Stead assured Posch that the informatics center would work with him to develop or purchase the appropriate information systems, and the E3 project—being *e*lectronic by 200*3*—began.

Table 13.1. Assessment of and change in the current systems.

Who	Goal(s)	What
Clinic assessment	1. Focus on a review of each clinic's operations. 2. Develop recommendations for efficiency, satisfaction, capacity, etc. 3. Establish an implementation team and guide the start of the redesign effort. 4. Develop a system to continuously monitor each clinic's attainment of its established goals.	Access assessment Clinical operations Comprehensive work flow General operations Readiness assessment Redesign consulting Space assessment Satisfaction
Billing assessment	1. To better understand the financial process and to collect the money billed in the shortest time.	Billing processes Charge capture process

The macro goal became to transform the Vanderbilt healthcare systems into a model for the future, including improved clinic redesign as well as creating the enabling technology tools to "*t*ransform our *o*rganization through *p*eople and *s*ystems" (TOPS).

The TOPS initiative had five interlocking components that together constituted the transformation goals:

1. Delivering the right care and only the right care (clinical guidelines, evidence-based medicine, and a reduction in variation)
2. Being able to deliver the right information when and where it is needed (the information systems and the informatics leadership in conjunction with the clinical and clinic operation leaders)
3. Quality patient interaction (listening to patients, meeting their needs, involving patients)
4. Supporting patient transactions (including parking, timely check-in, seeing the physician promptly, no waits, no delays, etc.)
5. Having a culture where employees understand and model the science of improvement in their daily work.

Trusting financial improvements to process redesign through information technology was a gutsy move for Posch. By betting success on a nonexistent technology product to be developed quickly and implemented efficiently—without ever disrupting work flow—Posch put his neck on the line.

VUMC Background

VUMC is a university-based comprehensive healthcare organization comprised of professional schools and wholly owned clinical facilities, including hospitals and group practices, as well as off-campus clinics. Its medical group practice participates in numerous joint ventures and affiliations. The medical center board, which reports to the Vanderbilt University board of trustees, oversees the institution's $1.2 billion budget.

The Vanderbilt clinical enterprise has two primary components—hospitals and outpatient clinics. The hospital component is comprised of four divisions: the university hospital with 650 beds; the children's hospital with 170 beds; the rehabilitation hospital with 80 beds; and the psychiatric hospital with 88 beds. The outpatient clinics component includes more than 95 specialty practices that see more than 688,000 patients

per year. Ranked highly nationwide are the programs for cancer; cardiology and heart surgery; digestive tract; ear, nose, and throat; hormonal disorders; gynecology; orthopedics; respiratory care; rheumatology; and urology. VUMC is a major patient referral center for the geographical region.

Clinical Visioning

Posch presented his informatics-laden strategy to the chief medical officer in May 2000. Based on recommendations from the chief medical officer and the director of the informatics center, the chief executive officer (CEO) for the medical center formed an executive steering committee to lead the E3 process. The group was comprised of leaders who could create change, mobilize resources, maintain accountability, keep the project on track, and serve as champions for the cause. Coordinating the process was Dr. Nancy Lorenzi from the informatics center, who was in charge of organizational development, specializing in change management. With the committee assembled, the "anchor" for this outpatient enterprise transformation was in place.

After the executive steering committee, a clinical visioning group was formed in July 2000. This group consisted of twelve respected clinical people from multiple disciplines who were to formulate an image of information communication needs for desired patient care in 2004. From an initial nine-page wish list, the clinical group narrowed its scope, outlined priorities, and established key goals. Table 13.2 is an overview of the "wish list" developed through this process.

The wish list was given to the informatics center for a feasibility assessment. At the same time a second group, the informatics brain trust, a committee comprised of half informatics center staff and half tech-savvy clinicians, was formed. The informatics brain trust developed an integrated picture of existing informatics tools and efforts, current opportunities, and future options. Supporting the clinical visioning group's first priority for a user-friendly front end to integrate the multitude of available products, the group began with this focus. They outlined a clinician-friendly front-end design and commissioned the informatics center to design a screen layout and prototype of their plan. Immediately pleased with the results, seven informatics brain trust members began using the test product.

The number of users grew quickly and spread. At this point the product was named StarPanel. The name *StarPanel* was chosen for the user-friendly portion of the evolving electronic medical record system called StarChart. StarPanel's fame was spread through stories of its use. Those using the system said that it increased the just-in-time information they needed for patient care and that it was making their lives easier. The excitement about StarPanel was palpable throughout the organization.

Projects: Competition, Distraction, and Convergence

StarPanel was not the only product under consideration for E3. Two years prior, development had begun on a computerized physician order and compliance system, as well as a structured documentation system intended for use in the outpatient clinics. With institutional financing, the two systems were being developed for integration with the existing electronic charting system (StarChart) to form E3's core products. Task complexity and production difficulties for these two projects delayed their timeline, but

TABLE 13.2. Overview of the clinical visioning group's goals.

Organizing principles	E3 visions
Patient flow management	1. Schedule all appointments/tests—outpatient and inpatient—through a single system; the patient's schedule is linked to all service providers (e.g., radiology) for easy electronic scheduling. 2. Make it easy for patients to obtain follow-up appointments. Patients can schedule their next appointment using a touch screen. 3. After a visit, provide patients with a voice mail code to obtain information regarding medications, things to do, results, etc.; or allow patients to query the office via the Internet regarding medication refills, return appointments, etc. 4. Contact patients prior to their visit with instructions to bring in medicines, records, blood pressure readings, etc. 5. Make a number of forms available, e.g., a telephone call log form database. 6. Provide better physical access to terminals, especially for handheld wireless devices.
Integrated story about patient	7. Give patients access to an abbreviated personal medical record electronically. 8. Allow a number of items to be scanned and available, e.g., ABN, permission to treat, etc. 9. Have all incoming faxes converted to digital format immediately. Inside Vanderbilt University Medical Center (VUMC), develop systems to e-mail or send results, reports, etc., to a physician's personal computer or printer. (Go from WIZ to VNET electronically.) 10. Need an electronic medical record that fits an office-based practice with a clinical decision support system. 11. Have only one history/physical, one problem list, and one current medications list. 12. Electronic progress notes that are updated with each provider contact (store). 13. User-friendly front ends to integrate systems/information (e.g., buttons/tabs that represent the history, physical, problem list, progress notes, current medications, allergies, etc.).
Actions	14. Provide automatic alerts for doctor-to-doctor contacts. Provide the ability to click on a referring physician's name to automatically e-mail and send to the medical record. 15. An outpatient order entry system that will eliminate dose errors, medical errors, chemo, etc. Ability to order lab results beyond the clinic, allowing the patient to go directly to the test location. Diagnostic tests (lab, radiology, etc.) are coordinated with visits; requisitions and prescriptions are electronically sent to their destination. 16. Provide a reminder system—e.g., to fill orders, trigger screenings, etc.
Capturing information	17. Computer-assisted ICD-9 coding. 18. Need to have voice recognition readily available to assist the clinicians. 19. Electronic progress notes that are updated with each provider contact. (capture)
Internal business knowledge	20. Make all patient insurance information available online for authorizations/ precertifications, etc. 21. Complete referrals/prior approvals electronically; the system knows what insurance will pay. (This is a way to end claim denials.) 22. Provide a database of referring physicians and a computerized mechanism for making a referral to another physician within VUMC. 23. A Web-based forms page where all VUMC forms can be found. 24. Database with free text flexibility to manage population (real time, inside/outside facility, request/track referrals, etc.)
External knowledge	25. A database of referring physicians.
Using information technology long term	26. Provide the ability to easily search patient records by diagnosis, physician, etc.

institutional support kept their development going forward. This full-featured approach to E3 would satisfy order entry, compliance, billing, and documentation needs, but the difficulty of developing programs in these complex efforts made completion by 2003 seem out of reach. On the other hand, StarPanel development was an unexpected early success. StarPanel is the comprehensive user-friendly electronic medical record for VUMC. It allows users to create a panel of patients, which enables a provider to track his or her patients in an efficient manner. StarPanel integrates patient data from multiple sources, including laboratory and pathology results, radiology reports and a link to a picture archiving and communications system (PACS), echocardiography reports, discharge summaries, physician notes, lists of problems, medications, and allergies, and physician orders, as well as other documents. StarPanel also contains a powerful messaging system to facilitate communication regarding patient care.

Documents from outside VUMC can be incorporated into the medical record utilizing StarScan. This feature allows providers to have a patient's complete medical record at their fingertips and available from any location.

A faculty member proposed the creation of StarNotes, a version of the clinical note-taking tool extracted from the hospitalwide clinical provider order entry (CPOE) system. Using StarNotes, physicians create templates to enter patient visit data and notes, replacing dictation. StarNotes was another component in developing an all-in-one system and integrated nicely into StarPanel.

Early Results

One of the informatics brain trust's early adopters, Jim Jirjis, M.D., enthusiastically embraced StarPanel. He shared the early product with other primary care physicians. Together they decided to adopt StarPanel for the entire adult primary care center (APCC). The target site for initial implementation and development of the StarPanel project was the Vanderbilt APCC. The center is housed in a campus-based building. It is comprised of twenty-four attending physicians and seventy-one residents and is divided into four physical suites of offices and examination rooms. There are three group practices: internal medicine primary care, medicine and pediatrics, and geriatrics. Practitioners vary in type, including physician-scientists, physician-educators, and full-time medical center clinicians and medicine residents and nurse practitioners. All attending physicians are part of a larger multispecialty medical center–owned physician practice group, the Vanderbilt Medical Group. Primary care at this site services 35,000 patients and has 48,000 office visits per year. The APCC needed to invest in $31,102 worth of new hardware for a solid technological infrastructure. See Table 13.3

TABLE 13.3. Adult primary care center (APCC) overview.

Item of analysis	November 2001	Annual
Visits (actual)	4,103	
Visits (projected)		49,236.00
Total cost (baseline)	$294,513	$4,597,165.32
Total cost (tech-enhanced)	$144,917	$1,739,015.52
Net savings	$149,596	$2,858,150.00
Investment (APCC suite IV deployment)	$31,102	$150,000.00
Return on investment	$4.81	$19.05

for an overview. The APCC's management structure consisted of a medical director, a nurse manager, two assistant nurse managers, two administrative assistants, and a clerical staff member. The APCC employed seventy-eight staff members, including patient care technicians, nurses, and clerical staff. The practice information system consisted of a mainly paper-based, traditional charting system that was not standardized throughout the four suites. Charts were kept in file rooms within each suite, and management of the charts was the responsibility of the suite's file clerk and the other clinical staff members. Some medical information was also available in an electronic medical archive record system, which included laboratory data and various notes and reports. Most documentation and the associated work flow of patient visits, telephone calls, correspondence, laboratory, and imaging was contained in a paper chart. StarPanel was implemented in this milieu both as a test for the clinic and for codevelopment and enhancement of the product.

But Dr. Jirjis did more than a standard test implementation; he altered StarPanel's foundations by guiding creation of a message basket function—an electronic tool allowing clinicians to communicate regarding patient care and easily send information to StarChart. Thus, StarPanel could be tailored around the uniqueness of the clinical work flow of each specialty clinic. This innovation made adoption of StarPanel much easier for other clinicians.

With StarPanel usage increasing and paper costs decreasing, an economics Ph.D. conducted a return on investment (ROI) study of StarPanel. For November 2001, in which there were 4,103 patient visits, the results were compelling: 32 percent less time and 51 percent less cost per patient visit using StarPanel meant a reduction in cost from $294,513 to $144,917—$149,596 savings that month alone—and projected annual savings of $1.8 million for the APCC.

The study said that StarPanel cut costs of physicians, office assistants, patient care technicians, and patient service coordinators (Tables 13.3 and 13.4). Per visit the cost for physicians was cut in half to $25.82, for technicians to $1.62, and for patient service coordinators to $1.33. More time was required to enter data into StarPanel; thus the per-visit nursing costs increased from $6.13 by a nominal $0.42 to $6.55. The cost of office assistants as well as medical information assistants (those who previously pulled and transported charts) was completely removed. These employees were placed in a redeployment program and reassigned to other parts of the organization that had suffered losses through attrition.

The expanded pilot in the APCC had required a projected initial investment of $150,000 for technology for the entire clinic. It seemed that StarPanel appeared ready for enterprisewide implementation to help the institution achieve its financial goals.

Table 13.4. Adult primary care center personnel costs.

Personnel costs	Visits	Rate ($)	Process cost ($)
Direct			
Physician	4,103	25.82	105,939.46
Office assistant II	4,103		
Patient care technician	4,103	1.62	6,646.86
Patient service coordinator	4,103	1.33	5,456.99
Registered nurse	4,103	6.55	26,874.65
Indirect			
Medical information assistant I	4,103		
Personnel subtotal	4,103	35.32	144,917.96

Posch's Dilemma

StarPanel's success was inspiring. However, there were some issues to resolve before a housewide rollout was launched. Personality was one such issue. Dr. Jirjis was a superchampion of technology-based medical change. He had jokingly said he would like to "have his tablet PC surgically implanted into his arm." Dr. Jirjis made improving health care through informatics his top priority. Although other physicians in the organization were tech-savvy, future StarPanel implementations could not rely on the dynamic presence of a Jim Jirjis type at every site.

In addition to the intangible element of enthusiasm, economics also came into play. Was the ROI analysis valid?

Several factors make it questionable:

- First, the staff time and cost numbers were best estimates, not meticulously gathered measurements. A review team was put together to audit the report and determine if, in their experience, the numbers were realistic.
- Second, the analysis did not take into account cost implications related to medical records, internal audits, finance, contracting, risk management, or legal affairs.
- Third, was the generalization of the clinic's figures for one month (November) across the entire calendar year indicative of its true annual performance? (Could this clinic alone save $1.8 million? This seemed highly unlikely at first glance.)

Did the ROI analysis inflate cost savings by failing to recognize that the termination of medical information assistants was a one-time event? While the medical information assistant could be replaced by automation, other employee time and monetary savings would be achieved on a percentage basis across the entire worker pool. No other specific employee groups could be targeted for termination because their roles were not 100 percent replaceable by technology.

Understanding the reality of StarPanel's impact, Posch knew that the product could save money, but he was forced to reevaluate how to calculate its savings. Based on the pilot results, Posch reasoned that one full-time employee (FTE) could be redeployed for every 10,000 patients. Although this seemed a good approach for the medicine specialties, would it hold when the product was rolled out in the surgical specialty areas?

Would Posch risk his future on a pilot performed on 7 percent of the total patient population in the hope of extending it to all clinics serving 688,000 patients? What should he do?

Questions

1. What would you do?
2. What questions would you ask?
3. What would be the critical success factors?
4. If you decided yes, what would you be committing the organization to do and what would be its true value?
5. How would you design a rollout process to ensure successful adoption of the tools and capture the savings?

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Catch 22: The Case of Utilization Management's Return on Investment Evaluation

Fern FitzHenry

"I've just identified about $200,000 in charges that don't meet the medical necessity requirements," John confides to Frank. "If we had been audited on these cases, the lost revenue would be minor compared to the penalties we would be facing. Senior management wanted a meaningful return on investment to justify purchasing of utilization management software. This should do it."

Both John and Frank work for a large academic medical center. John works as the director of utilization management (UM), while Frank works as an information systems analyst. It is a winter morning in February 2000. John had first proposed the purchase of a UM system a year and a half ago. The management team in charge of capital expenditures had asked him to justify the expenditure. The most measurable of the savings were in labor, but John was unwilling to cut his staff to realize these savings. As a consequence, there was no measurable revenue improvement, and John's request had not made the cut in an organization that prioritized capital expenditures for information systems based on the speed with which the organization could expect to realize a return on investment (ROI).

"We billed Medicare for inpatient cases when we should have billed the patients as observation patient cases?" asked Frank.

"Yes," John confirms. "You can't blame the staff. The workload has increased. They just don't have time to do it all. With a utilization management system, it wouldn't have happened." The $200,000 justification John has just identified has put the software system he has requested squarely in the realm of significant possibility.

Background

Defining Medical Necessity

In 1996, the U.S. Congress passed legislation that meant federal programs not only would refuse to pay for hospital services that were not "medically necessary" but also that it was the responsibility of the billing organization to review requests for payment prior to submitting them to ensure that the bill did not include "medically unnecessary" services. For example, if a patient could safely be cared for as an outpatient, then inpatient care is medically unnecessary. Unfortunately, observation care (the hourly costs previously billed for monitoring outpatients) soon will not be reimbursed at all. This is because of new reimbursement regulations taking effect in 2000 (ambulatory patient classifications [APCs]) that "bundle" observation costs into averages that are blended across all outpatient service reimbursement rates. Thus, there will be strong

incentives to convert observation patients who are bordering on sufficient medical necessity into inpatient admissions. The crux of the dilemma is having a timely review and physician agreement on the level of care while care is under way.

The role of UM is to monitor the process of admissions, review the circumstances, initiate a dialog with physicians to ensure that the correct level of care is delivered, and ultimately bill them correctly.

Managing Utilization

John's job and his department were created to ensure that payers like Medicare and Medicaid are not improperly billed. In the case of commercial payers, the job is to notify the payer of patient admissions and obtain concurrence (agreement to pay) for planned care. The function of UM is to match patient needs with healthcare resources, primarily to eliminate unnecessary care. It initially emerged to monitor medical necessity in inpatient encounters. Although the definition of UM has changed over time and varies across healthcare organizations, the most important factor in determining what services and functions are parts of UM is method of payment.

As payer concerns about the rising costs of care grew in the late 1970s, they began to shift the burden of cost control to providers, and the function of UM was the result. The components of UM that relate to certifying the necessity of the healthcare services provided includes precertification, concurrent review, and discharge planning to ensure that care is both medically necessary and covered for payment. For urgent care, the functions are primarily retrospective. They occur after the patient has developed a condition that requires treatment. In such cases, UM acts to match the level of treatment to the patient's need.

Shifting Management Risk to Hospitals: When It Happened and How It Works

The Increasing Cost of Health Care

In 1980, national health care expenditures represented 8.8 percent of the U.S. gross domestic product, but by 2000, they had grown to 13.2 percent of the gross domestic product*. Medicare and Medicaid paid almost 50 percent of hospital care expenditures that were the focus of the department in this case. Healthcare expenditures continued to rise despite the limited success of multiple federal, state, and private initiatives to reduce medical costs.

Federal, state, and commercial payers were all looking for strategies to lower costs. The primary strategies for federal programs and state programs were setting up capitation and/or prospective reimbursement programs to cap payments, as well as penalties for provider abuse of the payment system. The primary strategies for commercial programs were requirements for authorizing treatment.

The Role of Diagnosis-Related Groups in Managing Costs

As healthcare costs grew and payers searched for ways to contain costs, they began to shift risk to providers. Medicare's conversion of inpatient encounters to prospective payment by diagnosis-related groups (DRGs) in 1983 was a milestone in the growth of UM. Prior to DRGs, fee for service was the primary method of hospital payment. The fee-for-service method of payment put all the risk on the shoulders of the payers. DRGs put some of the risk on the shoulders of the hospitals. If the patients stayed

*http://www.cms.hhs.gov/statistics/nhe/projections-2001/t1.asp

longer or had greater costs than the prospectively set DRG amount for that type of case, it would be the hospital that incurred the majority of the loss (minimal payment adjustments were made for DRG outliers). In addition, DRGs became the basis of reimbursement for inpatient stays for many commercial payers. The length-of-stay standards associated with these groups grew to be a management goal for resource management, patient care pathways, and discharge planning.

Ambulatory Patient Classifications and Observation Patients

At the time of this case, the Health Care Financing Administration (now Centers for Medicare and Medicaid Services) was preparing to introduce a new form of prospective reimbursement for outpatient hospital services, APCs. The proposed model was introduced in August 2000. APCs bundled services and costs into payment packages. Although some services remained relatively unaffected, hourly fees previously charged for observing patients not expected to need care for 24 hours or longer were to be bundled and eliminated. These types of patients are often called observation patients. Since observation hourly fees were no longer reimbursed, hospitals would have strong financial incentives to admit only patients who would require more than 24 hours of inpatient care.

The Rules for Certifying Medical Necessity

For the purpose of billing the payer, medical necessity must be established and documented by a physician. It is the physician's diagnosis of a patient's condition as documented in the medical record that establishes diagnoses. For example, there are many diagnoses that could be inferred from the results of clinical laboratory testing. However, even though the laboratory report of a test like a blood culture might be positive, indicating a systemic (vs. local) infection, such a diagnosis cannot be coded onto a bill until there is a provider note documenting that the patient has a systemic infection.

Other details about the patient's condition and treatment are also used to certify patient need for hospital services. In an effort to reduce conflict and reviewer subjectivity, many payers have adopted clinical decision support criteria. These standards can provide objective, measurable parameters, but they are intricate in the level of detail that must be abstracted from the chart and documented by the providers. In addition, criteria often assume one major condition, and further negotiations must be made with the payer when the patient has more than one medical problem.

Requiring Certification

In 1996, the U.S. Congress passed a law called the Health Insurance Portability and Accountability Act (HIPAA). In addition to mandating that employers offer options for health insurance to their employees when they resign, the act also mandates that certain payer/provider transactions be exchanged electronically via standard transaction sets. These transactions include requests for payer authorizations and certifications. The request for certification of patient stays was one of the transactions that payers were required to accept and respond to electronically when the deadline for enactment of the regulation came due in October 2003.

Hospital Background

Located in a southern, medium-sized metropolitan region of about 1 million residents, University South Medical Center and its associated university are one of the largest private employers in the state. University South Medical Center is an academic medical

center with a 650-bed hospital and associated ambulatory care facilities generating 31,000 admissions and 640,000 outpatient visits annually. The hospital features a level I trauma center with a helicopter critical care/transport program that services three states, and a comprehensive neonatal intensive care unit. The medical center is also a major "disproportionate share" provider to Medicaid beneficiaries. Hospital census is often at capacity, but net revenue is low. Medicaid patients are reimbursed at a flat rate of $100 per diem. With other payers equally aggressive in cost containment, it is a struggle for the organization to "stay in the black."

UM Department Analysis

UM departments exist in most hospitals. Although the functions of these departments might differ, certification of patient stays is always included. This base function means that the staff must semiconcurrently review the patient chart and treatment plan. At the same time, a UM specialist reviews the chart and sets a "working" DRG with an associated average length of stay.

Admissions Certification Process

Most third-party payers other than Medicare and Medicaid require concurrent notification of admissions for their beneficiaries, including clinical details of the patient's condition and treatment. Payers ordinarily require that inpatient days be approved and certified or authorized. In many cases, the criteria used for determining these approvals and authorizations have developed into industry standards. For example, standards emerged for measuring the patient's severity of illness and the hospital's level of care. Some payers require their inpatients to be treated according to clinical pathway standards.

Ultimately, the regulatory and payer requirements for the reimbursement of hospital inpatient stays mean that a UM staff person needs to review the patient chart almost every day of the patient's stay. It is a labor-intensive, expensive process that could be made more efficient with information technology support.

Calculating the Information System's ROI

Calculating the ROI from information systems is difficult at best. Information systems are the keepers of what is being increasingly recognized as organizational knowledge, one of the most valued but ill-defined assets of an organization.*

For example, patient accounting systems, one of the earliest areas of computerization in hospitals, not only create a patient bill but also manage nursing station census and feed the general ledger system. The latter benefits are of great value and importance to the organization but might be described as by-products of the patient accounting system's primary function—creating the patient bill. Another example of an indirect benefit is increasing patient safety. This is really an indirect benefit of the physician order entry and pharmacy management systems. It is primarily because the clinician interacts with a system that holds structured information about patient age, weight, allergies, current medications, and laboratory test results, as well as a knowledge base about pharmaceutical formulations and interactions, that patient safety is improved.

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*For a more in-depth discussion see *The Squandered Computer* by Paul A. Strassmann, 1997.

For a new system proposal, these sorts of indirect benefits, like integrating business activities and processes, may be difficult to anticipate and "sell" with the new system proposal. However, to the extent that they can be anticipated, they are worth documenting and including in the proposal. The proposed ROI presented in this case has both direct and indirect components.

Direct Benefits of a UM System

UM's current processes are primarily manual and disjointed. The expectation is that the primary direct benefit of the system will be a more efficient use of staff time. In order to understand where the efficiencies will be gained, John and Frank will review the current process in greater detail. First, they will describe a high-level view of the current work flow in UM and the information system support currently available to the department (Figure 14.1). Second, they will estimate the time savings expected from the proposed system. Third, they will estimate the new revenue expected to be captured from the proposed system. These two estimates, times savings and new revenue, are the two direct benefits projected for the system.

Existing Work Flow for Certification of Hospital Stay

First, it is necessary to understand UM's existing work flow in order to project where improvements might occur and to estimate the value of the improvements for the ROI. The current process for tracking patient cases and certification status is a mix of computer reports, utilization specialist notes, and microcomputer databases.

The process starts with patient case lists from the single-user system. This system tracks the status of all active patient accounts across multiple departments and payers. Unfortunately, the system is updated only in batches (at midnight). It is available to only a single user from a single workstation in the patient accounting department. The database for this system is not robust, and the vendor enhancements have been hard to get.

The patient accounting system also provides limited support to the UM department. To being with, the tracking system receives a nightly data feed from the patient

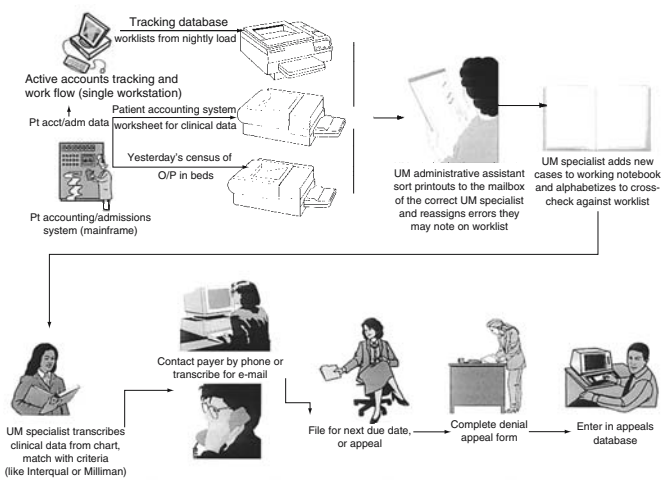

FIGURE 14.1. Utilization management (UM) current work flow.

accounting system, but this data feed excludes outpatients. In particular, it excludes observation patients and day surgeries. These two classes of outpatients are housed in hospital beds throughout the organization. UM must monitor these cases to ensure that the patients are discharged in the appropriate time frame or converted to inpatient status.

Second, the patient accounting system produces a report listing all observation patients from the previous day. All the specialists review this report to see if any of the specialties they work with have patients. If so, the UM specialist adds the patient to their caseload for review. The patient accounting system also produces (in nightly batches) a UM data recording form for all inpatients. These forms have all the basic patient demographics and payer information with additional space for the UM specialist to record details about the patient's condition, treatment, and approval status, as well as to document details of communications with the payer and physician regarding the patient.

The reports from the tracking and patient accounting systems are typically picked up from the printer and sorted by an administrative assistant and put in the correct UM specialist mailbox. The UM specialist starts the day by picking up these printouts (Figure 14.1) and then goes to the nursing stations to review the patient charts of the cases she has marked as due for review. On the chart, the specialist transcribes clinical data, matches the condition and treatment of the patient against the standard criteria for justifying continued stay, and notes any actions to be taken.

Typically, patient cases are not certified for more than 1 to 2 days at a time for each payer. If the patient's certified days have expired, the UM specialist will contact the payer later in the day to ask for continuing certification of the stay.

When a day of the stay is denied, the UM specialist completes a form documenting the details of the denial. This information is reviewed by a manager and entered in another microcomputer database within the UM department. It is a single-user system dedicated to tracking the status, communication, and outcome of payer denials.

Estimated Time Savings from Proposed System

A direct benefit of the proposed UM system is that it will save staff time. To estimate the size of this savings, John and Frank followed a UM specialist for a day and completed a limited time-and-motion study. The study was limited in that only a single specialist was observed for a single day. In addition, times were collected only for tasks relevant to the hospital days' certification processes. Figure 14.2 documents certification tasks and times for both the existing work flow and the expected work flow (with a new system).

The majority of the time gains are projected to come from improvements in tracking patient authorization status, integrating patient forms, and real-time patient work lists. In the current process, UM work lists and patient forms are batch reports that always lag changes in the patient census and status.

The sum total time for completing activities to this point under the current process is 75 minutes. Under the proposed system, this time is expected to be reduced to 20 minutes. Significant improvements in staff efficiency are expected. Based on this observation study, John estimates that he could save at least 30 minutes per day per UM specialist or approximately 1.25 full-time employees (FTEs) in improved productivity.

As Table 14.1 demonstrates, UM has increased 23 percent since 1997, but the number of UM specialists has remained constant at 20. In addition, the number of discharges requiring certification is expected to continue to increase. The increased workload

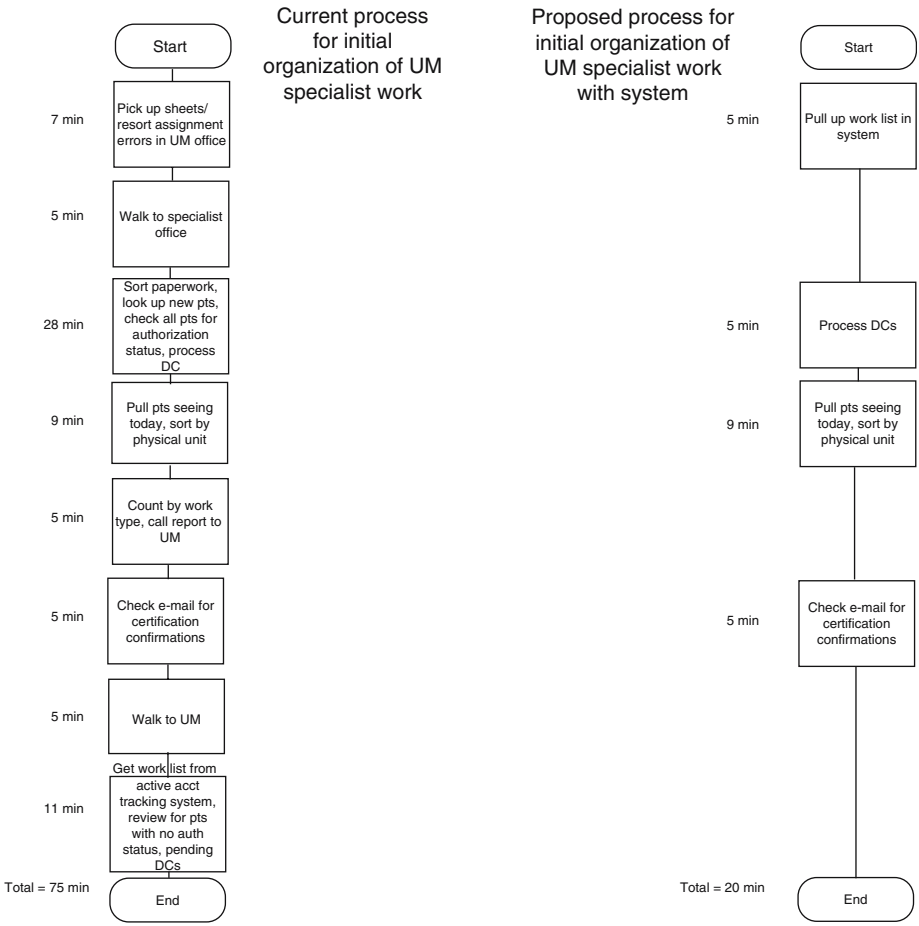

FIGURE 14.2. Existing and proposed certification process and time. UM, Utilization management.

TABLE 14.1. Weekly certification workload, 1997–2000.

	1997	1998	1999	2000 (partial)	1997 compared to 2000
Average number of discharges requiring certification	355	383 ↑(7.9%)	420 ↑(9.7%)	435 ↑(3.6%)	↑23%
Average percentage of discharges requiring certification	59.4%	63.4% ↑(6.7%)	66.1% ↑(4.3%)	67.2% ↑(1.7%)	↑13%
Average dollar amount certified per week	$4,253,000	$5,022,000 ↑(18.1%)	$5,619,461 ↑(11.9%)	$6,199,327 ↑(10.3%)	↑46%

TABLE 14.2. Project return on investment for a utilization management system.

Benefit description	Annual value ($)
Reducing denied patient stays (50% of gross)	32,500
Avoidance of labor costs (without system requesting two full-time employees to replace)	70,000
Avoidance of Medicare loss (50% average denied inpatient to outpatient)	172,229
Case-mix improvement example (assumes 100%)	250,331
Total	525,059

justifies adding another UM position at this time. The cost of adding this individual (justified by the increased workload since 1997) is estimated for this analysis at a conservative $40,000. John is willing to commit that he will not add this position if he is allowed to proceed with the purchase of a UM system.

The labor productivity improvements will produce a direct ROI totaling $70,000. One part of this savings will be from elimination of the supplemental labor support of $30,000 per year (existing annual per-diem and overtime expense). The other part will be from a labor cost avoidance. The workload justifies adding an FTE with a salary expense of $40,000 per year. The productivity gains from the UM system will allow the additional labor cost to be avoided. Even so, additional productivity gains are projected.

Intervening to Correct Admission Type

The final direct benefit for the ROI is estimated at $32,500 per year (Table 14.2). It accrues when the UM specialists are able to intervene with the patient's provider to correct the patient admission type (primarily observation vs. inpatient). When the patient admission type does not match the provider's order and/or the patient's condition, payers deny payment. If the patient type is incorrect, it must be corrected virtually concurrently with the patient's admission. Once the encounter has been denied for an incorrect patient type or lack of medical necessity for the billed patient type, the case cannot be appealed. Since 1997, the hospital has seen a 264 percent increase in nonappealable days (Figure 14.3).

The feature of the UM system that would allow it to capture this lost revenue is a feature called concurrent work lists. John and Frank anticipate that with concurrent

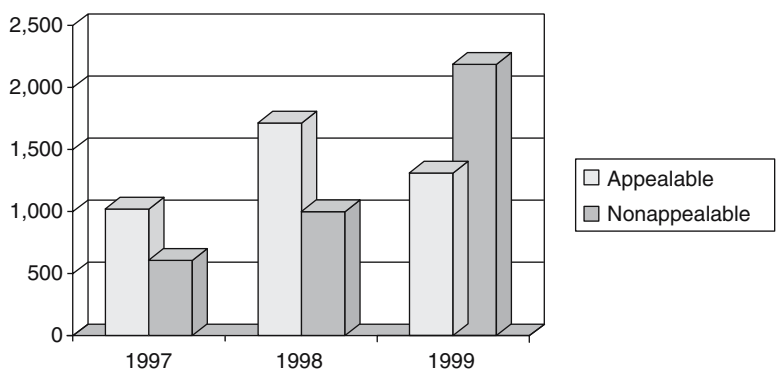

FIGURE 14.3. Appealable vs. nonappealable days since 1997.

work lists, the UM specialist could match the admission type with the patient's chief complaint (collected by the admitting staff) and know if the patient needs immediate review to potentially correct the patient admission type.

The existing work list previously described in the section on work flow is a combination of patient lists. None of the existing support systems provide specialists with concurrent admission notification.

John and Frank estimated the value of this benefit (timely correction of patient admission type) from the denial tracking data that John's staff maintains manually. Since UM operates only during normal business hours, not all these denials could have been reversed, even with concurrent work lists. Still, John and Frank found there were twelve cases in 1999 that were denied by payers because of incorrect patient type. The total charges for these patients was $63,592.20. Since John and Frank need gross revenue (vs. charges) for the ROI analysis, they assume 50 percent of charges, $32,500 will be the actual revenue.

Indirect Benefit

The staff in UM are hourly employees; therefore, increasing the workload increases the budget expense. The opportunity cost of holding the budget constant but increasing the number of certifications has been that some important work (not directly related to certification) is not being completed. The increased number of certifications has decreased the time available (1) to monitor medical necessity in Medicare patients, and (2) to "prompt" physicians for documentation needed to justify higher case mix levels for inpatients billed via DRGs. The productivity gains expected from the system could free time to apply to these two areas. The next two sections describe how John and Frank estimate the value of that work.

Avoidance of Risk

Avoidance of risk is how John and Frank categorize the "potentially" lost revenue. John estimated that in the past quarter the hospital billed $172,229 in "potentially medically unnecessary care" to Medicare for inpatients. The estimate came from an in-house audit of a subset of Medicare inpatient charts. Reviewing these charts to ensure medical necessity is met is one of the tasks that got less specialist time as the workload increased over the previous 3 years. Failing to adequately ensure medical necessity can result not only in the need to repay erroneous billing but also penalties (when the payer is a federal plan).

Increased Medicare Inpatient Revenue

The second indirect benefit of UM has a projected value of $250,331 per year. UM specialists, as concurrent reviewers of the inpatient chart, have been assigned the additional duty of prompting physicians for the documentation needed to justify the highest possible case mix levels for patients billed under DRGs.

John and Frank used the study done by case management to estimate the revenue that could be achieved from freeing specialist time to do case mix prompting. Since not all physician prompting improves clinical documentation, they estimated that only 80 percent of the cases might be coded appropriately if the physician were prompted in a timely manner and would improve reimbursement only 59 percent of the time, resulting in savings of $250,331.

TABLE 14.3. Estimated costs of a utilization management system.

	Vendor 1 ($)	Vendor 2 ($)	Vendor 3 ($)
Software license	117,080	43,190	102,500
Implementation	19,600	64,486	50,000
Interfaces	30,000	30,000	30,000
Annual maintenance	21,624	28,800	20,500
Criteria interface	1,500	9,135	Integrated
Server	40,000	40,000	40,000
Estimated total	229,804	215,611	243,000

Decision Presentation: Costs and Benefits

Frank and John now have to present the business case for a UM system to executive management. Their cost-benefit analysis hinges strongly on indirect vs. direct benefits. The direct benefits of the proposed system (reducing denied stays and reducing labor costs) total $102,500. The indirect benefits total $422,559 (meeting criteria for medical necessity and improving case mix).

Costs and Benefits Not Included in the Presentation

The estimated costs of three potential vendors of UM systems are listed in Table 14.3. With an estimated system cost of $250,000 and a potential ROI of more than $500,000, the breakeven point would be achieved in less than a year. The explicit ROI excludes other potential benefits that might be achieved with a UM system in the future.

Just days before the project ROI presentation in August 2000, John and Frank learned that the chart audit done by John the previous winter definitely identified multiple Medicare patient encounters that were medically unnecessary. The legal department for the medical center has determined that the organization should refund the reimbursement received for these patients to Medicare. The amount will be almost $70,000.

Questions

1. How would you create a cost-benefit analysis using this data?
2. What are some of the strengths and limitations of the method used here?

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Antimicrobial Utilization Program at the University of Central State Medical Center

Melissa Kaplan and Beth Wickerham

Prologue

Bob Bartlett hung up the phone and sighed. Since his appointment nearly 3 years ago as vice president and provost of the Health Sciences Center at the University of Central State, he had become accustomed to the incessant ringing of his phone and the sound of knuckles rapping on his door. He looked around his office. How had it ever come to this? Family vacation photos were hidden by stacks upon stacks of articles, abstracts, and newsletters. The place looked like a cross between an executive office and a college fraternity house. It was covered from floor to ceiling in paper, mismatched bookshelves, and ominous filing cabinets. He made a mental note to call someone Monday morning to discuss redecorating.

Bartlett's mind wandered back to the phone conversation. It was the third call he had received that morning about the antimicrobial utilization program (AUP). He leaned against the back of his tall, black, leather chair and scratched his head. Embarrassed that he could not recall specifics about the program, he spun his chair around, opened the second drawer, and pulled out a large expanding folder marked "Medical Management." He thumbed through the files until he finally came across the one for the AUP. He placed it on his desk, closed the drawer, and began to read.

Background

Institutional costs at academic medical centers across the nation have been rising, especially over the past half-century. Likewise, the University of Central State Medical Center often finds itself operating over budget in several service areas. Most problematic have been the skyrocketing costs of medical supplies and pharmaceuticals. During the 1997 fiscal year, the medical center's antimicrobial utilization was nearly $2.4 million, accounting for 15 percent of the total inpatient drug expenditure. Fifty-nine percent of the adult inpatients receive antimicrobial therapy. Less-than-ideal prescribing practices have elicited a need for increasing cost scrutiny. The excessive and/or inappropriate use of antibiotics has three important implications. For the patient, improper practices could result in prolonged hospitalization, adverse drug events, or compromised outcomes. Second, the hospital accrues unnecessary expenses. Third, increased bacterial resistance to antibiotic effectiveness, a potentially hazardous outcome, could greatly affect the community as a whole. Unsuitable prescription practices could, in effect, touch every dimension of health services delivery.

As a result of the 1997 fiscal expenditures on antimicrobials, in January 1998 the infectious disease (ID) subcommittee of the pharmacy and therapeutics committee was rechartered as the antimicrobial utilization committee (AUC). The AUC quickly formulated a proposal for the AUP with four main goals: (1) to decrease the medical center's cost of antimicrobial utilization, (2) to decrease the potential for complications among acutely ill ID patients undergoing excessive, inappropriate, or overlapping drug therapy, (3) to decrease the trend toward resistant organisms to the drugs, and (4) to improve patient outcomes.

It soon became Central State's first medical management program, predating the structured medical management umbrella under which it now falls. The AUP received rapid approval from Bartlett, Tom O'Malley (the medical center's chief of staff), the medical management team, the finance department, the internal medicine's ID department, and the clinical microbiology laboratory. One month after the AUC was organized, a memo was sent to the entire University of Central State Health System faculty and staff to announce the May implementation of the AUP (Exhibit 15.1). Although the stakes for both the patients and the hospital financial budget were evident, Bartlett and his colleagues did not anticipate the impact on residents, attending physicians, ID consultants, and medical management. On May 18, 1998, the antimicrobial surveillance team (AST) rounds for the adult inpatient service started, and the phone calls began.

The Plot

The antimicrobial formulary was reorganized into three tiers depending on the targeted bacteria, the potency of the drug, and the method of delivery. Restriction category A included agents requiring ID department approval before use. These antibiotics included restricted, extremely high-cost, and/or high-risk agents and all nonformulary antimicrobials. Category B included agents that may be ordered but not continued beyond 72 hours unless approved by the ID department. These second-tier agents are high-cost and moderate-risk antibiotics. C-level antibiotics may be ordered without restriction or stop orders.

The AST (also known to hospital staff as the "SWAT team"), consisting of one ID attending physician and one pharmacist, received a daily list of all inpatients (1) on a category A agent, (2) on a targeted category B medication, or (3) on any combination of three or more antibiotics. The medical information system (MIS), the hospital's computerized information system, generated this list. The team performed rounds on each floor of the hospital, reviewing each of the listed patients' charts in their entirety in order to assess the use of the antibiotic(s) for each individual. The team wrote a progress note on each patient, and this note became part of the patient's permanent medical record. If the AST felt that a change in treatment was warranted, they made suggestions in the chart for the treating physician to review.

Therapeutic recommendations might include changing to an alternate agent, conversion of multiple- to single-agent therapy, conversion of parenteral to oral therapy, discontinuation of therapy, or an assessment of the appropriateness for home therapy when other indications for discharge have been met. The AST made recommendations an average of 51 percent of the time. Data suggested that the treating physician followed the AST's advice 53 percent of the time.

Sometimes the AST also "swatted" a drug—implementing a 72-hour stop order on the antibiotic by placing a bright orange sticker on the chart. They then notified the

pharmacy. If the treating physician did not concur with the stop order, they could call the 24-hour on-call ID team member to discuss the recommendations until an agreement was reached. There were no set standards or guidelines for the ID physician in making this decision.

The first feedback to reach Bartlett's desk came from the medical house staff. While very aware of the global implications of antibiotic resistance, medical residents were more focused on the immediate situation facing their individual patients. They felt that since the AST members were not the ones managing the patient, if the patient should take a turn for the worse because of a change in medication, the AST shouldn't be able to make treatment decisions. There was overwhelming sentiment among the residents that they should be the ones to make decisions about medications.

In surveying the different specialties, Bartlett found varying degrees of resistance among the house staff. The medical residents thought that having the AST and an ID attending physician "looking over their shoulder" was primarily a nuisance. One resident felt that money was the driving factor behind the program, contending that the hospital would do anything to "save a buck." However, they did acknowledge an educational benefit from the recommendations in learning about resistant bugs and new medications. One medical resident even stated that it was helpful to have the additional resource for treatment planning.

Because the ID attending physicians were so highly esteemed, medical residents respected their insight and leadership in the program. When asked about the 72-hour stop order, the residents replied that it was annoying but necessary. On average, the medical residents responded that they now think twice before prescribing a "heavy hitter."

The surgical residents were not as accepting. They saw the AST's presence as an "invasion" and nicknamed them the "SWAT team." They didn't like other physicians second-guessing their medical decisions and giving unsolicited opinions. "If I wanted their opinion, I would call an ID consult," stated an angry surgical intern. When asked if the AST's presence made them more aware of the global problems of antibiotic resistance, one responded, "No, it makes me want to hide." Another felt a retaliatory approach was more effective, waiting until 3:00 A.M. to page the on-call ID attending physician to ask about a change in medication. The perception among the surgical residents was that the AST was interfering in situations where it was "none of their business." Some of them found the "SWAT" stickers on charts to be offensive, while others claimed to ignore them. Bartlett was dismayed by the surgical residents' reactions to the AST.

The attending physicians seemed much more in favor of the program. They were aware of the high cost of antibiotics and the direct and indirect effects it had on patient care. They recognized the need to improve the appropriateness of antibiotic use, and most found the AST's suggestions useful. While one attending physician stated that it was "embarrassing" to be "caught" by the AST, he felt they kept him on his toes and forced him to be more proactive in his decision making when treating patients with antibiotics. All in all, there were mixed opinions among the attending physicians, but most seemed willing to comply with the AST recommendations.

Bartlett decided to meet with the AST to get a feel for their perceptions and thoughts on the program. In discussions with Dr. Fred Hyde, one of the ID attending physicians, he discovered that there were frustrations on the AST side as well. Hyde explained that while the pharmacist on the AST remained constant, the attending physicians rotated on a weekly schedule. Each attending physician had different treatment methodologies, and there were no standard guidelines to follow. In functioning inde-

pendently of the ID department (and the ID consulting team), there occasionally was some overlap and duplication of work. Without actually seeing the patient, the AST could only attempt to "re-create" the decision-making process of the treating physician in determining why a certain drug (or combination of drugs) was used. He also complained about the lack of responsiveness from the surgical residents. He claimed that the upper-level surgical residents were usually unavailable in the operating room (OR), and therefore a surgical intern was the one most often in contact with the AST. When asked why a patient was on a certain drug, based on hospital procedures and protocols, the typical answer of the surgical intern was "because the surgical resident or attending surgeon said so."

Dr. Hyde felt there was more acceptance among the medical interns, who often discussed, debated, and learned from the AST's recommendations. The overwhelming sentiment of the AST, however, was that, although arguably effective, the rounding process was an extremely labor-intensive way of addressing the antimicrobial utilization problem. The opportunity cost for the ID attending physicians on the AST was "outrageous."

Discussions with Amy Pakyz, a full-time ID pharmacist and full-time AST member, shed a different light on Dr. Hyde's comments. She saw the variations and inconsistencies among the physicians as one of the biggest drawbacks. One physician might "swat" a drug on Friday, and another may reinstate it on Monday. Some were stronger in their stance against allowing the continuation of a drug, while others gave in "at the drop of a hat." These disparities did not lend credibility to the program.

Pakyz suggested that if some members of the upper-level administration, including Bartlett, O'Malley, and Scott Jones, M.D. (chair of the surgical department), publicly supported the program, it would be more likely to receive greater respect and compliance from the surgical residents and attending physicians. Pakyz also complained that she had no administrative or clerical support; she entered all the data into a database and tracked all the statistics on her own. If she took a day off, the paperwork piled up and waited for her to return. The medical management group might be overseeing the project, but the day-to-day tasks lay solely on her shoulders.

AUP Preliminary Results

Bartlett turned back to the file and reviewed a progress report given by one of the administrators in the medical management group. From a financial perspective, the cost of drugs was growing. New drugs were expensive, and indications for their use were not always scientifically determined. From an educational viewpoint, there was not enough information available for physicians to make accurate determinations about which medications to prescribe. Prior to implementation of the AUP, lack of communication between the ID department and the clinical staff had limited the clinical staff's ability to stay on top of the newest, most current antimicrobial protocols. The medical management team felt not only that the physicians were benefiting from AST recommendations but also that the administration could now better monitor and regulate the use of antibiotics.

However, one administrator noted potential barriers, such as the clinicians' reactions to "corporate medicine" and the perceived loss of their problem-solving capabilities and professional judgment. The decentralized structure of the hospital also made it difficult to evaluate an endeavor of this nature. Additionally, the lack of good information systems and strong analytical resources made proper management of the project

difficult. While certain infrastructures were not initially in place to secure a smooth implementation, he felt that the program had gained momentum and that they would eventually see the projected reduction in costs. He also thought it would enable the hospital to manage antimicrobial expenditures more efficiently while simultaneously improving quality.

Preliminary data suggested that improvements had been made. The AST had reduced its average rounding time from 2.6 to 1.8 hours/day. Prescriptions for duplicate antimicrobial therapies and for three or more antibiotics had fallen by 15 percent and 24 percent, respectively. The percentage of total recommendations had remained constant, yet the surgery response rate had steadily increased. Although more data was needed to make any conclusive claims, it appeared that some AUP goals were being reached with AST's efforts.

Epilogue

Bartlett looked up from the file. Pulling his Palm Pilot from the pocket of his blazer, he scrolled to the month of April. Yes, he was right. The meeting to discuss the AUP was only 3 weeks away. He could foresee how it would go. After the presentation of status reports from the finance department, medical management, team, ID department, clinical microbiology lab, house staff, and AST team, the meeting would become a heated discussion about what direction the program should take. If the meeting went as most of them had in recent years, team members, lacking a shared vision of where to go with the program, would look to Bartlett for guidance. What would he say?

As he contemplated the sea of information before him, a picture caught the corner of his eye. It had been taken on one of the inpatient units just after he began his tenure at the medical center. Bartlett's mind rapidly shifted gears. What about the patients? They were, after all, the number-one priority of the medical center. Was the AUP benefiting them in any way? Could an improvement in outcomes be measured? If the residents either ignored the "swaT" orders or antimicrobial medications were abruptly stopped, would there be adverse effects for patients? Did changing the antimicrobial treatment plan have negative effects on the continuity of care? Was the hospital treating patients fairly with this plan? If the program did save money for the hospital, would that money find its way back to the patients?

After a few minutes of thought, he jotted down four options on a legal pad. At the top he wrote a note to himself: Assumption—Something must be done to control the inappropriate use and excess cost of antibiotic prescribing practices at the University of Central State Medical Center. Patient outcomes are the first priority.

- *First option*. Continue the program in its current state until some future date, after which more physicians would become accustomed to it and more data could be collected. This is undoubtedly the easiest option to pursue and would require no change from the current program infrastructure.
- *Second option*. It could be decided that, although the AUP was on target with its goals, the program needed to be reworked in order to take into account the increasing concerns of all affected by it. This option might require disbanding the current AUP and appointing a new, multidisciplinary team.
- *Third option*. Abandon the AUP in favor of a new, wholly different approach to addressing the antimicrobial utilization problem. Is there an information technology solution out there? Would automating the process make it more acceptable to the

house staff? Would the direct and indirect costs of a new system be worth the benefits, and would the benefits be measurable?
- *Fourth option*. Eliminate the AUP altogether. The medical management team could choose to target its efforts elsewhere, such as medical cost or medical student training.

The phone rang. Bartlett put his fingers on the receiver, closed the file, picked up his keys, and walked out of the office.

Analysis

Overview

The University of Central State Medical Center is a tertiary care facility located in the heart of central Virginia. As with similar institutions across the nation, its operating costs have risen exponentially over the past half-century. Its budget is often overrun with expenditures, particularly for the purchase of medical supplies and pharmaceuticals. There has been a call for increased cost scrutiny, and less-than-ideal prescribing practices have made pharmaceuticals the primary target.

The AUP was first implemented in May 1998 with the goals of decreasing costs to the medical center, preventing adverse complications and outcomes among overly or improperly medicated patients, and minimizing community resistance to the drugs. The AUP charged the AST with the daunting task of monitoring prescribing practices of the inpatient medical and surgical units at the medical center. The AST's labor-intensive, direct, and perhaps confrontational attempts have received a broad array of unanticipated responses from several of those affected by the program.

The case outlines the problems with antibiotic usage, the AUP's efforts to reconcile them, and several of the issues that have arisen in the first year of the program. In analyzing these issues, it is important to consider several questions:

- What need was the program intended to address? What were the goals?
- Who are the stakeholders? What role do they play?
- Were the implementation and structural framework effective? Have the goals of the program been reached? What are the benefits thus far? The barriers?

The Program

Before any conclusions can be drawn as to the merits of continuing the program, and in what format, a comprehensive understanding of the underlying issues in the AUP's first year is essential. What need was the program intended to address? What were the goals? At the outset, it appears that cost was the underlying force. The case clearly establishes the financial problems that the University of Central State Medical Center is currently encountering in adhering to its budgetary constraints. Although there were several potential target areas for cost-cutting measures, antibiotic utilization was chosen. It has been observed that "most organizational decisions are made at the emotional level, and logic is subsequently used to justify or rationalize them." The specific reasoning behind "Why antibiotics?" is unclear, although the expenditure data provided in the case lends a rationale to the decision.

The decision to limit the scope of the current effort to antibiotics incurred much debate. Some argued that a more comprehensive approach toward a cost-effective practice would be preferable. After all, if the same issues are prevalent in more than

one area, the solution may be overlapping. However, the AUP's decision to focus its efforts on one area was perhaps optimal. A program of this size and scope would be easier to manage than a larger, more expansive endeavor.

It is also important to consider the individual and global issues at stake in regard to antimicrobial utilization. While improving patient outcomes was also considered a goal, there were no concrete plans as to how to achieve this abstract ideal. Additionally, there is a growing problem of antibiotic resistance, and medical centers across the country are undertaking similar efforts to stem overuse. It is considered a "hot topic" among clinicians and researchers, and there have been initiatives to educate the medical community.

"Communication of intended strategy leads to realized strategy." The key piece missing at the onset was communication of the intent and goals of the program. It is still unclear; the administration has done little to publicize its justifications for the program. In a memo to the University of Central State Health System faculty and staff, it did little more than announce implementation of the AUP.

The memo (Exhibit 15.1) called for collaboration, but it did not explain the purpose of the program. The administration and the ID department did not clearly convey their goals to the key players in this process. There was no real shared vision, an essential prerequisite to effective change. To some the AUP is a cost-driven effort, while to others it is about improving patient outcomes.

Who Are the Stakeholders in the Process? What Role Do They Play?

Both attending physicians and house staff are clearly affected by the program. Efforts to curb prescribing practices must be aimed at those writing prescriptions and requesting orders. However, the case clearly delineates the concerns of the ID department, the medical management team, the pharmacy, the clinical microbiology laboratory, and the financial arm of the institution.

To date, these people have all played key roles in the implementation of, and reaction to, the AUP. Which of them has been at the forefront? Which has reluctantly taken the spotlight? The case argues that the ID department and the administration spearheaded the program, while the attending physicians and house staff were compelled to participate. Is this an ideal structure? Meanwhile, the pharmacy has taken a back seat to the ID division.

Who Is the True Leader? Whom Should It Be?

The house staff, who are responsible for all patient prescribing orders, are not targeted by the AUP. Their role has been consistently ignored throughout the program. The program fails to target the prescribing practices of the residents, who may be responsible for a substantial share of patient care. Omission of the house staff in designing the program creates tension between the attending physicians and the AST because an attending physician may not be directly responsible for an inappropriate prescription(s).

The case concludes by citing that patients are the first priority. They clearly have a stake in the process, but what exactly should their role be? As an inpatient, one's condition can undoubtedly improve or worsen because of the use, misuse, or lack of needed antibiotics. However, as a member of the community, the patient is indirectly affected by increased antibiotic use through rising healthcare costs and the spread of antibiotic-resistant organisms.

Like other hospitals nationwide, the University of Central State Health System has many and varied stakeholders. These include the administration, physicians, and patients but also the public, state government, vendors, staff, and payers.

Implementation and Structural Framework

One could argue that the program was set up for failure. There was no single champion or shared vision. The implementation and program structure lacked comprehensive forethought. As the program becomes established, acceptance may grow.

Despite the evidence, people resist the need to change. If leadership is strong and good processes are put into place, short-term positive results begin to emerge. Then, a repeating, iterative consolidation of the new way into a habitual way of doing things establishes a new baseline.

Was the Implementation Effective?

The decision to implement the AUP came from the top levels of the medical center, under the auspices of the medical management team and the ID department. One of the basic tenets of effective change management involves seeking active participation from all facets of those affected by the change. In this situation, no input was gathered from the attending physicians, the residents, the house staff, or the pharmacists. All are subject to the AUP but had little say in its structure.

Are the Program Structure and Support Optimal?

As is, the program is designed to target inpatients receiving antimicrobial therapy. Although this is understandably important and feasible, a valuable addition may be an effort to preassess a patient's need for antibiotics on admission. In doing so, the program could longitudinally monitor patients and more directly observe its effects on patient outcomes.

Staff Support

One particularly pervasive problem has been the lack of analytical support lent to the program. Currently one pharmacist does virtually all the data entry, while one analyst massages the data and reports from it. There is also insufficient clerical support to assist in managing the onslaught of paperwork.

Communication Medium

With regard to the process by which the AUP is run, there has been a strong negative reaction to the "sticker" approach. Many of those interviewed see the stickers, an extension of the AST, as a loud confrontation to their autonomous decision making. The AUP is reactive rather than proactive. Finally, the ID rounding member of the AST changes each week. This provides little chance for consistency in prescribing practices and thus creates little respect for the ID department. No standards have been set for reviewing the charts, and the implications of this have become apparent.

Have the goals of the program been reached? What are the benefits and barriers? There were no clearly defined goals or measurement tools established to ascertain progress. The abstract, broad goals were not presented to the University of Central State Health System faculty and staff required to participate in the AUP.

According to the AUP director, the short-term goal of the program was to "change the culture" within the institution. Recent data shows that the percentage of physicians following the AST's recommendations is increasing and that discrepancies between the medicine and surgery departments are decreasing. However, there is no simple measure of the exact culture in an organization. Without any starting data or benchmarking tools, there is no way to gauge what the percentages mean, how accurate they are, or even if they have had any effect on reducing costs or improving quality of care. The data regarding any reduction in costs, length of stay, or adverse outcomes for patients has not been made available at this time. There are, however, other indexes of the potential achievements of the AUP. Preliminary data suggests that (1) AST rounding time has decreased, (2) attending physicians concur with recommendations more often, (3) duplicate therapies are less prevalent, (4) doses are being decreased to more appropriate levels, and (5) there are fewer patients on three or more antibiotics. While there may be no figures to compare these with, the trend is heading in the right direction.

Reception among physicians in the Department of Medicine has been promising. The attending physicians have demonstrated a willingness to try to improve their practices, while the residents have shown esteem for the AST and for the learning process required of them. Most recognize the need to decrease inappropriate or excessive prescriptions. To quote one physician, "Most of us, if you internalize the need to do this, would welcome another opinion—if it's not stuffed down your throat."

The Future

The first year of the AUP has shown both promise and pitfalls. The case mentions four alternatives with respect to the future of the program: do nothing, rework the AUP, abandon the AUP but target antibiotics, or abolish antimicrobial utilization efforts altogether.

The first option—doing nothing—is undesirable. Maintaining the program as is, without addressing all its problems, is prescribing failure. Reworking the AUP is perhaps the most desirable pathway to pursue. Most agree that there is a problem with antibiotic prescribing practices, and many feel that something should be done to fix them. Much has been learned during this first year, and this information should be put to good use. Many of the shortcomings are apparent, and addressing them now could provide even greater success in the future. Abandoning the program is not a likely option. Everyone interviewed for the case was motivated to make an impact on the program and see its progression, albeit with several modifications. The principle of the program already has enormous support.

Targeting efforts toward other resources may be ideal, and it may be a valuable supplement some day. The lessons learned from the AUP will be invaluable in attacking other resource problem areas. Its issues are exemplary of many of the issues encountered in implementing change.

Information Technology

The AUP director is very hopeful that new clinical information systems that the University of Central State Medical Center is about to purchase will solve many of his procedural and statistical issues. A clinical information system could aid in addressing the problem preemptively.

Summary

The architects of the AUP tried to create a uniform standard with a nonuniform approach. The AUP started off "on the wrong foot," but after one year, the program is gaining acceptance. Despite all the questionable decisions concerning the design and implementation of the program, data suggests that there is a trend toward better patient care. If planned carefully, any program alterations could provide a promising future for the problems of antimicrobial utilization at the University of Central State Medical Center. The potential for success is enormous.

Exhibit 15.1. Summary of the Antimicrobial Surveillance Team: Costs, LOS, Mortality Rate—A Memo.

To: University of Central State Health System Faculty and Staff
From: Thomas A. O'Malley. M.D., Ph.D., Chief of Staff
W. Michael Shultz, M.D:, Professor, Department of Internal Medicine, Division of Infectious Diseases
Leigh G. Dell, M.D., Professor, Department of Pediatrics
Date: 02/15/99

Re: Antimicrobial Utilization Program

On Monday, May 18, 1999, the University of Central State Health System Antimicrobial Utilization Program will begin. Under the direction of the antimicrobial utilization subcommittee of the pharmacy and therapeutics committee, the program will involve an ongoing review of a select group of inpatients receiving any of a target group of high-risk, high-cost antimicrobials and those receiving three or more antimicrobials concurrently. Separate adult and pediatric antimicrobial surveillance teams (ASTs) will use the hospital's computerized information system to determine which patients will be screened. An AST consisting of an infectious disease physician and a clinical pharmacy specialist will round daily Monday through Friday and provide written recommendations in the progress notes. After hours and on weekends, the assigned AST physicians will be on call for phone consultation.

Ordering of category A agents (except continuation of antiretroviral therapy) will require prior approval by the physician on the appropriate adult or pediatric AST. Targeted category A agents may be ordered but will be placed on automatic stop order at 72 hours unless prior approval is obtained. The remaining category A agents and all category C agents will be unrestricted. The AST on-call physicians will be available 24 hours daily for consultation and to approve antimicrobial orders. Inpatient order entry computer screens are being updated to provide guidance on ordering and instructions for reaching the AST contacts. Policies relating to drug stop orders are being developed to ensure against inadvertent discontinuation of appropriate therapy.

Collaboration among physicians, pharmacists, and nursing staff will be essential to ensure that appropriate antimicrobial therapy continues without interruption and until review by the physician of record and the AST can be accomplished. Working together, we can succeed in meeting the program's objectives of improved patient clinical outcomes, reduced microbial resistance, and more cost-effective prescribing.

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Central Medical Healthcare System: The Case of the Well-Aggregated Patient Data

Laura Larsson, Michael Lieberman, and Kelly J. Bradway

Background of Central Medical Healthcare System

Central Medical Healthcare System (CMHS) is the region's historically premier healthcare delivery system. It is comprised of a broad network of primary care physicians, specialists, outpatient centers, and hospitals. It is a recognized leader in health care, research, and education. Its mission statement reads that it is "committed to the care and improvement of human life" and "the provision of high-quality, cost-effective, and state-of-the-art medical services in a compassionate, caring manner responsive to the needs of the community." Additionally, it has incorporated the following values:

- Treat each other, our patients, and our partners with respect and dignity.
- Achieve standards of excellence that will become the benchmark of industry practices.
- Act with absolute honesty, integrity, and fairness in the way we conduct our business and the way we live our lives and perform at all times to the highest ethical standards.
- Achieve a competitive return for our investors.

The system's core business is owning and operating specialty hospitals, outpatient surgery centers, home health agencies, rehabilitation hospitals, psychiatric hospitals, and long-term care facilities in the Midwest. It provides comprehensive inpatient and outpatient services to a vast geographical area.

CMHS is headquartered in Nashville, TN, and employs about 80,000 staff. Through its outpatient clinics, it employs one third of its physicians, with the other two thirds being community physicians with inpatient admitting privileges. Managed care has been widely adopted in the region and has put quite a strain on CMHS's finances. Because of the fierce competition in the region, it has had to aggressively compete for managed care contracts. Revenue has decreased, while medical costs, especially pharmaceutical costs, have continued to rise. In order to maintain its leading position, CMHS needs to find new sources of revenue.

CMHS Information and Data Environment

The CMHS information technology (IT) division captures and stores individual patient medical records from about 550,000 customers in its various databases. These records contain sensitive health data as well as demographic information such as phone

numbers, social security numbers, employment information, birth dates, diagnosis codes, encounter notes, and financial and insurance information. The IT division staff is well versed in data warehousing and data management. They provide data for most healthcare management needs and regularly produce management reports used to monitor utilization and cost patterns by delivery site, as well as generate member demographics such as contracting provider entity, employer group, and other carrier-designated variables.

CMHS instituted an electronic medical record (EMR) in its outpatient clinics 5 years ago, and after some initial missteps, it has been well received by the physicians and administrators. Community physicians (not employed by CMHS) use the inpatient system but currently do not use the outpatient EMR in their practices. The chief executive officer (CEO), Marcus Orell, is a charismatic leader who sincerely believes that the EMR will help save lives by providing necessary patient information in a timely manner. His vision percolates throughout the organization and influences most decisions.

Decision Making in CMHS

When an important issue arises, it is directed to the appropriate individual who either researches the topic himself or has a colleague collect information. He then brings it up before one of three steering committees. Each committee is a cross-functional group made up of approximately ten people with representation from three groups: clinical (physicians and other clinical personnel), business/financial, and the healthcare privacy officer, Lynn Schneider. Each member of the steering committee keeps external perceptions of CMHS by consumer groups in mind. One of Schneider's roles is to help identify where she believes consumer groups will have the most concerns. As in other large organizations, each issue has its own champion—usually the individual who brings it to the steering committee. At least one of the members acts as a "devil's advocate" to stimulate discussion of all related issues.

The interplay among these two individuals and the steering committee members helps to identify critical issues so that there are few surprises later. Ultimately, the head of the steering committee, usually a vice president (VP), makes the final decision on the issue, though an attempt at consensus is usually made. As a matter of form, the VP runs the decision past the CEO for final approval. The legal department always clears the idea before any action is taken.

The Problem

UA Pharmaceutical, Inc., is a megalithic, multinational pharmaceutical company desiring to increase its share of the highly profitable antihypertensive market. UA Pharmaceutical has approached Dr. F. Haustus, director of data commercialization, about implementing a disease management program at CMHS. The program would be implemented through the EMR to alert physicians when hypertensive patients are not being managed according to established clinical guidelines. Schneider is very enthusiastic about the program, as it could lead to improved care for CMHS patients. In order to offset the cost to CMHS of implementing this system, UA Pharmaceutical would like to pay a fee that would more than compensate the healthcare system for this cost. In return, UA Pharmaceutical wants to show that the disease management program

improves patient care. Therefore, they want data from before and after implementation to show that the intervention was effective.

UA Pharmaceutical is asking only for scrubbed, aggregated data, not access to patients' personal medical records. Scrubbed, aggregated data is data that has been "cleaned up" to remove duplicate records and personal identifiers and combined in a way that eliminates the ability to identify individuals. Haustus realizes that access to scrubbed, aggregated data is the critical issue.

UA Pharmaceutical needs the data for its researchers and marketers who have been asking for outcomes data to support internal research that can lead to more effective marketing. CMHS needs the income that could be generated from this new venture and the support it could provide to the IT division.

After discussing the issue with some of the stakeholders, several concerns are identified. Answers to the following questions are needed: Just how far does CMHS wish to go with patient confidentiality? Can scrubbed or aggregated data be resold to employers, pharmaceutical firms, companies, or foundations? Are there ethical or business concerns that might affect or limit the distribution of this data? What are the business partner's responsibilities to protect the data?

Before meeting with the appropriate steering committee, Haustus laid out some of the costs and benefits to various internal and external stakeholders as follows.

- *IT Division/Department*. They are happy to have someone making use of the data. They know the IT division will have to support implementation of the disease management program.
- *Physicians*. They are concerned about this invasion of patient privacy and are worried about the confidentiality of the medical records. They understand that aggregated data can be used to assess how well physicians are following standard care guidelines. They see the potential for collecting useful outcomes data but are concerned that they will be penalized if they stray from care guidelines.
- *Business/Planning staff*. They are enthusiastic about potential new revenue. They see the potential for collecting useful outcomes data that can be used to evaluate physicians on their performance. They believe that a disease management system will improve public relations.
- *Patient and consumer advocates*. They feel that patients should be informed even if no personal data is being given out. They are concerned that UA Pharmaceutical will somehow find out about patients' conditions and will send out health promotional materials and personalized pharmaceuticals based on the patients' medical needs. They believe patients should be given the opportunity to say "no" to having their data included in this project upfront. They are concerned that an individual's medical record may become a marketing tool. They are also worried that aggregated, de-identified data may lead to a greater chance of medical record abuse and of causing real damage to people. They believe that opening up patient records is unethical and may be unrestrained. They are concerned that employers may misuse healthcare data.

Questions

1. Based on these concerns, should Haustus champion this program?
2. Is the risk (no matter how small) of potential loss of trust, negative publicity, or loss of reputation worth the potential benefit UA Pharmaceutical can offer?

3. As the potential for innovative, nontraditional relationships between medical centers and for-profit entities grows, how can these relationships be effectively evaluated and managed?

Analysis

After considering all sides of the opportunity, Haustus decides to champion the program under the following conditions:

- *First*, they will accept only enough funding to develop the disease management software program, implement it, and provide training to their employees, so as not to be seen as merely selling data.
- *Second*, CMHS will set up a disease management program data committee that will include a physician, the CMHS privacy officer, a consumer advocate, and a representative from UA Pharmaceuticals. The committee will be charged with determining what data will be made available to UA Pharmaceuticals and how privacy and confidentiality will be maintained.

The money will be used to fund development of the software through the IT division. By developing the software internally, several of the IT division employees will be supported for several years as they work on the program. CMHS will get a software program developed to meet its disease management needs as well as a management tool to evaluate its physicians. In addition, if UA Pharmaceuticals chooses to license the software for use in other healthcare settings, the licensing fee will be a healthy revenue stream for CMHS for several years.

With this solution, CMHS can develop a new revenue stream without being seen as merely selling data. UA Pharmaceuticals will gain access to some aggregated data. Additionally, if one assumes that because of this program more patients are treated with antihypertensives, its revenue will increase. By including physicians and consumer advocates on the data committee, CMHS can avoid negative publicity and resistance to this program.

Although Haustus feels this is the best course to follow and will likely be successful, he realizes that there could be problems. UA Pharmaceuticals may not feel that there is enough of a benefit to them with this scenario and may reject it. Additionally, it might be difficult to form a workable disease management program data committee. It will be essential to choose members who are flexible enough to work toward an acceptable solution for all while still maintaining their core convictions. Finally, even with the committee, the CMHS image could still be tarnished if the program is seen as merely a clever way of selling data to UA Pharmaceuticals.

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Building Consensus: Quality Improvement at Vesalius Health System

Sarah Corley, Steven Cohen, Jeffrey Gilbert, Cora Lam, and Benjamin LeBlanc

Vesalius Health Systems (VHS) is a large, integrated nonprofit healthcare system based in Baltimore, MD, with branches throughout four states in the Northeast as well as the District of Columbia. Medical care is provided by a combination of employed physicians, affiliated physicians, and physicians in training, or by medical residents under three distinct entities—the Vesalius Medical Group (VMG), the Vesalius Service Division (VSD), and the Medical Education Group (Med Ed). VMG provides care to private insured patients in a fee-for-service environment and has a positive bottom line. VSD provides care to the poor and uninsured in clinics funded by the organization as part of its mission to serve the community and does not generate income for VHS. The Med Ed Group is made up of several internal medicine and family practice residency programs in several hospitals and is designed to be cost-neutral.

Affiliated hospitals and VMG have seen a decline in revenue over the past 3 years, creating conflicts over allocation of resources. For instance, Med Ed Group has become an increasing financial drain on VHS as federal subsidies for medical education have decreased over the past decade. In addition, physician salaries at VMG are based on productivity and decrease with an increase in expenses. This has led to an increased sensitivity among VMG physicians about any new expenses.

In this fiscal environment, VHS has spent $7 million in the past 4 years to establish Limited Medical Systems electronic medical record (EMR). It is used in all the VMG, VSD, and Med Ed clinics. As a consequence of this implementation, an informal Limited Medical Systems users group (LUG) has evolved over time. This group is comprised of interested members of VMG, VSD, and Med Ed, nursing staff, office managers, and corporate IT staff. In addition, Dr. Brett Lawler, the newly appointed chief medical information officer (CMIO), has been attending the meetings since he joined the organization 3 months ago. Part of Dr. Lawler's interest stems from a mandate to show a positive return on investment (ROI) for the $7 million cost of the Limited Medical System EMR.

Diabetes Disease Management

Six months ago, Vesalius Health Plan (VHP), the insurance arm of the organization, which covers 40 percent of the privately insured population in Baltimore, announced a new program to pay doctors incentives to improve the quality of care provided to diabetic patients. Primary care physicians who met certain clinical goals would receive a 10 percent increase in their monthly capitation rate. (A capitated rate

represents a fixed amount a physician is compensated for in caring for a particular type of patient. Capitation is intended to reduce costs by putting the physician at financial risk for caring for a group of patients classified by a diagnosis or condition, such as diabetes.)

Three months ago, a chart audit of the diabetic patients seen at the Baltimore VSD clinic showed poor performance in achieving standard clinical goals set for treating such patients. Performance on a number of outcome measures for diabetic patients was well below national target goals. As a result of this chart audit, the VSD director, Jess Lockhart, worked with the newly developed internal information technology (IT) and VHP staff on a plan to improve the quality of care provided to these patients.

After considerable research on the subject, Lockhart's team developed a comprehensive diabetes management program that utilized a third-party diabetes management module for the Limited Medical Systems EMR system. Seeking to help defray the cost of this software module, VSD decided to look for partners across the VHS organization. At a recent LUG meeting, attended by Dr. Lawler and key members of the other VHS ambulatory care divisions, Lockhart outlined the VSD plan and proposed the partnership idea.

While his presentation was well received by some, others rejected the proposal. Dr. Banting, the VMG medical director made a surprise counterproposal, announcing that VMG's IT department had already begun internal development of a diabetes registry and other related add-ons (forms, alerts, etc.) for Limited Medical Systems. He suggested that with added financial support from the other divisions and/or the corporate office, they could expand their effort. Other voices of dissent came from Med Ed and the corporate-level disease management group, who were both noticeably upset because they had not been consulted in the development of either plan.

Witnessing this clear lack of coordination among the various VHS groups interested in diabetes management, Dr. Lawler recognized a problem that would require his attention. In fact, it might be his first true test as the new CMIO at VHS. Here was an opportunity to enhance the ROI of the Limited Medical Systems EMR implementation. Enhancing the existing EMR to support the new diabetes disease management program could generate new revenue. How could a strategy be developed that would work for all stakeholders?

Vesalius Corporate IT Division

The information system infrastructure at VHS is based on a predominantly decentralized model, with each clinical division retaining the responsibility for managing its own systems operations. Hardware and software support, as well as policy administration, are handled at the local level. In contrast, the corporate information technology division (CITD) focuses on the IT needs of the health system as a whole. Among other roles, CITD supports the systemwide network architecture, provides Web services, and coordinates the implementation of core clinical and administrative applications.

Under the direction of Allen Shmitt, chief information officer (CIO) for more than a decade, CITD established VHS as a relative leader in healthcare IT. Shmitt was largely responsible for selection and implementation of the Limited Medical System EMR in each of the clinical divisions. At that time, in the mid-1990s, successful ambulatory EMR implementations were still relatively uncommon. With the support of senior management, CITD was able to provide substantial assistance to the VMG, VSD, and Med Ed clinics during the Limited Medical Systems rollout. Considerable CITD

staff time was devoted to developing custom templates, clinical reminders/alerts, and form letters for each of the divisions.

Unfortunately, the significant commitment of CITD resources to the local Limited Medical Systems implementation efforts was not long-lived. With a shrinking budget due to reductions in systemwide reimbursement levels, CITD was forced to push all EMR customization projects back to the local divisions. Large systemwide IT initiatives related to year 2000 (Y2K) and Health Insurance Portability and Accountability Act (HIPAA) compliance have absorbed much of CITD's attention in recent years. Consequently, there has been a growing feeling among divisional IT departments and provider groups that CITD has become "disconnected" from their clinical systems environment.

Recognizing the need for improving the deteriorating relationship between CITD and the clinical divisions, Shmitt developed a new senior-level CMIO position to focus on the impact of clinical information systems across the health system. Before approving this new position, the VHS chief executive officer (CEO) and chief financial officer (CFO) elicited a promise that the organization would show a positive ROI for the $7 million cost of the Limited Medical Systems EMR. Three months ago, Dr. Brett Lawler was hired as the new CMIO. His initial mission was to learn as much as possible about the clinical end user environment. The informal LUG seemed to provide an excellent opportunity for accomplishing this goal.

VHS Disease Management Group

The corporate services division of VHS included a quality improvement division that coordinated quality improvement projects throughout the organization. This division was headed by Pamela Harrier, R.N., M.S.N., M.P.H., who had more than 25 years of experience in the healthcare field starting with her days as a staff nurse.

Ms. Harrier was startled and offended to find out that VMG had been working independently to create a diabetes registry without her knowledge. She felt that any quality improvement projects should be coordinated through her corporate office. She wanted to play a key role in determining what type of physician intervention should be started and what informatics tools should be used. Ms. Harrier wondered how much of an additional outlay of resources would be needed to enhance the current EMR to support the new diabetes disease management program.

The VMG

VMG is the largest of the three medical divisions of VHS. This group is responsible for the only profitable outpatient medical clinic in the system. There are ten clinics with more than seventy providers. All the patients seen in this clinic have commercial insurance or Medicare. Dr. Fred Banting, the medical director for VMG has been with the organization for 11 years. VMG physicians take great pride in their solvency and feel they provide superb care for their patients.

After hearing that VHP was providing "quality bonuses" for improved diabetes care, they decided to pursue these additional funds. With an EMR already in place, they felt they had the means to track a lot of information electronically. Unfortunately, the software did not provide an easy way to track the parameters that VHP was rewarding.

The division has its own superb IT department. The IT director thought that he could create a disease registry that would meet the needs of the VMG physicians. He and his department have made rapid progress in developing a series of forms, alerts, and letters in addition to the registry. He would like additional funding to buy more equipment and hire more staff to complete the project.

Dr. Banting's group felt that a system built to their specifications would be superior to purchasing a product. They did not have a great deal of respect for the ideas from VSD, as they saw them as providing inferior health care. This view was reinforced after they saw the results of the recent diabetes chart audit at VSD. In addition, they did not trust the judgment of the VSD IT department, as it has only a few low-level network engineers. They are concerned that the VSD IT group is only trying to reduce their workload by purchasing a vendor system rather than building one.

The VSD

VSD, headed by director Lockhart, is made up of eight community clinics in underserved areas and a small IT team. Its mission is to provide accessible medical services and to promote health awareness among residents who otherwise would not be able to afford adequate healthcare services. Since VSD is a nonprofit division, its financial livelihood depends greatly on support from VHS.

In addition to working longer hours to meet ever-increasing demands for services, the VSD has also been working on a project to improve the quality of care for diabetic patients in response to the recent chart audit. After a thorough investigation, Mr. Lockhart and his team believe that purchasing an off-the-shelf disease management system is the best solution because the VSD IT team does not have the resources to develop and maintain a "home-grown" system. After seeing a demonstration of a vendor module that can be integrated with the existing EMR, they are eager to get started implementing a solution.

From the recent LUG meetings, Mr. Lockhart learned that the VMG has been implementing an in-house solution to meet the VHP diabetes guidelines. He is concerned that Dr. Brett Lawler, the CMIO for VHS, may decide to standardize the organization with VMG's solution. As Mr. Lockhart's IT manager Steve Gates put it, "VMG's IT people would bully us into implementing a monstrous system that would completely crush us. We just don't have the time, equipment, or bandwidth to support this." Nurse Manager Teresa Nightingale agreed, "Being forced to work with a system that is not compatible with our current equipment could cause a disastrous disruption to work flow in the clinic." The clinic is already under strain with the recent increase in the numbers of patients seeking services, and it hardly has enough resources to meet the current demand. There is concern that the quality of healthcare services would suffer further with any such disruption.

The Med Ed Group

VHS has long been dedicated to medical education. By creating high-quality training centers in the Baltimore region, the system has been able to further its mission in several ways. The Med Ed programs graduate a steady stream of well-trained physicians who tend to stay and practice in the community. The graduates usually remain affiliated with VHS facilities, thereby increasing market share. The presence of train-

ing programs at local hospitals also enhances the hospitals' esteem and allows them to compete with the nearby university medical center. Over the years, VHS has taken advantage of these benefits and has developed training programs at the three largest local hospitals.

Dr. Ed Hauk is the chair of internal medicine and program director for the largest VHS internal medicine training program; he also holds the title of director of medical education. The Med Ed programs at the three local area hospitals function autonomously. Given the nature of their Medicare funding, each of the programs is actually sponsored by an individual hospital and reports to each hospital administration. There is no integration of program development, recruitment, or operations, and there is only a nominal presence for Med Ed at the VHS executive level.

The Med Ed clinics do not have their own IT support. They are dependent on the VHS corporate IT department's small ambulatory services division, which always has more work than it can handle. The ambulatory services division sees the Med Ed clinics as one of many customers whose needs have to be met.

Any requests for additional resources to develop an internal IT department have been rejected by the hospital administrators who feel that they spend quite enough money on hospital IT already and don't want to spend more to support an ambulatory system. This has led to the Med Ed clinics trailing VSD and VMG in the formal development and analysis of improvements to clinical care using Limited Medical Systems. Fortunately, the Med Ed clinics have several early adopters and physician champions who individually have worked to develop improvements to Limited Medical Systems. In addition, several of these physicians have had the time and motivation to develop the informal LUG.

The Med Ed clinics were excited to hear about the VSD initiative to improve diabetes care with an off-the-shelf solution, but they had concerns that the system might not address the unique problems of a residency training clinic. In particular, they wondered about the possibility of research funding and scholarly work that might come from a study of the disease management program. The VMG IT's internal development of a diabetes disease registry announced at the recent LUG meeting raised fears that the residents would be excluded from the decision-making process. At best, they might be allowed access to the VMG diabetes management solution; at worst, they feared they would be prohibited from using the new system explicitly, or because it might not support the work flow of a resident-based clinic. In addition, they needed time to plan and perform a preimplementation study if they expected to have a grant proposal funded.

LUG

Responding to the reduction in CITD involvement in ongoing Limited Medical Systems support and development, several forward-thinking tech-savvy physicians from the Med Ed clinics organized an ad hoc LUG to discuss IT-related issues. With broad-based, active participation that included interested clinicians, office managers, and IT staff from each of the three clinical groups, the monthly LUG meetings usually offered practical information sessions that focused on issues related to the day-to-day use of Limited Medical Systems or specific local enhancement initiatives. It was in the context of a recent LUG meeting that the initial discussion of alternative approaches to the diabetes disease management issue arose.

The Meeting

As the LUG meeting began, Jess Lockhart, the VSD director, presented his suggestion for an ambitious program to improve the quality of care for diabetic patients. His research had shown that home grown systems take a long time to reach maturity and often cost large sums of money. His department was under constant pressure to hold down costs, and he argued that purchasing an off-the-shelf system would better serve the intended goals. This would require the purchase of additional third-party software from Clinical Content Consultants (CCC) at a cost of nearly $300,000. This software was already integrated with Limited Medical Systems, thus reducing the need for additional development. There would however, be an annual license renewal fee of $60,000.

After a number of positive comments from other attendees at the meeting, Dr. Fred Banting, the medical director for VMG, said that his physicians had no interest in pursuing such a program. According to him, the VMG internal IT team, dedicated solely to VMG, has been working on a series of new forms, alerts, and letters to patients in addition to a diabetic registry, which should increase compliance with the VHP criteria. He felt that his group would perform fairly well on the VHP guidelines because of this work. They would like VHS and/or the corporate IT division to invest money in funding further expansion of these features.

Dr. Ed Hauk, the chair of internal medicine, voiced his concern that the Med Ed clinics had no funding for quality improvement projects of this nature and no independent IT department of their own. He also expressed their concern that they would be excluded from the decision-making process because of their lack of resources. Dr. Hauk also spoke of the residents' desire to study the issue further so that they might pursue grant funding for rolling out a diabetes disease management solution in the Med Ed clinics, as well as their concern that any system solution also support resident education.

Ms. Harrier, director of the VHS disease management group (DMG) who did not normally attend LUG meetings, came to this one to find out details of what had only been rumored to be occurring. She voiced her belief that any disease management initiative should be run through the DMG office in order to ensure corporate support. She declined to support immediate purchase of the CCC software without a careful review.

The Dilemma

As Dr. Lawler reflects on this LUG meeting, he is struck by the inefficiencies present in the current situation with the duplicative diabetes management efforts across the VHS organization. A common, coordinated approach would make the most sense; however, reconciling the disparate groups and approaches will prove difficult in an organization that seems to lack cohesiveness. Dr. Lawler is also keenly aware that his CMIO position is new to the organization. Consequently, he feels a strong need to prove its value to the senior management at VHS. How should he proceed?

Questions

1. How can Dr. Lawler justify the $7 million spent over the past 4 years for the outpatient EMR implementation?

2. What parameters should he measure to assess its impact?
3. What data collected prior to implementation would you want for an analysis?

Analysis

Main Issues

As Dr. Lawler contemplates his next move, a large number of factors come into play. A brief discussion of the more significant factors follows.

Weak IT Governance Structure

- There is no central IT chain of command to set policy for all the IT groups and centrally determine funding priorities and asset allocation.
- LUG has no formal authority to mandate changes. There has been no mandate from the executive level for the LUG to promote standardization and shared decision making.
- The user group (LUG) is not organized in such a fashion as to speak with one authoritative voice to the organization and to the vendor.
- The VMG IT department has developed largely independently of any input from any other physician groups or the corporate IT department.
- There is a lack of trust among IT departments.

Fragmented Organizational Culture

- There is a fragmented organizational culture at VHS. The focus is on individual performance and advancement and competition among the divisions. There is virtually no identification with the larger VHS organization. Collaboration is difficult in this environment.
- There is a relative lack of respect among physician groups. One group fails to see the necessity for involving other divisions, while some are afraid of losing a voice in the decision-making process.
- There is no real cooperation or communication among the units.
- The different divisions have differing levels of influence on corporate governance.
- The Med Ed clinics are particularly fragmented, having neither one leader, an IT department, or a central administration.
- Individual ambitions are at play in evaluating options that may be in their personal best interests but not in those of the organization.

Different Core Missions Among Physician Groups

- There is a different core mission for each of the physician groups. These core missions are at odds with each other in some ways.
- The health system does not support each mission equally, which is at odds with their purported mission.
- There is a discrepancy between short-term goals (making more money) and long-term goals (developing a sustainable quality improvement model).

Disparity in Resources Among Physician Groups

- There is a large disparity in resources among the divisions. Only VMG has the current funding to support a new disease management software endeavor.

- The different divisions have different funding and salary structures.
- The changing economic climate has strained all the divisions equally but in different ways.
- The Med Ed request has no local IT resources or money to hire them.
- The relative financial importance of VMG gives it leverage over the health system.

Duplicative Diabetes Management Efforts Using Different Approaches

- Both VMG and VSD have moved independently toward the implementation of diabetes management software solutions of their own with similar, albeit not identical, goals. The overlap in effort is significant and unnecessarily wasteful.
- No one has clarified the organizational reasons to pursue diabetic care improvements. (Increased revenue? Improving the quality of care for the diabetic population? Providing positive public perceptions?)
- No one has decided which diabetic quality improvement activities should be pursued first and what the final criteria should be.
- The central quality improvement department has developed processes, but they have not been integrated into all the divisions.
- No one has done a systemwide organizational needs analysis regarding what software enhancements are needed, and no request for proposal (RFP) has been created to allow for a fair evaluation of all solutions.
- Each division has a different approach to software improvements, one wanting to develop a customized system, one wanting an off-the-shelf system, and one mostly interested in which system will better enable research.
- VMG is concerned that changes to their plan will slow down the development cycle.
- The Med Ed group prefers a slower development cycle so that all options can be evaluated.
- Each medical division has a different work flow, and there may be difficulty in finding a universal solution.

Other Issues

- Implementation of a diabetes management program may affect access and income by changing the patient mix.
- It is unclear if VHS will obtain significant savings due to improvements in the care of diabetic patients.
- The health system purchased an expensive EMR and then ceased to appropriately fund support so that optimal use could be made of the system.
- There is time pressure to show a positive ROI for Limited Medical Systems.
- The corporate IT division has withdrawn central support for EMR improvements because of fiscal constraints.

Alternative Solutions

Option 1: Status Quo—Allow Each Division to Pursue Its Own Solution

Dr. Banting and his VMG division will continue with its project to develop a series of forms, alerts, and letters in addition to a disease registry. Mr. Lockhart will purchase an off-the-shelf system module, and his IT team will implement the system at the VSD clinics. Dr. Hauk and his Med Ed group will be left to seek a solution for their division.

This approach allows each group to pursue a flexible solution in a shorter timeline that would be optimized for the local work flow requirements and reporting needs without having to consider the needs of the other groups. It also allows each group to determine the scope of development based on its financial constraints. Because there is no collaboration among the three groups, potential political conflicts would be avoided. In addition, this approach provides an opportunity to compare the different solutions in terms of ROI, and the financial incentives received from VHP.

However, this approach has several drawbacks. The overall cost of investment would increase along with duplicated efforts in developing different systems. There is also a loss of the opportunity to have the best minds from different groups achieve a better than expected result. Moreover, because of limited financial and IT personnel resources for all three groups, the risk of failure is higher. The Med Ed group would have the highest risk of failure since it does not have a dedicated IT department. Because of the continual lack of communication among the three medical groups and DMG, they may continue to be uncooperative with each other in future efforts.

Option 2: Implement the VMG Solution Across the VHS Organization

VHS will provide additional CITD funding and support for development and implementation of the VMG solution across VHS. VMG will work with DMG to set the priorities for activities. The LUG will be used to disseminate information about changes as they occur.

This approach would enable the whole VHS to standardize on a single solution that allows for improved research/QA reporting across the health system. It would also allow a higher degree of customization as a result of the system being built in house. In addition, VMG has the best-funded IT department and the most developed infrastructure to carry out the development and implementation of a disease management solution. It has already completed the groundwork and therefore has absorbed the initial investment cost. In addition, since VMG is the most profitable division, allowing the VMG IT department to implement its solution for the whole organization would safeguard morale at VMG and in turn might bring in more revenue to the organization. The involvement of DMG in the project would add to its legitimacy. Any immediate improvements in diabetic care that VMG made would result in immediate financial benefits via the bonus system.

However, this approach of mandating a systemwide solution may increase conflicts and dismay among the groups and toward the corporate administration. Mr. Lockhart and VSD may feel that their previous efforts in analyzing the issue and coming up with an off-the-shelf solution were wasted. The Med Ed group may feel completely left out of any decision-making process and may not participate in future discussions. As a result of this anticipated lack of cooperation, the system may not be designed and implemented as effectively as expected. In addition, since it is more costly to build an in-house system, it may take a long time to complete and implement the system. More importantly, the VMG solution may not meet the reporting requirements needs of VSD and Med Ed. This may cause disruption to the clinical work flow in these groups and in turn adversely affect the quality of patient care.

Option 3: Implement the CCC Solution Across the VHS Organization (the VSD solution)

VHS will provide additional CITD funding and support to purchase an off-the-shelf system module and implement it throughout VHS. VMG and VSD IT departments will

be restructured to report to the corporate IT division, which will distribute IT resources to provide installation and training assistance to all divisions. The product will be charged equally among divisions relative to the numbers of physicians. DMG will set the order in which feature implementation will be done by collecting inputs from the three medical groups and work with CCC to meet the customization requirements.

This approach has several benefits. It allows a relatively lower cost of implementation and a shorter development time to standardize on a single solution. It was determined by Mr. Lockhart and the VSD team that it would satisfy the VHP incentive program guidelines and would be compatible with the existing Limited Medical Systems system. By working on customization of this module, the solution will likely meet the hardware and clinical requirements of the medical groups. This approach will also improve coordination among the different IT and medical groups. In addition, as it offers other disease management products, this may serve as a model for developing a complete disease management solution in the future.

Nevertheless, this approach may also face some challenges. VMG may refuse to implement the CCC solution. Dismayed VMG physicians and IT team members may leave the organization as a result, which may affect the flow of revenue to the organization. In addition, the CCC solution may not meet the needs of VMG and Med Ed. This may cause further conflict among the divisions and toward the corporate administration. There may also be additional costs for integrating the CCC solution into the Limited Medical Systems EMR. The cost of customization and maintenance by a third-party vendor may offset the benefits of a lower initial investment cost and more rapid implementation.

Option 4: Reorganizing to Enable the Consensus-based Approach

The problem facing Dr. Lawler and VHS clearly goes beyond the selection of a computer-based solution to assist diabetes management activities across the three physician groups. Duplicative efforts to develop these programs are symptomatic of the fragmented organizational culture that pervades VHS. Hindered by a lack of collaboration among individual clinical and corporate divisions, VHS has failed to realize the synergistic and cost-saving benefits that are possible in a truly integrated healthcare enterprise. Integration is critical to the survival of VHS in the current healthcare environment with its emphasis on quality improvement and cost containment. This approach requires a three-step process: (1) organizational change, (2) open communication, and (3) system purchase and implementation.

As the new CMIO with a mandate to focus on the impact of clinical information systems across VHS and no internal political history, Dr. Lawler is in an excellent position to marshal an effort to integrate the clinical IT functions within the organization. First, he needs to address the political conflicts among the divisions regardless of which software system will be chosen since the divisions currently share the same Limited Medical Systems system. Using the current situation as supporting evidence of the need for stronger, organizationwide clinical IT governance, Dr. Lawler should recommend to senior VHS management that a clinical informatics steering council (CITC) be formed.

Comprised of senior level executives and professionals (clinical and IT) from each of the VHS divisions and chaired by the CIO/CMIO, CITC would be empowered to fund and oversee all clinical IT projects with systemwide significance. Initial recruiting for CITC positions would logically begin with LUG since its members have already formed a functional informal network that crosses divisional boundaries. Additionally,

CITC should include representation from DMG with its organizationwide quality improvement perspective.

One of the first tasks for the newly created CITC would be resolution of the conflict among the three physician groups regarding diabetes management programs. A CITC subcommittee could be formed to address this specific issue and other disease management related clinical informatics issues. As the current director of the corporate DMG, Ms. Harrier is the logical chair for a CITC disease management subcommittee. Her involvement would help ensure that any disease management informatics tools implemented across the VHS organization are integrally linked with proven, evidence-based disease management processes and techniques. With representation from the three physician groups, DMG, and the corporate IT division, the CITC disease management subcommittee should conduct a thorough needs analysis that accounts for: existing diabetes management processes and clinic work flows, a proposed best practice approach to diabetes management, payer requirements (e.g., VHP), financial resources, and IT infrastructures.

Based on this needs analysis, the subcommittee members should work together to develop a common requirements document and a system proposal for software to support the diabetes management process. This system proposal would then be considered by the wider CITC body in the context of all the clinical information needs across VHS. With CITC approval, a formal RFP would be released inviting proposals from both internal (e.g., VMG) and external (e.g., CCC) candidates.

Responsibility for both system selection and implementation oversight would also reside with CITC based on the ongoing recommendations of the disease management subcommittee. The next step would be to communicate the objectives of the diabetes management project to personnel at all levels of the health system through multiple channels. Details regarding the VHP incentive program and other insurance plans' quality-based reimbursement offers should be explained along with how the financial savings would benefit the organization as a whole.[1–3] In addition, the communication should include an analysis of how the new system would improve the quality of care to patients, with pertinent references to the medical literature.[4,5] By providing employees with a clear vision of the project, the IT division would encourage cooperation and participation from all of them and thus significantly improve the rate of success of the project.

After a solution is chosen and approved by the administration, the CITC disease management subcommittee should work on a detailed development and implementation plan. The plan should also include an assessment of the temporary disruption of the daily work flow at the facilities caused by the implementation. Dr. Lawler should ensure that the plan is explained to all employees who will be working with the system before the start of development. During the implementation phase, CITC should ensure that all employees receive regular updates on the project progress and collect feedback so that changes to implementation can be made early on to prevent a more costly action to correct a problem.

This consensus-based approach to clinical IT governance is likely to foster a more positive, collaborative environment at VHS. Such an environment is more conducive to the process refinement and standardization initiatives important to quality improvement efforts and research projects across the organization. It also increases consensus and ultimate buy-in. In addition, significant cost savings will likely result from the strategic systemwide coordination of clinical IT projects.

The challenges of this solution include the amount of time and effort it could take to form a CITC. It is expensive to devote time and resources to development of the

infrastructure of the groups. Individual groups may feel as if their solution has been compromised if they cannot arrive at a common decision.

Epilogue

In the month following the last LUG meeting, an executive-level steering committee was created consisting of the CEOs of VMG and VSD, the regional CFO, the CMO, the medical director for IT, and an administrator for the Med Ed clinics. This group met to discuss the high-level, long-range vision for all IT issues involving the ambulatory clinics (Limited Medical Systems, billing software, scheduling, etc). It was felt that the current IT structure was too focused on the inpatient/hospital side and wasn't representing the needs of the ambulatory clinics. This executive committee then chartered a new committee called the Limited Medical Systems integration committee (LIC), which essentially replaced the LUG but has been granted resources and decision-making authority.

LIC is charged with actually investigating Limited Medical Systems–related issues and their solutions and making recommendations to the larger committee. Much of the infrastructure support for LIC is going to come from the VMG IT department. There are still concerns among VSD and the Med Ed clinics that LIC will just be a cover for VMG doing what it wants to do, but the broad executive representation at the parent committee level and the presence of a non-VMG CMO will hopefully ensure that this doesn't happen. Interestingly, there has been no talk of trying to integrate the IT teams within the three major service groups under a corporate IT structure.

Question

1. Which option would you choose? Are there other options that have not been explored here?

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Section V
Leadership

Introduction

Joan S. Ash

Joe Simpson, M.D., was known as a charismatic leader. A dynamic, persuasive speaker, in his role as chief medical information officer at United Hospital he could convince the hospital's administrative team to move in whichever direction he wanted. He enjoyed articulating his vision of a paperless hospital and was successful in getting the budget needed for implementing computerized physician order entry. The only problem was that he neglected to share his vision with either the information technology (IT) group or the physicians and other clinical staff whose jobs would change as a result of the new system. While he appeared on the surface to be a strong leader, he lacked a number of key characteristics needed by a truly great leader.

What, then, is a good leader? It is generally believed that good leaders get good results, but it is important to consider the time period used for measuring results. Dr. Simpson might have been considered a good leader at the moment he secured funding for his project, but in the long run, his efforts were bound to lead to a failed system implementation and organizational turmoil. Another important consideration is that leadership and management are not the same thing. Leaders create and communicate a vision, while managers implement strategies that lead to achieving that vision. Great leaders need not be great managers, but they must surround themselves with great managers. Dr. Simpson had a vision, but he neglected to include information technology managers in that vision. Another critical consideration about leadership is that it does not always follow that the formally appointed leader is the true leader of a group. Informal leadership can be just as important. It is quite likely that there is at least one clinician at United Hospital who has an interest in medical informatics and is an opinion leader, a well-respected clinician who has influence by virtue of her clinical skills and who could also convince her peers that Dr. Simpson's vision is a good one. Instead of neglecting her, Dr. Simpson should be partnering with her.

Leadership is important in all organizations, but perhaps even more so in the realm of health informatics. This is because of its complexity, its interdisciplinary nature, its dependence on continuously changing technology and the involvement of users. In this tumultuous environment, a leader must be truly remarkable: a superb communicator, knowledgeable about both the technology and the clinical domains, able to innovate and adapt, and able to convince many different types of smart people from different backgrounds to work toward a vision. And excellent leaders are terribly important in informatics because, once burned by bad leadership and failed projects, stakeholders, including users of informatics applications, are reluctant to give the next project a chance.

According to researchers, leadership is a blend of traits and skills, is directed toward a vision or task, and involves the ability to motivate people to accomplish that vision or task. So-called trait theories of leadership have given way to situational and contingency theories that take into account attributes of the leader, the followers, and the context. There is no magic blend of skills and traits that is applicable to all organizations at all times. One useful framework for describing the general capabilities that a leader needs is that outlined by Goleman,[1] called emotional intelligence, which is defined as the ability to manage oneself as well as one's relationships with others. He breaks the capabilities into four categories: self-awareness, self-management, social awareness, and social skills.

- *Self-awareness*. This includes awareness of one's own emotions and the impact they have on one's work. It also includes the ability to assess oneself. Not only that, but successful leaders need to be able to learn from both successes and failures, especially if their leadership played a central role. A leader needs a good deal of positive self-esteem to be able to recognize that the failure was his fault, however. If Dr. Simpson pushes for implementation without ensuring that the organization is ready, and if the system fails, he needs to be self-aware enough to learn from the experience.
- *Self-management*. This includes self-control of one's emotions, trustworthiness, conscientiousness and drive, adaptability, and initiative. Adaptability and flexibility are especially important in informatics because it is likely that different leadership styles may be appropriate at different times. If Dr. Simpson had been a leader with a participative style and had developed a high level of trust with the IT group and the clinical staff, he might have been able to successfully launch his system using a more authoritarian approach. We are aware of situations like this, and the stakeholders often go along with this type of leader because they trust him (though they still grumble at first).
- *Social awareness*. Empathy is an important characteristic in any leader who needs to be able to understand other people's perspectives. There also needs to be an organizational awareness—the ability to sense the political climate. A good leader does not avoid power and politics but uses them to facilitate action and movement toward his vision of the organization. Leaders in informatics also need a user orientation—the ability to recognize and meet the needs of different stakeholder groups. Dr. Simpson does not seem to rate high on the social awareness scale.
- *Social skills*. A leader needs to inspire movement toward the vision. He understands the big picture of the new healthcare and informatics environment and establishes a future vision that energizes and inspires. A leader must also make sure that goals are set that provide a strategy for reaching the vision. This might be done by others, but the leader must make sure it gets done. A leader must also make sure that others understand the vision, and so communication skills are of great importance. Other social skills in play include the ability to develop others, to stimulate and manage change, to resolve conflicts, to cultivate social networks, and to build and nurture teams. Dr. Simpson's social skills are clearly not too bad since the hierarchy above him gave him funding for his pet project. However, he seems to be lacking when it comes to communicating his vision to the people responsible for implementing it.

Dr. Simpson is not unusual. It is not easy to be a leader in the informatics environment. The following cases illustrate the difficulty that even experienced, talented leaders face when times change, technology changes, and organizational structures change. When reading the following cases, think about the four characteristics of

emotional intelligence and how the ideal leader might handle the situations described. Chapter 18 involves a dilemma about planning and the difficulty of developing a needed strategic plan when so much change is occurring in both the technological and organizational environments. Chapter 19 outlines a situation in which implementation of a pharmacy system proved unpopular and the dilemma is how to improve it within the terms of the organization's contract with the vendor. In Chapter 20 the decision maker is confronted with tension between what the leaders above him at the corporate level want and what he thinks is best at the local level. He tries to understand the shortcomings of the radiology imaging technology and its potential impact on the organization's bottom line, and at the same time he wants to keep those above him and within his local organization happy. Finally, Chapter 23 presents a wonderful opportunity to apply the emotional intelligence framework to a situation in which emotions within the organization wreak havoc.

Reference

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18
Strategic Informatics: Planning for the Future of AtlanticHealth

Peter Embi, Yun Ho Jung, Dewey Schneider, Jack Sofsky, Margaret Sundre, and Thomas Yackel

What business strategy is all about—what distinguishes it from all other kinds of business planning—is, in a word, competitive advantage. Without competitors there would be no need for strategy, for the sole purpose of strategic planning is to enable the company to gain, as effectively as possible, a sustainable edge over its competitors.

—Keniche Ohnae

Background

AtlanticHealth is a large academic healthcare center on the east coast of the United States. Consisting of a 400-bed hospital, a medical school, a dental school, and a nursing school, the institution serves almost 150,000 patients annually with more than 600,000 annual outpatient visits. In addition to teaching and patient care, AtlanticHealth ranks in the top thirty institutions in National Institutes of Health funding and is the recipient of more than $200 million annually in research grant funding.

Despite heavy investment in the institution's information technology (IT) infrastructure, AtlanticHealth has shied away from the "bleeding edge" of technology. Technological competencies at AtlanticHealth include the following: a clinical data repository, a local area network connecting all of AtlanticHealth's campus considered to be the largest private network in the state, and a recently implemented picture archiving and communications system (PACS). The PACS is Web-enabled and provides on-demand desktop access to diagnostic images and information both inside and outside AtlanticHealth facilities without the need for a special workstation. PACS Web distribution is touted as being a cost-effective solution that facilitates physician-to-physician consultations, speeds diagnoses, reduces time to treatment, and improves patient care. The PACS implementation has been successful overall, but its transmission speed has been criticized as being too slow.

AtlanticHealth has yet to implement a fully functioning electronic patient record. Unlike many competitors in the same city, its clinical staff continue to use paper charts for each hospitalization and outpatient visit. Many have developed "auxiliary charting systems" in their own offices because access to medical records can be variable. (A vendor who had been contracted to develop an ambulatory electronic medical record [EMR] product recently declared bankruptcy. Another vendor subsequently bought its ambulatory medical record product, and the ambiguity surrounding this product has

put the implementation on an indefinite hold.) Another problem is AtlanticHealth's appointment-scheduling system. It was recently "desupported" by the vendor, and the replacement system still doesn't work properly.

The Dilemma

Kelly Johnson, who has been chief information officer (CIO) for a year and a half, has been asked by the chief financial officer (CFO) and the chief executive officer (CEO) of AtlanticHealth to prepare an IT strategic plan. Kelly recently attended an IT steering committee meeting. This committee is made up of administrators and representatives from most of the clinical employee groups that use the information systems at AtlanticHealth. There she outlined her process for developing an IT strategic plan.

First, she'd develop an instrument that would be used to survey her division managers to determine the state of AtlanticHealth's information systems relative to the state of the art in the marketplace. Based on the areas of weakness identified, she and the assistant CIO would prioritize the list for presentation at the next IT steering committee meeting and seek funding for the top items on the list.

Unfortunately, her proposal was met with immediate criticism and even overt hostility by some of the IT steering committee members, especially the clinicians. One doctor said, "How in the world is an IT person in your building going to determine what I need in my clinic! I don't know how many times I come to this meeting telling you we need a wireless network for our PDAs [personal digital assistants] to optimize our data entry and billing, but you guys never make it happen!" Nurses, residents, and researchers shared similar disappointment in describing perceived unmet IT needs.

The CFO also shared her concern that all IT projects be prioritized by their cost-effectiveness to the institution, not solely according to technological merit. Someone else suggested that an IT vision statement be developed.

The meeting continued past its scheduled end time, with a heated discussion over how the IT department should construct the IT strategic plan and what exactly should be contained within it. Kelly left the meeting feeling deflated. It was clear that she needed a method for developing AtlanticHealth's IT strategic plan.

She wondered how much time and effort she should devote to IT strategic planning to avoid letting other IT projects lag behind schedule. How would she ever generate consensus on an IT strategic plan among the IT steering committee members given their varied perspectives and desires?

Analysis

Main Issues

- No consensus of mission and vision.
- No identification of external opportunity and risk, and of internal capabilities and advantages.
- Insufficient communication between the CIO and committee members and lack of trust between them.
- Organizational politics impact on strategic planning.

Options

Option 1

Developing a worthwhile strategic plan that will encompass such a large, diverse organization will take a large amount of time and effort. Thus, Kelly's first option is to pursue her original strategy: Outline hardware and software upgrades according to the recommendations of IT personnel with a focus on building and maintaining a vast, complex technology infrastructure.

However, most CIOs doubt the ability to predict what technology will be needed beyond the next 2 or 3 years. AtlanticHealth was recently burned by the flux of technological change when its EMR vendor went bankrupt. The crucial appointment-scheduling system has become a major problem. If the clinics cannot schedule patient appointments, a crisis could occur. Relying exclusively on IT personnel to assess the IT needs of the organization may be unsuccessful.

Option 2

Kelly could follow the traditional method of institutional planning. She could create an IT strategic planning task force with people predominantly from the IT department but with some representatives from other departments. This task force would have a series of meetings to discuss and outline the IT needs of AtlanticHealth and produce an IT strategic plan document. Beginning with the AtlanticHealth vision and mission statements, the IT strategic planning task force would outline the broad mission and major goals of the IT department. It would list key IT strengths and weaknesses and the threats and opportunities the organization faces (SWOT analysis). The IT strategic plan would list the most critical strategies for accomplishing AtlanticHealth's major goals. Specific actions would be recommended, and Kelly would present the plan to the IT steering committee and other key constituencies.

Option 3

Match the strategic plan of the IT department with the strategic plan of AtlanticHealth. IT planning must be explicitly linked to patient care, teaching, and research activities in a way that shows how IT will enable the pursuit of AtlanticHealth's goals. IT performance must be tied as closely as possible to the business needs throughout AtlanticHealth. The priorities of the medical school deans, hospital department chairs, division chiefs, senior administrators, and other key decision makers should be identified. The opinions of leaders regarding how IT might support the AtlanticHealth objectives are critical. A survey of the entire institution should be distributed to gather information about problems, unmet needs, and future goals. Goals should be prioritized according to costs and benefits from the institutional perspective. The first step is to assess what IT is needed to support the core processes involved in patient care, education, and research.[1]

Further analysis will reveal the gap between what IT people need to do the job and the current technology. The final step should prioritize and plan strategies for filling the gaps. Before the strategic plan is finalized it should be circulated among senior decision makers to consider financial and policy implications. Finally, when a high-level consensus is achieved, the strategic IT plan should be presented to the community at large.

Reference

1. Memel D. Development and Implementation of an Information Management and Information Technology Strategy for Improving Healthcare Services: A Case Study. *Journal of Healthcare Information Management* 2001; 15(3): 261–285.

Appendix 18.1: Questions the IT Strategic Plan Task Force Should Address

- What federal, state, and local regulations affect the IT strategic planning process?
- What are the capabilities of currently available software systems?
- How have other similar institutions constructed their strategic plans?
- Who owns needed data? Who generates needed data?
- How is the data shared, and among whom?
- Who is in charge of each aspect of the information system or systems?
- What software is currently in use, and where?
- What are the current IT roles and responsibilities, and should they be changed?
- How should the distribution of resources be decided?
- How will the IT strategic plan ensure a buy-in by stakeholders?

Appendix 18.2: Selected Readings on Information Technology Strategic Planning

Clark RC. Development of an information management system using a strategic planning process. *Topics in Health Information Management*. November 2001; 22(2); 44–51.

Strategic planning is a process used to develop a blueprint for guiding the activities of an organization. It provides the organization with a systematic approach to determine the steps and associated activities necessary to clarify and meet the defined mission and goals. Strategic planning focuses on the future direction of an organization. It requires planners to identify the mission and vision of the organization, relevant goals, and stakeholders. Although often used in the context of long-range planning, it provides a useful framework for the information management system. The steps of the strategic planning process include preparation, implementation, and completion. The preparation phase is often considered the most crucial aspect of planning; however, it is often neglected because project planners seek immediate action and results. Lack of clarity in defining expectations, roles, and responsibilities can lead to serious project difficulties in the long run. An essential component of the preparation phase is scanning external and internal environments to identify strengths, weaknesses, opportunities, and threats (SWOT analysis) to project completion.

The implementation phase of strategic planning includes execution of the plans, with ongoing modifications as indicated by continuous feedback from stakeholders. Communication among stakeholders is an important aspect of the implementation phase. This ensures that the project is meeting the defined needs and that these needs have not changed significantly during project planning. In the rapidly growing field of healthcare and information management, it is not unusual to see significant changes in the requirements and expectations of projects. In the ideal strategic plan, at the completion of the implementation phase, a functional product would be delivered and data

entry and analysis would be a seamless, ongoing process; however, evaluation of the strategic planning process is predicated on communication with stakeholders regarding the functionality of the product. This often results in modifications to the original expectations and plans.

Ribka JP. Strategic planning for managed care information systems. *Health Management Technology* November 1996; 30, 32, 55.

It is critical that healthcare organizations prepare for the new challenges of managed competition through astute information systems (IS) strategic planning. An entity can differentiate itself from its competitors and gain an advantage in the delivery, administration, and marketing of healthcare services by scrutinizing the means by which it collects, processes, and reports information. It is of critical importance that chief information officers (CIOs) plan for the selection and implementation of managed care systems as a component of the IS strategic planning process. The IS strategic plan and the subsequent implementation of computer systems to support managed care should be based on a comprehensive business plan produced by the health system. Each CIO should encourage their upper-management counterparts to develop a comprehensive business plan that includes the necessary managed care components. Each institution planning for managed care should also include education on managed care concepts. Typically, managed care components will exist in three distinct functional areas of a health system. These are: contract management and billing for the hospital(s), contract management and billing to support physician practices, and managed care administration and management of contractual risk. Each of these areas has specific requirements that should be addressed in the health system business plan, the IS strategic plan, and the subsequent implementation of IS solutions.

The most common method of interfacing data from disparate systems is through the use of a combination of hardware and software, known as an interface engine, that collects and transmits data between systems and stores it in appropriately configured databases. Data should be collected in one place, usually referred to as a data repository, and stored in a format that can be accessed by a decision support system or executive information system (DSS/EIS). The data should be accessible to all management areas within the health system. Many IS personnel lack a complete understanding of managed care systems and how they need to interface with traditional hospital information systems (HIS) or practice management systems. Only if these IS personnel understand the principles of managed care and its relationship to traditional hospital applications will they be able to successfully implement the managed care component of any IS strategic plan.

Memel D. Development and Implementation of an Information Management and Information Technology Strategy for Improving Healthcare Services: A Case Study. *Journal of Health Care Information Management* Fall 2001;15(3): 261–285.

1. For an effective e-health strategy, begin planning all e-health endeavors by being certain you understand what the stakeholders (caregivers, operational healthcare workers, or consumers) want and need to do. Once you know this, you can determine the information required to support the stakeholders' efforts, and then the best technology or process solutions can be determined.
2. Look at the big picture first; then identify the individual supporting components and iteratively implement them in order of importance.
3. Maximize the value of the data collected to date through existing information systems.

4. Do not focus only on data capture; it is equally important to concentrate attention on the output of meaningful data that can be used by clinicians and consumers in decision making.
5. Be careful not to allow the technology to drive the products.
6. Include work flow considerations in developing and executing any project.
7. Carefully evaluate the issue of process standardization and determine which processes or components of processes should and should not be standardized.
8. In a large, complex healthcare organization, there is some level of polarity between the corporate and regional priorities that needs to be effectively balanced.

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Fix Pharmacy!

Jim Carpenter, Tadaaki Hiruki, Michael Krall, and David Smith

An electronic medical record offers the ability to store progress notes and other important information electronically—providing access to a wealth of clinical and demographic information with the use of a personal computer (PC) in place of an individual patient paper chart. Clinical order entry systems offer the ability to order tests, medications, procedures, and consults electronically. At Fairview Valley Regional Hospital, there was a recognized need for electronic entry of medication prescriptions. A text-based medication ordering system was implemented by the pharmacy, which allowed medication prescriptions to be ordered by typing individually in a consecutive manner for all outpatient visits. Prescriptions that needed to be updated or modified required retyping of the entire medication prescription order. The system did not prove popular.

Background

At Fairview Valley Regional Hospital, a 300-bed community hospital, most of the clinical staff did not have access to PCs, and many lacked typing skills. Some began to complain that medication order entry was the first step in a process that would turn them into data entry clerks. Others complained that the online medication prescribing process would take longer than the paper process and therefore was a deterrent to providing efficient clinical care. In fact, they had just been through a process of "reengineering" the paper-based medication ordering procedure to make it more streamlined.

The reengineered process included a printed summary of a patient's active medication list called the "action profile." If a prescription needed to be changed or a refill was needed, this list could simply be edited by hand and returned to the hospital pharmacy. For a patient returning for follow-up visits, the pharmacy printed out an action profile with all the patient's medications, doses, remaining refills, and a space for new prescriptions. This became popular with clinicians because they needed only to sign their name below the preprinted information, whereas with the traditional paper prescription ordering method they had to use a prescription ordering pad and rewrite all the prescriptions in full.

Implementation Results

Because of unhappiness with the implementation of the pharmacy's new prescription ordering system for outpatients, clinicians, led by the Fairview Valley Regional Hospital medication use committee, began to clamor for enhancements to make the new

pharmacy ordering system meet their needs. The medication use committee knew that the hospital had long-term plans to implement a more robust physician order entry system, as well as an electronic medical record system, but the timetable for this long-term plan was unclear. The medication use committee wanted enhancements made to the existing system in order to make it more user-friendly; otherwise, they felt it was highly likely that many of the physicians would not use the new electronic system.

However, the cost of the enhancements to be made by the medication ordering system vendor proved to be prohibitive. An alternative would be to ask the hospital information technology (IT) programming staff to attempt to make alterations to the system on their own. However, this would make the modified system no longer subject to the warranties and to the 24-hour technical support contract the vendor offered. In addition, the vendor argued, additional ad hoc modifications would create a system that would not interface easily with other vendor products available on the market—creating additional expense in the future when the hospital moved forward with its large-scale implementation plans.

Questions

1. How should Fairview Valley Regional Hospital leadership address this issue now that a contract with a vendor has been signed and the system has been implemented?
2. What could the leadership have done to give the implementation process a greater chance for success?

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Showdown in the Heart of Texas

Robert Posteraro, Wilhelmina Estrada, Tim George, Julito Uy, and Sandra Yee

The Deep South Healthcare System (DSHCS) is a large, multifacility healthcare system consisting of a corporate headquarters located in Florida and seventeen healthcare facilities (hospitals and clinics) located throughout the southeastern United States from Florida to Texas. The mission of DSHCS is to bring state-of-the-art health care to their patients. Their vision includes becoming the largest, most efficient provider of health services for their geographical regions through the acquisition and modernization of smaller regional hospitals. Their strategic plan includes significant emphasis on information systems to virtually link their network, as well as to partner with strong local physicians.

The HomeBase Hospital Organization (HBO) is located in a city with a population of 200,000 in the state of Texas with a wider catchment area containing 1 million people. It was acquired by DSHCS 5 years ago and consists of an adult hospital, a children's hospital, several outlying hospitals, clinics, and a medical group. HomeBase Hospital, a 500-bed hospital, is a major trauma center and is the largest single facility in the DSHCS. The radiology services at the hospital are equipped with the customary diagnostic equipment—magnetic resonance imaging (MRI), spiral computerized tomography (CT), ultrasound, and nuclear medicine capabilities. The radiology information system is interfaced with the hospital information system (HIS) and is used primarily for ordering radiology examinations and scheduling procedures. The combined entity of the HBO is the largest entity in DSHCS in terms of number of patients seen and number of radiographic exams produced each year. The next largest entity in DSHCS performs 50 percent fewer radiographic examinations than HomeBase Hospital.

The entities that make up HBO are under the control of a single board of directors and a chief executive officer (CEO). The CEO of HBO, Mr. Hyde, is a native of the area and understands the local politics, customs, and people. He had been the CEO of another DSHCS hospital before the acquisition of HomeBase Hospital, and his status in the community helps buffer the corporate presence in the area.

The geographical distance between HBO and the corporate offices of DSHCS and the large size of DSHCS demand that communication between the corporate CEO and the local CEO be maintained on a regular basis. Because of the large cost of acquiring HBO, the corporate chief operations officer (COO), Mr. Ollie, has tasked Mr. Hyde with improving the financial picture of HBO through efficiency and cost-cutting measures.

The Scenario

The radiology staff of HBO consists of a seven-member private radiology group. The radiology workload at HBO has increased 10 percent each year for the past 10 years. With a shortage of radiologists, it has become apparent that in order for the department to continue to provide quality care it will have to improve its efficiency and throughput. To this end the radiologists have recommended to Mr. Hyde that HBO install a picture archiving and communications system (PACS) with the expectation that efficiency will improve by 10 to 15 percent once the system has been mastered by the radiology staff and end users.

PACS is an enterprisewide information and image management and delivery system. It integrates imaging modalities, interfaces with hospital and departmental information systems, and manages the storage and distribution of images to radiologists, hospital physicians, and remote referring physicians, specialists, clinics, and imaging centers. PACS vendors promise greater productivity for staff and radiologists, increased operating efficiencies, and enhanced services to hospital and referring physicians, which can create higher demand for imaging services and better patient care.

Mr. Hyde took this recommendation to Mr. Ollie. The board of directors of DSHCS endorsed the proposal as a way of making their entire system more efficient. They also saw it as having marketing potential, demonstrating to their customers that DSHCS is entering the information age in medicine. The board gave Mr. Ollie the mandate to implement PACS throughout DSHCS within 3 years.

A PACS committee was established at HBO and included among its members the director of radiology, the CIO of HBO, a radiologist with experience using PACS (Dr. Sihk), and a representative of the clinical physician and surgeon end users (Dr. Knownot). Mr. Ollie directed Mr. Yurit to take charge of the PACS implementation throughout DSHCS. The board of directors decided, on Mr. Yurit's recommendation, that purchasing a single-vendor PACS for systemwide installation would be the most cost-effective method of implementing the system, as it would give them quantity purchase leverage on the price of the PACS. The board also decided, again at the recommendation of Mr. Yurit, that PACS should be implemented systemwide in a one-shot, all-or-nothing manner. There should be no incremental phase-in for PACS. Mr. Yurit's reasoning is that implementing PACS is a radical move and that it's better to "bite the bullet" and "get all the problems over with at once" rather than having to handle the same issues repeatedly as PACS is introduced to one section of a radiology department at a time and at one facility after another. The board of directors has retained a purchasing group to investigate and make a recommendation of a vendor for the system. The directive given to the purchasing group by the board is "to find the best PACS for our system at the lowest cost." The "lowest cost" is the operative variable here since DSHCS is financially tight at the moment as a result of its purchase of a large number of healthcare facilities in the past 5 years. The purchasing group that has been retained has a short track record for PACS installations, all at small institutions. They are at the foot of the PACS learning curve and have no PACS experts on their staff.

Several of the radiologists at DLHS are familiar with PACS. Dr. Sihk has worked with the system for many years and continues to work with it in his capacity as a medical officer in the U.S. Army Reserve. He has trained each year at a military hospital where PACS has been used for more than 10 years. He worked with PACS within that facility while the facility was undergoing the transition from traditional radiology to PACS and is therefore familiar with the system, the problems of implementation,

and what the minimum needs of a department are in regard to PACS hardware. Dr. Sihk also knows several of the people who were involved in the planning and installation of the PACS at the military hospital and seeks their advice on PACS issues.

The radiologists have recommended to Mr. Frie that a leased system, not a purchased system, would be in the best interests of HBO. A leased system would allow the facility to try out PACS without making a major investment. If it doesn't work well, they can always go back to a film-based system. A leased system would encourage strong vendor support because of the possibility that the lease would not be renewed if support isn't provided. A leased system would allow for the option of replacing the system with a better system, should one be developed. The lease option, however, is in direct contradiction to the decision of the board of directors of DSHCS that PACS should be purchased not leased. The radiologists have also suggested that it would be better for HBO to implement PACS in a phased manner over time. This would allow the radiologists, technologists, and clinical end users to become familiar with it "a bit at a time" rather than radically changing their work habits all at once. This is also in direct contradiction to the way the board of directors of DSHCS has decided to implement a PACS.

The communication between Mr. Hyde and Mr. Ollie regarding PACS has been minimal over the past 8 months. Mr. Yurit has taken on the PACS implementation throughout DSHCS as a personal project and has not kept Mr. Frie informed of his thoughts or decisions. Mr. Yurit made a 1-day site visit to HBO during which he met with Mr. Frie and made a "walkthrough" with the chief technologist of the radiology department. He didn't speak with any of the radiologists or with any of the staff technologists, clerical personnel in the department, or clinical end users. The purchasing group submitted a request for proposal (RFP) to the board of directors of DSHCS several months ago. Mr. Frie learned of this only through the grapevine and had to request the RFP from Mr. Yurit several times before he was finally, and reluctantly, sent a copy. Because of the lack of information coming from DSHCS, the local PACS committee has not yet formally met.

Dr. Sihk approached Mr. Frie to discuss PACS and was told that Mr. Yurit had not been very communicative. Dr. Sihk was given a copy of the RFP and offered to review it and provide comments and recommendations. The RFP was reviewed and was found to contain glaring problems from the radiologists' point of view. For example, it proposed only one workstation for the entire operating room suite of twenty operating rooms and had no allocations for clinical workstations on the floors of the hospital or in the physician office areas. While the RFP referred to, in passing, the possibility of sending images to PCs, it did not request any cost factors or hardware requirements for implementing this capability. After reviewing the RFP and after hearing that no one from DSHCS or the purchasing group had had any contact with the radiologists or clinical end users, Dr. Sihk did not have confidence in the ability of the purchasing group to recommend PACS for an organization as large as DSHCS. He submitted his review of the RFP to Mr. Frie, who thanked him for his input and forwarded his comments, with an endorsement, to the other members of the HBO PACS committee. Mr. Frie assured Dr. Sihk that Mr. Hyde would not make a decision that would jeopardize local patient care or throughput. Although PACS has been mandated by DSHCS, the costs for each installation will be charged to each facility's individual budget, and Mr. Hyde is not about to spend millions of dollars for something he doesn't think will work well for HBO. Mr. Hyde has held his ground before and rejected some mandates from DSHCS in the past in the name of providing the best for his facilities.

The Issues

Mr. Ollie's Perspective

"I am convinced that adoption of PACS to the current hospital system infrastructure will prove to be beneficial for the organization in the long run. PACS is effecting a paradigm change in the way hospital organizations conduct their radiology department operations. The technology is evolving, and there are still kinks that need to be addressed. Nevertheless, most hospitals with operational PACS enjoy the benefits arising from convenience and realizable cost savings. From a corporate strategy perspective, PACS would help us sustain a competitive advantage for the organization. In order for this to be accomplished over a system as large as ours, DSHCS needs to speak with one voice. The board of directors and I have made the decision on how PACS will be implemented and it's up to the local CEOs to comply with our decisions. Unfortunately, Mr. Hyde, the CEO of HBO, seems to be challenging our decisions on how to choose a vendor and our decision to purchase rather than lease PACS."

In summary, from Mr. Ollie's perspective the issues are:

1. *The decision to implement PACS for DSHCS.* Timely access to radiological images and reports translates to improved quality of care and management of resources. The improved cycle time would guide the medical decision making of healthcare providers in a more timely manner, resulting in a shorter length of stay for patients. A user-friendly PACS will build physician staff preference for the hospitals in DSHCS. Implementing PACS will demonstrate that DSHCS is in the forefront of the information age in medicine.
2. *The decision to purchase rather than to lease PACS.* There will be economies of scale. The corporation will be able to leverage the number of units to be purchased against the price per unit. The initial capital outlay for the purchase of PACS will be spread over the serviceable life of the system. With the corresponding tax effect of the depreciation, buying would be a better option than leasing. "I want the best system for the least cost."
3. *Resistance* on the part of his subordinate, Mr. Hyde, and how to overcome this.

Mr. Yurit's Perspective

"I'm doing my best to follow the decisions of the board of directors and CEO and doing what we think is best for DSHCS as a whole, but this is shaping up as a struggle between two players in the DSHCS system, Mr. Ollie, the corporate CEO, and Mr. Hyde, the CEO of HBO. What if I go forward with the rollout? It's a good bet that Mr. Hyde would balk. He knows his territory and will not accept even the remote possibility of failure at his institution. He's done this before, successfully, with other implementations that the board has mandated, but I don't think he's seeing the systemwide 'big picture.' I suspect that he may find a way to undermine my efforts. It is clear that a successful implementation of PACS at HBO will require local support. Mr. Hyde understands his team and how best to deliver healthcare products at his institution. He is experienced but hasn't expanded his 'team philosophy' to include the desires of DSHCS. The bottom line will be preserved if there is uniformity across the system. For a systemwide project to be completed on time and with efficiency, there needs to be central control. The board has agreed that we should buy rather than lease and has agreed that we should install PACS as a one-shot implementation. Mr. Hyde should acknowledge my expertise and authority in this field and come along like the rest of

the CEOs. There is a high probability that if PACS fails at one institution, it could lead to a systemwide failure and loss of a huge investment.

A failure on my part to get the systemwide implementation accomplished would severely diminish my power and influence within DSHCS and could cost me my job. Mr. Hyde seems to be challenging me directly."

In summary, Mr. Yurit's concerns are:

1. A need to actualize the decisions of the board of directors and Mr. Ollie regarding the implementation of PACS throughout DSHCS.
2. Resistance from Mr. Hyde.
3. Risk of loss of esteem and possibly the loss of his job if the PACS implementation fails.

Mr. Hyde's Perspective

"For the past several years, the radiologists have been suggesting to me that the hospital install a PACS in order to help reduce the turnaround time for radiology reporting, as well as to address the sparse radiology coverage of the regional hospitals by electronically connecting them to HBO. PACS will greatly enhance the efficiency and the perception of the radiology department to physicians and help improve the quality of care for patients. Lost films or x-ray jackets will be much less of a problem. Images will be available to physicians in the radiology department, throughout the hospital, in the operating rooms, and in the private physicians' offices via a Web product. Radiology reports will also be available more quickly, as they will be online as soon as they are electronically signed. Physicians will no longer have to come to the radiology department to view films. Looking for films and awaiting results are significant physician issues.

Why else do we need PACS? Our patient load has increased each year. Also, the newer technologies (spiral CT, faster MRI software, etc.) allow us to perform exams more quickly. The faster exam times have encouraged physicians to order radiology studies more liberally. PACS seems to be one way to handle this increased workload. The other way to address this would be to hire more radiologists, but this is very difficult in the current market.

Critical issues still need to be addressed. I want to know if the technology is developed enough to ensure that this is not just a "fad" that the radiologists will not use after 3 years. What I've read in the literature seems to support the idea that PACS is going to be the future of radiology. Why else would Kodak and Fuji, major players in the film-based radiology arena, be putting so much R&D into PACS? Will the technology be obsolete in a few months? Well, there will be improvements, just as there are every 6 months in the PC area, but with a reliable company the systems should be back-compatible. What are the financial considerations in terms of cost, the time to breakeven point, and the return on investment (ROI)? These variables depend on the institution, but from what I read, a facility like ours should break even in less than 5 years. We need to be sure to use a vendor that has a history of staying power in the field and of excellent site support in order not to jeopardize patient care. I agree with our radiologists' assessment that it would be best for us to lease a system and install it using a phased-in approach. I don't want to commit to something that may not work for us and don't want to disrupt the physicians' work patterns too drastically all at once.

We're the largest facility in DSHCS, and Mr. Ollie hasn't even asked our opinion of what we need or want in terms of PACS. He sent Mr. Yurit down for only one day and

on the basis of his walkthrough thinks he knows how we operate. I've got to be sure that the system we install will benefit us. I'm not sure that DHSCS understands our situation at all."

In summary, from Mr. Hyde's perspective the issues are:

1. Lack of communication between Mr. Ollie and him on the issue of PACS.
2. Control issues between him and Mr. Ollie regarding the implementation of PACS. Should he accede to the decisions of DSHCS and accept PACS as configured by the purchasing group, or should he instead trust the judgment, opinions, and experience of his radiologists and go with the system as they suggest? Should he follow the directive of DSHCS and purchase PACS for his facilities or should he lease whichever system he decides to install?

Dr. Sihk's Perspective

"Corporate headquarters is mandating PACS for its entire hospital system. Our facility is the largest hospital in the system in terms of the number of radiological examinations performed each year. Corporate headquarters has retained the services of a purchasing group to recommend a vendor for PACS, with the goal being 'the best for the system at the lowest cost.' In spite of our size, no local administrator, radiologist, or end user was invited in on the development of the RFP for PACS. A corporate representative visited our radiology department for one day, but didn't speak with end users or request their input into the needs and preferences of the department vis-a-vis PACS. The RFP that was developed by the purchasing group shows that the equipment allotted for HBO is woefully inadequate (too few workstations and not enough monitors per workstation) considering our volume of work and the number of radiologists at HBO. In view of their failure to seek end user input and in view of the recommendations they made regarding equipment, I see the purchasing group as a 'lightweight' in the field of implementing PACS for an organization as large as DSHCS."

In summary, the issues for Dr. Sihk are:

1. Lack of communication between DSHCS and the administration, radiologists, and end users at HBO.
2. No end user involvement in the decision-making process.
3. The decision is being mandated from a top-down rather than bottom-up direction.
4. A sense of disenfranchisement of radiologists in areas where they have expertise and which affect their daily work.

Dr. Knownot's Perspective

"I am a clinician on staff at HomeBase Hospital. I have been reading about the risks and benefits of PACS over the past several years. I have experienced the inefficiencies of medical imaging and would like to eliminate them in order to improve the quality of patient care. I believe that PACS will address many of these inefficiencies and will help improve patient care. Among the multitude of inefficiencies regarding medical imaging, I am most concerned about those having to do with the daily work processes that end users experience. I want the studies that I order to be performed in a timely manner and with minimal inconvenience to my patients. I want to be able to review the studies as soon as possible after they are completed and want to be able to compare them with prior studies. I want easy access to the imaging system, and I also want the official results of the studies to be conveyed to me in a timely manner.

Although PACS has been discussed in depth by the administrative staff of DSHCS, we end users have barely heard a word about it. I worry that the administration will once again force a change on us for which we are ill prepared. Once the proposed change fails (and not *if* it fails), the administration will blame us (as it usually does) for being resistant to change. We feel that we are vital to the success of any change and think that we are crucial to the decision-making process.

I view the lack of communication between the administration and the end users as a major impediment to PACS implementation. I hope that the administration will educate us about PACS technology, review its advantages and disadvantages, and explain how it is going to affect our daily work. I feel strongly that the administration should solicit feedback from the end users regarding their questions and suggestions regarding PACS. This process would not only keep us informed but would also improve our sense of buy-in, increasing the likelihood of a successful PACS implementation. This educational encounter should be conducted before the administrators decide on a specific vendor, so that our issues can be considered in the decision-making process."

In summary, for Dr. Knownot the concerns are:

1. Efficient scheduling of studies.
2. Clear and precise instructions for patients (re special studies).
3. Prompt retrieval of images for interpretation.
4. Prompt retrieval of previous studies for comparison.
5. Prompt dissemination/retrieval of radiographic reports.
6. Easy access to PACS, with multiple workstations and minimal downtime.
7. End user input in the decision-making process.

The Solutions

From Mr. Ollie's Perspective

"I'm determined to bring PACS online for DSHCS at the lowest possible cost. My CIO and I are in agreement that this should be done using a single-source vendor for our entire system in order to effect a quantity purchase leverage of costs. If I allow one local facility to choose its own vendor, it would undermine our single source cost savings. On the other hand, if PACS fails at our largest facility, then the systemwide implementation could fail. Perhaps we can compromise. Give them more hardware as long as they accept the vendor we choose, and let them implement PACS incrementally if they see fit. We could justify an incremental installation at HBO because of its large size. Perhaps these concessions will satisfy them, and we can still get the purchase price leverage from a single vendor."

From Mr. Yurit's Perspective

"There appear to be at least a few options for me. I can continue to roll out PACS as the project has been decided by the board. Alternatively, I can consider the project from the point of view of the local CEOs and place control of the project in the hands of local administrations. A third option is to proceed with the rollout while providing for a special circumstance for HBO because they are the largest facility in DSHCS. It would probably not compromise the bottom line too much, and my own credibility would not be challenged if their installation failed. If there is success at HBO, I could build future projects on their success. The only risk would be that if we made an excep-

tion for HBO, the other local CEOs might start agitating to obtain local control of their PACS installations."

From Mr. Hyde's Perspective

"I'm convinced that I need to implement PACS at HBO in a manner that is best for our situation, but am I seeing the project from a local level without realizing the 'bigger picture' of the corporation? Instead of turning this conflict with DSHCS into a potential disaster and turf war, I could take it as an opportunity to showcase the talent at our local hospital. I can show how our PACS committee, strategy, and planning could save everyone, including DSHCS, time and money. HBO can then be a showcase for the corporation."

From Dr. Sihk's Perspective

"I am trying to develop a proactive role in the process by establishing a line of communication with the local administration and demonstrating my willingness to assist with the implementation of PACS. I will obtain a consensus from my fellow radiologists regarding their views on the minimum requirements as well as the optimum PACS to manage the workload at HBO. I'm preparing talks on PACS that I can give to the radiologic technologists, clerical staff, and clinical end users to bring them up to speed on PACS. At the same time I will be able to get input from them on their needs and desires regarding PACS and incorporate these findings into a proposal to administration."

From Dr. Knownot's Perspective

"End users of any technology should have some input into what specific system requirements are needed. We are, after all, the ones who ultimately determine whether or not the technology is truly beneficial. Each of us has unique job demands that PACS should address in order for the technology to improve the efficiency of our work flow. Therefore, we need to have input into the decision-making process. I'm not sure how I can go about making this happen because we have been left out of the loop almost completely on this issue. Perhaps I can talk with Dr. Sihk and together we can go to administration with our ideas."

Questions

1. How can these individuals with disparate perspectives agree on a solution?
2. Who should be the ultimate decision maker? What leadership characteristics/behaviors should this person demonstrate?

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Mission Valley Medical Center Physicians Group Practice: The Rumor

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Amid a forest of southern California technology start-ups and dot-coms, a century-old healthcare institution delivers health care to the neediest of Mission Valley's residents. Mission Valley Medical Center (MVMC) has managed to maintain an "open door" policy since 1876. Providing quality medical care under the strict auspices of Mission County's oversight has left few resources to support clinical information technology (IT). County resources must be used to meet the information needs of about 4,500 county employees, as well as the 200 employees who make up the medical staff, also known as Physicians Group Practice, Inc. (PGP) members. Historically, PGP physician IT needs have been a low priority for MVMC. As a result, in 1998, PGP began to support these needs first by supplying e-mail services, and now it provides a dedicated staff. With some successes, PGP IT found favor with the medical staff by providing a high level of support. Some overlap with MVMC IT functions resulted in a need for negotiation, which resulted in a "memorandum of understanding" (MoU) being written (Appendix 21.1). The MoU attempted to clarify the roles and responsibilities of the MVMC IT department and the PGP IT group. The MoU has been useful, but tensions remain between the two IT staffs. Recently rumors have been circulating that MVMC IT and PGP IT staffs will be merged as the result of a near future reorganization. The PGP chief operating officer (COO), Paul Hammer, is faced with a dilemma. He faces his governing board with the possibility of his IT staff being absorbed by MVMC IT in order to streamline services and cut costs. His staff is opposed to this measure, particularly because historically, MVMC IT support has been poor for PGP staff.

PGP Organizational Background

MVMC is part of an integrated delivery system, Mission Valley Health System (MVHS), owned and operated by Mission County. MVMC is composed of a 300-bed hospital and extensive outpatient facilities and provides the full spectrum of inpatient tertiary care services. MVHS also supports ambulatory and community health services, public health services, mental health services, alcohol and drug services, and a medical call center that provides nurse triage/advice and scheduling services 24 hours a day, 7 days a week year-round. MVMC serves a population of approximately 2.8 million of varied ethnicity and socioeconomic status.

All the physicians belong to PGP, which came into existence from the hospital's need to provide billing services for professional services rendered by the medical staff.

MVMC and PGP are funded solely by Mission County. A PGP board of directors is elected from among the physician staff annually by the physician stockholders who govern PGP.

The PGP

PGP was preceded by a not-for-profit organization known as the Medical Staff Corporation (MSC). MSC was organized to support education and research activities at the medical center. In 1966, MSC started providing additional administrative services, including billing Medicare for physician services, providing secretarial services for the physicians at MVMC, and purchasing and administering physician benefits in addition to those they received as Mission County employees. As MSC grew in complexity, it became clear that its not-for-profit status was not the proper legal structure for providing administrative services. To address this deficiency, PGP replaced MSC in 1975.

Although organized as a for-profit organization, PGP has never distributed a profit. All PGP income comes from the county via an annual budgeting process that allows for reimbursement of only direct operating expenses. PGP has a nominal amount of working capital (approximately $500,000), which is used to cover accounts payable and staff compensation between county disbursements.

In addition to providing a wide range of clinical services, MVMC is a teaching hospital. Even though there is no formally organized academic faculty practice, PGP performs many of the administrative services seen at a teaching institution. PGP has continued to grow in size and complexity and provides MVMC with many additional administrative services, which are described below. PGP has 200 physician stockholders and an administrative staff of 120. The ratio of employees to physicians has diminished over time, indicating increasing staff productivity. PGP staff provide the support required by physicians, who are not only clinicians serving patients, but also teachers of medical students, medical/surgical residents, clinical researchers, and administrators of the various departments and divisions of the medical center.

Services provided by PGP include the following:

1. Provide support staff and management for physician shareholders and MVMC clinical departments.
   - Management of supplies and services
   - Physician recruitment
   - Preparation for accreditation surveys, including JCAHO
   - Program planning
   - Marketing
   - Management of physical space
   - MVMC contract management (agreements for services)
   - Intra- and interdepartmental communications
   - Scheduling of physicians and patients
   - Liaison with all MVMC departments
   - Medical secretarial support
   - Residency program coordination
   - Support of continuing medical education programs, research, and educational grants
2. Billing, collecting, and reporting of MVMC physicians' services.
   - Acts as MVMC's billing agent for professional services

- Provides management reports to chairs and chiefs of clinical departments and divisions
- Reports to the patient business services department of MVMC information regarding physician professional services
- Purchase and administration of physician benefits

3. Provision of IT via PGP IT services (PGP IT).

In 1996, PGP hired a new COO, Paul Hammer, who quickly became aware of the division between physicians and MVMC IT. Based on what he heard from doctors, as well as direct observation of the MVMC IT department, he was not confident that MVMC IT in its then-current form could take care of the IT needs of physicians. He soon learned that MVMC IT services had historically neglected doctors, had not been interested in them, had not viewed them as customers, and had said, "The IT personnel at all levels did not have an understanding of the nature of medical practice either in a hospital or a medical practice."

However, that level of understanding may be maturing. Rupert Silas, MVMC CIO, recently joined MVHS and has made advances on many fronts for nonphysician issues but recognizes the need for an increased role of MVMC IT adopting physicians in the larger context of customer service to the organization as a whole.

Two years ago Mr. Hammer and the PGP business office manager discussed the opportunity to consolidate the billing/collection functions of PGP (which consist of 25 percent of PGP's work) with MVMC billing/collection. He knew that, as the COO of PGP, part of his role was to come up with an alternative to the business office (i.e., billing/collection) as an important and "visibly valuable" reason for the continued existence of PGP.

Thus, Mr. Hammer proposed to various committees and individuals, including the newly formed medical informatics committee of the organized medical staff, the MVMC IT service, the hospital director, and finally the PGP board of directors, that PGP take on the task of developing an IT service for member doctors only. All the major stakeholders approved of this proposal, and Mr. Hammer responded by hiring a consulting firm to create a strategic plan for the new vision for the PGP IT staff. The plan would include a strategy for integrating the PGP billing/collection services with the appropriate counterpart at MVMC. This is scheduled to occur over the next 1 to 2 years. When the merger occurs, many of the smaller-scale functions that PGP billing provides will likely disappear.

PGP's recent implementation of PGP IT services grew out of the increasing information needs of the physicians. MVMC recently began installing a new core information system that would permit physician access to the system from their desktops rather than at common workstations. This improved functionality has increased physician productivity and satisfaction. Unfortunately, the information services department (ISD) of MVMC often failed to provide physicians with the needed hardware and support to facilitate this transition. Because of increasing physician dissatisfaction, PGP's board of directors instructed PGP to provide these services directly to physicians. This has led to increased tensions between the PGP IT and MVMC IT services.

This controversy led to the aforementioned MoU that delineates the roles of PGP IT services and MVMC IT. Since PGP IT is based in PGP, physicians believe that they now have a stronger voice in meeting their information needs. In addition, the MVMC chief medical officer of the hospital has provided PGP with political support in its efforts to provide a personal computer (PC) on every physician's desktop. PGP IT has grown quickly and now has its own help desk.

The IT Environment

From the point of view of the MVMC staff physicians, MVMC IT has not proven itself to be an asset to patient care. The reason for this is that the core attending staff, PGP members, historically have been poorly supported in the area of IT by MVMC. PGP has filled the void and has begun to extend the scope of its services to the physician staff at MVMC to include IT support.

Physician involvement in IT projects has grown over the years. Two-and-one-half years ago, a physician liaison was hired at MVMC IT to bridge the chasm between the IT department and the clinical staff. The medical informatics committee of the medical staff serves as a vehicle for dialog through its quarterly meetings. Recent issues of discussion have included policy on the use of electronic signature and the impact of the Health Insurance Portability and Accountability Act (HIPAA) on clinical practice. In addition, PGP hosts a weekly IT advisory group meeting to further discuss issues of IT support from the point of view of the physician. Its membership includes PGP physicians, PGP COO Paul Hammer, the PGP IT chief, and representatives from the PGP administrative support staff.

With all that has been accomplished by the larger organization, still less than half of the PGP physician staff have ready access to PCs at their desks. Common workstations remain the main venue for physician access to the core clinical systems and to e-mail. The PGP IT six-member team is in the process of assessing the PC and cabling needs of the remaining PGP physicians who do not have desktop PCs.

One of the significant functions PGP has performed is providing the clinical staff with Internet access and e-mail capability. With the successful implementation of e-mail services, PGP clinical staff are looking forward to PGP IT providing more advanced services such as support for wireless network access and funding for acquiring a group software license for online clinical knowledge management services. PGP doctors see these tools, and perhaps others as they are developed in the future, as being essential in the years to come to assist with providing more efficient, comprehensive, safer patient care; keeping up with and maintaining the standard of care that is evolving in the private and university sectors in the region; assisting with ongoing research projects; improving the functioning of MVMC in an increasingly competitive healthcare environment; and enhancing the image of MVMC.

The Rumor

Of late, rumors have emerged indicating there may be a movement afoot for the hospital IT department and the PGP IT department to merge. A view has been expressed by some hospital executives questioning the rationale for the existence of PGP IT services at all. PGP doctors are extremely concerned that the small gains obtained through the help and support of PGP IT will be lost if PGP IT were dismantled. Although the MoU was signed with the intent to clearly define IT responsibilities, a few points are vague enough to have the doctors feeling that PGP IT services could become subservient to the IT needs of the hospital.

Opinions differ among the medical staff. One PGP physician, an internist and a member of the physician council for implementation, claims, “PGP physicians have functioned without any elaborate information technology for a long time and have learned to get patient-related information through other sources. Even if the merger of the two results in less IT support, physicians will still be able to get the same information through other means and provide the same level of care.”

A core group of doctors has met with the PGP IT advisory group and Mr. Hammer to express their concerns. They know the advisory group and Mr. Hammer are both strong advocates for PGP IT. The doctors anticipate that the advisory group and Mr. Hammer will be against the merger and want the doctors' support. The PGP doctors want Mr. Hammer to act proactively to pursue the rumor to verify or refute it. If the rumor is substantiated, the doctors will press Mr. Hammer to fight any attempt for PGP's IT services to become subservient in any way to hospital IT services.

Mr. Hammer is also aware of how the rumor is affecting his own IT staff at PGP. The manager of IT services, who reports to him, is quite clear that he will resign should the merger occur. One technician and an administrative assistant may also leave. Other non-IT services PGP staff have become very nervous as well.

Question

What should Paul Hammer do?

Analysis

1. *Distrust and communication breakdown*. This is the prime issue between PGP IT and MVMC IT, as well as between PGP physicians and MVMC IT. There is a long history of apparent neglect of the IT needs of PGP physicians by MVMC IT. Regardless of the facts, the important point is the strong *perception* on the part of PGP physicians that they have been (and will continue to be) treated as second-class citizens in the IT realm. While both parties are aware of this issue and a MoU has been generated, there is still an undercurrent of deep skepticism beneath the surface. This distrust has resulted in a further communication breakdown between PGP IT and MVMC IT.
2. *Survival of PGP as a relatively autonomous body within the MVMC system*. Distrust and a communication breakdown have created paranoia, to a certain extent, about PGP's survival as a strong physician representative and advocacy group. Rumors of a merger between the respective IT departments have heightened this sense of vulnerability. This stems from the fact that historically PGP was separated from the rest of MVMC because its billing operations were handled by PGP IT. Now that these operations are being merged, a certain influential faction of PGP physicians feels that diverting the PGP IT functions to solely serve and represent their growing IT demands (and thus keeping it separate) will not only ensure committed IT service but will also continue to give it leverage and a voice within the MVMC system.
3. *Technological issues*. Regardless of PGP and its IT department's preference for maintaining as much autonomy as possible, it is the MVMC IT that provides the fundamental network backbone. And it is MVMC IT that PGP IT will need to depend on to invest in and expand this infrastructure. The choice of hardware and software components for PGP functions depends on this irrevocable tie. It is regarding this vital technological aspect that dialog appears to have been inadequate.

Epilogue

Rumors of a merger between the IT factions of MVMC and PGP turned out to have more than a grain of truth. In the 2 years since the case was written, PGP was dissolved by Mission County and all former PGP functions, including management of IT resources in support of the physician staff of MVMC were assumed by MVHS infor-

mation services. The PGP COO, Paul Hammer, resigned, as did the PGP chief of IT. The balance of the PGP employees, those in both administrative and IT roles, were absorbed into the MVMC ranks at equal status.

The customer service orientation of the MVMC CIO and his execution on the MoU with the physician staff, then under PGP, proved to be the right approach to convincing the medical staff to accept direct IT support services from MVMC information services. In fact, many physicians noticed a dramatic positive change as physicians used desktop control and permission to install software replaced the fully locked-down configuration of the former PGP desktop standard.

The dissolution of PGP ultimately served to improve overall IT support for the medical staff of MVMC.

Appendix 21.1 PGP/MVMC Memorandum of Understanding Between the PGP Information Systems Department and the MVMC Information Systems Group

The Mission Valley health and hospital system information service department is a department of the Mission Valley health system (or enterprise), which owns, operates and maintains the Enterprise information systems, networking, computing and data communications infrastructure. This infrastructure is used by PGP, Inc. PGP, Inc. is a private corporation owned by a majority of the employed physicians at MVMC. PGP IS provides insurance billing services to the county and to the clinical departments of which they are members. These support services include information systems and technology services.

This MoU defines the responsibilities of the MVMC and PGP information services.

Definitions

PGP-supported PC

A personal computer used exclusively by a PGP employee or a PGP physician in his or her primary office.

Non-PGP-supported PC

A personal computer used by a county employee in a shared workspace and supported by MVMC information services.

Identification of Equipment

All PGP-supported PCs, printers, and other peripherals are identified by an affixed label on which is printed "PGP IS."

Responsibilities of PGP IS

1. Exercise the sole administration of user accounts in the HHS domain, including adding, deleting, and modifying user accounts.
2. Exercise primary control over, and the maintenance of, all PGP servers and other equipment.

3. Manage and control installation, upgrading and maintenance of all software applications of PGP servers and PCs.
4. Install additional PGP servers in order to accommodate business growth and technical advancement.
5. Provide a help desk and other technical user support.
6. Adhere to MVMC IS standards and policies.
7. Notify MVMC IS in a timely manner when server or global PC issues arise.
8. Participate in the planning and execution of upgrading servers.
9. Participate in the planning and execution of software upgrades.

Responsibilities of MVMC IS

1. Execute its duties in support of the MVMC mission effectively and efficiently in collaboration with its partners of which PGP is one.
2. Allow PGP unlimited and uninterrupted access to its servers and domains.
3. Provide requisite data communications support and network access.
4. Coordinate with the PGP IS help desk on work order requests.
5. Provide PGP IS with space sufficient out carry out its mission.
6. Notify PGP IS in a timely manner when server or global PC issues arise.

22
The DNA Donation Project

Tricia A. Thornton

Ever since completion of the first sequencing of the human genome, geneticists have been struggling to meet the public's hope for breakthrough discoveries. The search for a "genotype-phenotype" link in which associations are made between genetic variations and physical traits faces at least two challenges: (1) the need for rapid ascertainment (patient consent) or ready access to study participants and their DNA, and (2) the need for rich clinical information to accompany DNA samples. These are the two challenges that William Anderson, M.D., of Hudson University Medical Center (HUMC) decided to tackle.

Dr. Anderson is the assistant director of research at HUMC, a large academic medical center in the United States. Along with many other biomedical researchers, Dr. Anderson is interested in how genetic variations are related to human disease and response to pharmacological treatment. Large numbers of subjects with detailed clinical information are crucial to the success of genetic studies, but current methods of subject ascertainment and chart review are labor-intensive and time-consuming.

Dr. Anderson set out to define his biomedical research project by describing a method that would automate the process of linking clinical data with patients' DNA. The process of collecting DNA samples for each individual research study would no longer need traditional subject ascertainment, which required developing a patient consent form and obtaining approval from the institutional review board (IRB) of each individual research study's ascertainment process. Researchers would simply submit requests for the use of anonymous banked DNA samples from patients who had received care at HUMC and whose clinical information could be retrieved for use in any number of genetics studies approved by the medical center's scientific advisory board and the IRB. De-identifying the DNA samples, such that DNA information would not be recorded in a patient's record, would safeguard patient privacy, and patients could not be identified from their DNA samples. Dr. Anderson's concept was named the "DNA donation project."

The DNA Donation Task Force

At the beginning of the year, Dr. Anderson assembled a task force of research and administrative faculty he considered integral to making his vision a reality. It was the consensus of all present at the first meeting that the DNA donation project was very ambitious and would require a large, concerted effort across several individuals and

departments. However, there was also recognition that the project would be very efficacious, especially in the long term, since the greater the size of the DNA bank, the more useful it would be to a wide range of HUMC researchers and their collaborators. Thus, the task force decided to investigate the matter further.

Of great concern from the beginning were the legal and ethical issues surrounding the project, such as when and how patients should be asked to participate, whether HUMC could ever be compelled to release DNA information to a third party, and whether a patient should be notified of a significant medical advance in treatment for a disease to which they were predisposed. In addition, there were concerns about whether patients would actually be willing to participate.

One task force member, Carol Evans, M.D., J.D., director of the genetics and public policy center, offered direction on the legal issues, which included the patient consent process. She expressed the view that true "informed" patient consent could not be obtained under Dr. Anderson's current proposal, where patients would be asked to participate and would be provided with the requisite patient consent form by clerical staff at the time of admission or check-in. These staff would not have the clinical or research background to be able to answer detailed questions about the project, and in addition, patients might feel pressured to participate since the request was made prior to receiving any care, particularly in the hospital setting. The recommendation was made that persons trained in patient ascertainment—either research nurses or genetic counselors—be utilized in this role and that efforts be restricted to outpatient clinics and the clinical trials center.

The second recommendation Dr. Evans made was that focus groups be conducted to assess the public's potential willingness to participate and to explore potential areas of sensitivity. In addition to the anticipated concerns about the privacy of medical records and DNA information, several patients had indicated that they were uncomfortable with the idea of donating DNA without a specific study in mind. Some patients did not understand how DNA from anonymous persons could be used in research. Thus, Dr. Evans recommended that a large-scale educational and public relations campaign precede implementation of the DNA donation project.

In June, a second task force meeting was held, with one important addition to the list of attendees. Just that week Lauren Nelson, Ph.D., M.L.S., had begun work as assistant director of medical informatics. At this task force meeting, she offered to assemble a formal proposal for the project based on notes from the meeting, and in October she disseminated the proposal for comments. Among the items suggested was the hiring of a clinical research professional to plan and direct the entire project. This person would work with administrative and clinical leaders from the hospital and the outpatient clinics to develop a comprehensive business plan, detailing costs and phases of implementation. Despite this recommendation, Dr. Anderson continued to direct the project. By the time a year had passed since the first task force meeting, the recommendations of neither Dr. Evans nor Dr. Nelson had been heeded.

In April of the following year, a third task force meeting was held to discuss the feasibility of the proposal and to decide what the next steps in the process would be. The proposal indicated that a DNA database would be developed that would de-identify patient medical record numbers. Thus, samples would never be labeled with these numbers, and the fact that a patient had donated DNA would not be recorded anywhere in their medical record, although there would be a field in the electronic medical record indicating whether the patient had been approached about participating, so that the same person would not be approached repeatedly. The task force decided that the center for human genetics (CHG) was best equipped to store the DNA samples and

to coordinate any genotyping or DNA sample distribution. In addition, the CHG information technology staff were tasked with developing the DNA database.

During this task force meeting, it was also decided that a pilot for the project should be initiated in one of the outpatient clinics. Dr. Anderson's good friend and colleague, Dr. Duncan, who headed the pediatric asthma clinic, agreed to pilot the DNA donation project. They reasoned that the many patients entering the clinic for blood work would be more likely to donate a DNA sample since it would not require an additional needlestick.

The DNA Donation Project Pilot

By July, IRB approval had been obtained for the pilot. The pilot project began as scheduled in the pediatric asthma clinic with one research nurse from the CHG and one from the pediatric asthma lab. Both nurses covered only a few hours a day at variable times, in an attempt to work with all associated doctors, nurses, and staff.

Almost immediately, conflict developed between the two research nurses and the clinic personnel. The patient consent process and the blood draw for DNA took an average of 20 minutes per patient, which was a significant amount of time for an outpatient clinic. The pilot continued for 3 months, ending in October, with a patient participation rate of 85 percent. Despite the high participation rate, parents of patients in the pilot had expressed concerns about donating DNA for nonspecific research purposes, as opposed to donating it for a specific study of particular interest to them.

During the time the pilot project took place, the DNA database was being developed. DNA samples were being stored in the CHG with the patient medical record numbers still identifying them. Not until December was the system fully functional, allowing DNA samples to be assigned a randomly generated sample number that would de-identify the sample from the patient's medical record. This was not seen as a problem because researchers were not yet allowed to submit requests for DNA samples, and therefore no DNA samples had been released, de-identified or otherwise.

A Change in Plans

Because of the success of the pilot, some researchers in the pediatric asthma clinic began to plan research pursuits that would use the DNA samples that had been collected from their patients. However, unknown to both the pediatric asthma clinic and the DNA donation project task force, Dr. Anderson had abandoned his goal of a large-scale DNA sample bank and database. Despite the high participation rate and general success of the pilot, he felt he still did not have a good blueprint for how to expand the project to a large number of clinics, much less hospitalwide. He reluctantly accepted the view that only experienced professionals, not clerical admitting staff, were qualified to conduct patient ascertainment, and he did not have the resources necessary to dedicate to this effort. This resource limitation, in combination with the concern of patients in the pilot about donating DNA for nonspecific research purposes, led Dr. Anderson to pursue another solution.

His alternative strategy focused on simplifying the IRB process and dramatically limiting the number of DNA samples that would be collected and stored. The DNA database would be used only to store information pertinent to a particular clinical research trial and thus would not provide the detailed clinical information crucial to the success of genetic studies that he had originally aspired to perform.

Questions

1. What might have happened differently if Dr. Anderson had followed through on some of the recommendations made early in the planning process, such as launching a public relations campaign or hiring a dedicated project director?
2. How would you characterize Dr. Anderson's leadership style? What are some of his strengths and weaknesses?
3. What indications were there along the way that Dr. Anderson would not achieve his large-scale plans?

23
Who's in Charge?

Melanie Wilson, Mark Mailhot, and Ed Quick

On May 1, 2000, Steve Modest entered the world of public health informatics by becoming the first information systems coordinator of the Oklahoma Health Division (OHD), a state agency responsible for overseeing public health programming and vital records. In December 1998, a forum sponsored by the National Library of Medicine and the New York Academy of Medicine had resulted in a dozen published papers describing the many and varied information-related challenges of this field. It highlighted the diverse backgrounds of those working in this area, and their widely differing information needs. Their work environments are equally diverse, ranging from huge state health departments with hundred of employees to small county offices with few staff and resources.

Steve Modest was well aware of all this. Starting his new job, he felt his subject and technology expertise as well as his knowledge of the history of public health informatics would serve him well. He had worked for the OHD for 13 years and could even remember when the first personal computer was installed there.

Background

OHD is a small unit of the state department of health. Among its peer state agencies across the United States, however, the OHD is known for its willingness to pilot new projects, to serve as a test bed for Centers for Disease Control initiatives, and to rapidly deploy prototype programs and services. Many of its accomplishments have been recognized far beyond state boundaries, including a program to identify and control emerging infectious diseases. The OHD consists of 116 separate programs organized into five centers: child and family health, disease prevention and epidemiology, environment and health systems, the public health laboratory, and the office of the administrator and program services.

In his previous role, prior to becoming the OHD's first information systems coordinator, Steve's supervisor asked him to conduct a survey of the health division staff regarding their computing needs, expectations, and frustrations and to present it. Steve's efforts were widely applauded by his peers, and he listed the following needs in his report:

- Technical support that includes prompt, courteous, and dependable service
- Better communication channels that would allow them to make a case for getting their information technology (IT) priorities acknowledged
- Clear guidelines concerning standards, security, and documentation requirements

- Convenient and relevant training for line staff
- A revamped purchasing system that would give them timely access to the software and hardware they need
- A clear IT strategic plan.

The division's IT environment improved somewhat after distribution of the report. A definite improvement in the customer service orientation of the technical support staff was seen, and a technical support staff representative was appointed specifically to be a liaison to the health division on technology issues. A new communication channel was also established. A departmentwide information systems steering committee (ISSC) was formed to help address computing-related issues on a broad level and to funnel division-level needs to senior-level administration.

Steve now had a better overall perception of the role of IT throughout the OHD based on the work he had done to complete his report. He had noticed that the funded initiatives of the various centers of the OHD had led to highly splintered IT activities. For example, some centers could be contacted via e-mail or had a sophisticated Web presence, while others did not.

Furthermore, there were no standards for database management software. Some staff had data stored in a Microsoft Excel spreadsheet, some used an Oracle database, and others used a Microsoft Access database. This just added a layer of complexity when people needed to share data with one another. In the past, the OHD had attempted to establish a data warehouse, but there wasn't even a comprehensive list of what it contained nor were there standards or protocols for depositing data. Then, beginning in 1998, the OHD became focused on the year 2000 (Y2K) problem, which became a top priority.

Priority staff time was spent identifying the potential problems, devising means for addressing them, and implementing these strategies. But in the background, some staff members were also starting to express serious concerns about the security of the division's data. A single highly publicized breach could be disastrous. Measures had been taken to increase internal security, but it was external security that was of primary concern. Furthermore, the impending Health Insurance Portability and Accountability Act (HIPAA) regulations were a worry. The OHD was going to need all kinds of new policy and guidelines documentation in order to demonstrate its compliance with new security and confidentiality measures.

In 1998, an information resources strategic management plan was developed. However, a year and a half went by without much of the plan being accomplished. Although the ideas contained in the plan were good, there was no central person to coordinate the work. No one had the authority to execute the plan. Acknowledging both the lack of progress on the information resources strategic management plan and the fact that no one served in the role of chief information officer within the OHD, senior leadership initiated a search for someone to serve permanently in a similar capacity.

After some deliberations, it was decided that the job would instead be advertised internally as a job rotation, i.e., a 1-year change of responsibility for a current department employee. There were some problems getting funding for a permanent position, and a yearlong trial run would allow the department to test whether such a position could be effective both internally and externally. It was hoped that after a year either permanent funding would be found or the person identified would have at least established some permanent means of addressing the most pressing informatics issues facing the health department.

Steve's New Job

The job rotation was advertised to permanent state employees early in 2000, and on Monday, May 1, 2000, Steve Modest began his new job. Although he started out with no staff, he thought he would probably be able to get funding along the way for a few people to help him out on some specific issues. He quickly got to work.

First and foremost, Steve knew his first priority had to be security. The Y2K problem had siphoned staff attention away from this emergent issue, and the lack of an authorized person to lead the team that was interested in implementing it had slowed progress. He also felt the division needed to revamp the information resources strategic management plan and rededicate itself to it. Finding out the current business needs of the department was critical to the development of systems in order to meet the related information needs and to update the plan.

The defunct data warehouse was another issue; he needed to figure out a way to put it to good use. Last, Steve thought that an updated survey of a broad spectrum of the OHD staff about IT support services would be a good idea. An up-to-date document showing current IT needs could be compared to the 1996 document he had compiled to identify overlaps, gaps, and differences. He could then follow up on them in an efficient way.

Steve had been at his new job only 6 days when the bombshell hit. On May 7, the Office of Information Systems top administrators made a formal presentation at the Department of Human Services cabinet meeting. They described the current IT environment departmentwide as one in which the various divisions enjoyed too much independence. About a quarter of all the IT staff were not funded or supervised directly, and at least half of IT spending was done outside it. Divisions contracted directly for some services with outside vendors, setting up their own local area networks, and acquiring and deploying network hardware. There were no departmentwide mechanisms for judging whether and when IT resources should be reallocated within the department to meet sudden priority needs within the various agencies. Fragmentation had led to inefficiencies, confusion, suboptimal service, and poor communication.

The IT division staff also laid out their demands. They wanted a higher-level administrator to manage their group and a new mechanism for setting departmental IT priorities. They also announced that, effective immediately, no IT positions could be created or modified in the various departmental divisions without their approval. Furthermore, they wanted the authority to review all existing IT positions external to the IT division and to determine whether individuals should continue to work in that unit or be transferred to another unit to be determined by the IT division. They asked that reporting authority for IT positions be transferred to them effective immediately.

Steve heard about the meeting later when a senior administrator returned to the office. An electronic summary of the meeting minutes went out to all department staff via e-mail, so that managers as well as line staff received it at the same time. Rumors and questions were rampant. IT staff wondered: Should they no longer report to their boss? To whom should they report? Would they still be doing the same work?

Managers had other kinds of questions: How immediate was "effective immediately"? Would they have some time to plan? Would current technical staff be around long enough to complete ongoing projects?

On the personal level, Steve wondered where he would fit into the organization now and how this might change his agenda. Would he still be perceived as a decision maker or as a colleague? What would the final outcome of this meeting be? Would the IT division demands be fulfilled?

Questions

1. What should Steve do?
2. What questions should Steve have asked as part of his "due diligence" prior to accepting the rotating position?
3. What red flags existed beforehand indicating that this was a high-risk position?

Section VI
Organizational and Interpersonal Conflict

Introduction

Wendy McPhee

Recently I walked into my kitchen to discover that the dishwashing area was again swarming with ants. There was only one thing to do—move into attack mode and deal with them. Why was it that these small "warriors" always appeared when I least expected them, and why did I always react with an angry and aggressive attitude? I decided that I should try a different approach to these pesky little warriors. "Give a little," I said to myself. "Why not try and see if we can live in the same space for the short amount of time that they are present?"

So I placed a small amount of honey on the windowsill—a place where they would be happy to feed and a spot that did not interfere with the day-to-day workings of a kitchen. The ants and I cohabitated for 24 hours, and then they disappeared. I felt much better; I was happy not to have had to resort to ant poison, and I must admit, there were a couple of occasions when I found that I was gazing at their movements and feeling quite fascinated. I'm sure that the ants themselves were also much happier—able to feed on the honey and then move back outside. It struck me that this event was a simple metaphor for conflict management. A little give and take on my behalf had led to a win-win situation with a good outcome for all.

The following statement was made at a recent world peace forum.

> Entering deep dialogue, we will meet up with polarities that cause conflict and turbulence. We have to be willing to accept that. We cannot be afraid of chaos, but see it as a necessary and fertile part of the process. Here are some polarities: deep dialogue vs. forced results; open agenda vs. controlled agenda; process oriented vs. product oriented; formless vs. form; anarchy vs. authority; respectful listening vs. language barriers; presence in the moment vs. time pressure; trust vs. ego. Brought together we enter in trust. Each person is a facilitator. This works best when an urgent problem is facing us. It keeps the attention focused on one reality. It helps to move our hearts and minds toward a common objective. There is no choice necessary between process and product when deep dialogue is most important. When we can reach the magic of genuine communion in deep mutual respect, wonderful products can come out.[1]

The most difficult aspect of conflict is that it is very often a subjective perception (some people would not have been angered by ants in their kitchen). Different styles of personal and organizational communication, management, and authority are all part of the many facets of our personality. Most of us have had the experience of retrospectively wishing that we had responded in a different way from what we did in a moment of confusion, disappointment, and/or anger. We come to understand that in encountering new situations and personality styles, especially ones that we have not yet experienced in our workplace, our reactions can be unknown, hence, the feeling that we could have handled the situation in a different manner.

How is it that participating parties can express conflict in such an opposing and differing manner? Both parties often feel that the other is to blame and are left with a feeling of dissatisfaction, anger, frustration, or discontent. Often we have the innate knowledge that the first step of conflict resolution needs to begin with an apology. It is at this stage that either the downward spiral of conflict can begin or the building blocks of resolution can be constructed.

While effective conflict management is a challenge within any organizational setting, the healthcare setting presents a complex set of issues because of the varied and unique relationships among the many different members of healthcare teams. Perceptual gaps, incompatibilities in an individual's and/or an organization's conceptualization of the same problem can lead to conflict. Conflict has been defined by Hocker[2] as "an expressed struggle between at least two parties who perceive incompatible goals, scarce resources, and interference from the other party in achieving their goals."

The causes of conflict can be many, including resource sharing, interdependent tasks, different or shifting goals, different perceptions and values, personality styles, poor communication, cultural differences, and issues of politics. Often currents of active power play underpin these causes. Newer methods of electronic communication such as e-mail, for example, also introduce another set of complex variations with regard to communication and conflict. Many of us have had the experience of misinterpreting the content of an e-mail. Communication is also an example of a behavior that can be affected by the level of power a person holds within an organization that can be even further exacerbated by using newer forms of electronic dialog.

The evolving information systems of today are reshaping organizations. Traditional boundaries are becoming less defined as sophisticated networks move across departments, divisions, geographical locations, and levels within the organization itself. Organizations need to reconsider how this change will affect on the organization's environment as a whole. With the implementation of new information technologies, future organizations may perhaps consider project, conflict, and change management components of their core business.

Conflict can be healthy and desirable in order to retain creativity and to keep groups moving forward. This is an easy statement to make, but in reality it is a very difficult task to manage. Often conflict between individuals, and within and between groups, can become destructive and personal. The traditional view of conflict is that it is something to avoid at all costs, a phenomenon that could have disastrous consequences for both the organization and the people involved. It is also possible to view conflict as a positive encounter—with consequences that lead to clarity, unity, constructive outcomes, and satisfaction for both the individuals involved and the organization as a whole.

There are many conflict resolution models that can be applied to conflict management. The following is a short description indicating how one might identify the beginnings of a developing conflict and what models of resolution one might consider for achieving a desired outcome.

Recognition of Conflict

The following suggestions are the first steps to consider when one first determines that something is amiss. These five points consider the "what, who, and why" components of the situation that requires attention. They are a mix of many theories but are triggers that I believe lay the foundation on which to build.

1. Detect conflict early. Often a situation can be "nipped in the bud" before it escalates.
2. Determine whether the situation involves healthy or unhealthy conflict. Do you need to deal with the conflict? Will this conflict lead to a positive or a negative outcome?
3. Try to understand why the conflict has presented itself. Reflect on recent meetings and behavior and remember to consider the issues from both sides.
4. Determine the cause of conflict from the symptoms. Are you dealing at the personal or the organizational level?
5. Identify personal approaches to conflict management and negotiation. Reflect on the best way that these can be managed. Do you need to seek further advice?

Methods of Conflict Resolution

In the field of organizational and interpersonal conflict, there are many models of conflict resolution from which to choose. The models presented here are only an introduction.

- *Denial/avoidance.* Denial and avoidance are different things. Denial means to metaphorically "put one's head in the sand" and not acknowledge that there is a problem at all. The circumstances are impossible to manage if one is in denial–despite recognizing that a problem exists. On the other hand, avoidance means that one has made a conscious decision not to do anything. Sometimes there is no advantage to addressing a conflict because there is nothing to be gained.
- *Accommodation or "giving in."* Accommodation of a situation could be considered the best path to choose when one might jeopardize a long-term relationship or when the other person involved holds substantially more power or control. Accommodation is not effective if one believes that the issues at hand are critically important, if one feels resentment by not doing anything, or when one needs to establish a sense of authority.
- *Compromise or "finding a middle ground."* Often, attempting to arrive at a compromise aims to arrive at a solution that is acceptable to both parties. Unfortunately, in reality this solution often does not completely satisfy both parties, and this should be taken into consideration if one decides to pursue this option. Finding a middle ground can also be considered as a first step in conflict management while a more robust solution is being explored.
- *Imposing or using power.* The main components of this method are the use of power and influence. Beware, as this is an extremely high-risk strategy. Relationships may be permanently damaged, and one may be forced to accept a win-lose situation. If the stakes are very high, a decision needs to be made or a disaster will result, and if you are absolutely sure that you are correct, then this may be a viable option.
- *Collaboration or working together.* The advantages of this method are clear. Working together to resolve conflict is almost always the best choice. While this method can require a lot of time and effort, it is most likely to lead to in-depth and sincere discussion, collaboration, teamwork, and analysis, and ultimately achieve a win-win solution.

Once one has recognized the conflict, determined whether it lies at an organizational or a personal level, and once one has decided which model of resolution to use, there

are a few final recommendations that may be helpful for successfully managing conflict. Raymond Zueschner,[3] suggests the following:

- Conflict can be constructive. Recognize that conflict can strengthen your relationships.
- Be prepared. Plan how you will communicate about conflict to create a supportive climate.
- Be involved. Do not withdraw from the conflict or avoid conflict situations.
- Withhold quick retorts. Be careful about what you say and how you say it.
- Review. Summarize what you have discussed and make plans to continue the discussion if time permits immediate resolution.

Remember that conflict at any level is very often subjective and that one doesn't have to address conflict alone.

Personal Accounts

College-level health informatics students wrote the personal accounts in this section. All of them are very private experiences; therefore, some of the authors have chosen to be published anonymously. Consider the following questions when reading these accounts.

- Can you identify any of the five possible steps that lead you to recognize that a conflict situation is arising?
- Can any of the methods of resolution described above be applied to resolve the situation?

And Last

On a final note, the ants are back, but this time those little warriors are marching around upstairs! What is it with these guys? I thought that my compromise was working well! It just goes to show how situations can change. I'll have the opportunity to reflect on which method of resolution I will adopt this time. Hopefully I'll choose the right one, and this battle can be resolved. But realistically, I'm just too tired to be rational about this. I think I'll just go to bed and make a decision in the morning!

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The Chief Resident's Dilemma

Stephen Morgan

Medical residents are neither students nor employees; hence the conventions that exist in the normal business world do not always apply. Residency is often thought of as being more like indentured servitude than a true learning experience; things are often done "because the attending physician said so." With that in mind, the following situation is taken from my tenure as chief resident of pediatrics.

The Conflict

As chief resident, I was often called on to intervene, and hopefully resolve, interpersonal conflicts between medical residents and interns. However, sometimes conflicts involve patients as well. One situation involved a relative of a child who was admitted for dehydration.

Things seemed to be going smoothly for the resident team taking care of the child until the results of admission laboratory studies indicated that he was more metabolically unstable than anticipated. The team responded to this by adjusting the rehydration regimen and subsequently resampling the child's blood to see if the new regimen was helping. Since the child was significantly dehydrated, venipuncture was difficult, requiring multiple attempts. This upset the child's family significantly, as they did not understand the need for so many blood tests. After some discussion, the resident team arrived at a compromise to hold off on further blood tests for the time being and watch the child's progress through observation only.

The following morning the primary care attending physician came in for rounds and reviewed the results from the previous day. She was not happy with the agreement with the family and insisted that the blood test be repeated again immediately. She spoke briefly to the mother and left it to the resident team to perform the procedure. The child's mother then called a close relative for advice. This relative soon came storming into the unit, threatening the resident team and almost striking one of the medical interns. She claimed that they were experimenting with her nephew and persecuting them because of their race. The resident team called the teaching attending physician, who was unable to calm the aunt down. He recommended that the resident team contact child protective services and have hospital security forcibly remove the aunt. It was at this point that I became aware of the events and offered assistance.

The Resident Team

This resident team is comprised of six members: two interns, one junior resident, one senior resident, and two medical students. In addition, there is a teaching attending physician who oversees the workings of the unit and educates the residents. Last, each patient admitted to the ward has a primary care physician who manages the care of his or her patients through the resident team.

- The intern, a physician in his or her first year of pediatric specialty training, is the workforce of the team. The intern is expected to be the primary caregiver for every patient on the ward. He or she writes daily progress notes in each of the patient's medical charts and performs the necessary procedures for each patient. Because the workload is significant, this is a very stressful role. There were two interns on the unit at the time of the conflict.
- The next member of the team is the junior resident. This person is in his or her second year of training and serves as the direct supervisor of the interns and medical students. The junior resident is expected to be the "manager" of the team and ensure that all the work is done properly.
- The senior resident is in his or her third and final year of training and is often thought to be the "oil of the machine." Although not entirely required for the functioning of the team, the senior resident can play more of an educator role for the students and interns. At the time of the conflict, the senior resident was in the emergency department evaluating an ill child and thus was not present for most of the events.
- The teaching attending physician is responsible for the general operations of the inpatient unit as well as being ultimately responsible for the actions of the residents.
- The primary care attending physician is the person who cares for the patient outside the hospital. In this case, the primary care attending physician was one who was thought to believe that residents were somewhat of a nuisance and were useful only for doing the "dirty work" of inpatient hospital care—paperwork, procedures, etc. She offered little support in managing the conflict.
- Third-year medical students on the unit generally work alongside the intern in the day-to-day care of patients. They are responsible for looking after patients assigned to them but are not held accountable for the daily paperwork. This team had two third-year medical students.

Further Developments

The patient's family dynamic and background also played a large role in this conflict. In the local refugee Hmong culture in central California, the family dynamic is matriarchical. Often the eldest female member of the home becomes the head of the household even if she is not truly biologically related to the rest of the family. Another complicating factor in this culture is that the community as a whole is extremely impoverished. This potentially could lead to resentment and mistrust of those thought to be more privileged.

I learned of the conflict at about the time that the security guards were about to be summoned. I was giving a lecture to the medical students when one of the residents interrupted my presentation to let me know that the conflict was happening and that they needed my help. I approached the teaching attending physician and asked if I could attempt to resolve the conflict. I then sat down with the resident team to find out

what had happened and what the issues were from their perspective. Next, I went into the child's room to speak with the family. I introduced myself as the supervising resident and asked them to tell me their side of the issue. Through an interpreter, they relayed their feelings of mistrust and anger toward the residents. I asked the child's aunt about her accusations of racism and if she had attempted to strike one of the interns. The family felt their child was being singled out for frequent blood draws that were not being performed on other children. She also reported that she had not intended to strike the intern but was merely expressing forceful emotions.

I explained that the reason that other children on the unit were not subjected to frequent tests was that they were not as ill as her nephew and that everything done up to this point would be considered standard care for any child with his diagnosis and clinical condition. I also pointed out to her that if someone did not know that it was accepted behavior in their culture, the person experiencing her "forceful" emotional outbursts would in fact be quite intimidated and fearful. I then asked them what it would take to reach a compromise in this matter. We eventually agreed that the conflict seemed to arise from a series of miscommunications and misunderstandings. I offered to supervise the remainder of the child's stay personally.

The aunt and mother were satisfied with this resolution—feeling that they had developed sufficient trust in me and that an acceptable solution had been found. I then notified the primary care physician of the events that had transpired and the agreement that had been made. Finally, I settled down to write a long note to document the conflict.

Analysis

Looking at how this situation unfolded, I can see several factors that contributed to the conflict. First, there seemed to be a lack of communication between the family and the treating team. This is evident in the family's view that the child was receiving treatment different from that given other patients admitted at that time. Another illustration of this is the family's lack of understanding of the expected clinical course. Further communication breakdowns occur on both the physician-to-physician level and the physician-to-patient level, as seen in the family's overall lack of understanding of the treatment plan or clinical course. Last, the family's concern about racism serves to illustrate the general mistrust the local culture has toward the medical community.

There are several examples in the literature of how good conflict management skills could have avoided such a situation. Merideth and Mantel[1] provide an excellent synopsis of the major issues involved in conflict management. They emphasize that negotiation skills are of critical importance for any project manager. Weiss and Wysocki[2] also provide a good review of some of the accepted methods of conflict resolution in a project design. To extrapolate the concepts of project design and management to the clinical setting, anticipation and advanced preparation may have avoided the entire conflict. For example, if the resident team had anticipated the anxieties and apprehensions of the family, they might have been able to recognize that there was a significant degree of mistrust directed toward them. Empowered with knowledge, the team could have sat down with the family and outlined a detailed treatment plan including contingencies for unexpected results prior to the onset of treatment. With regard to the interaction between the resident team and the primary attending physician, much of the conflict could have been avoided if they had discussed the treatment plan and the compromises that had been made.

Overall, this conflict illustrates that negotiation should be focused on obtaining the best outcome rather than trying to win. In this case, the best outcome would have been proper care for the patient and enhanced family satisfaction. Thus, with proper application of project management techniques, this conflict may never have occurred.

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Death of a Committee

Robert Halliday

> *Hence it is necessary for a prince wishing to hold his own to know how to do wrong, and to make use of it or not according to necessity.*[1] *(Machiavelli, 1513).*

Five years ago the chief executive officer decreed that our hospital should have an Internet as well as intranet presence to position the hospital as a leader in information technology (IT). As a result of this decree, the director of IT formed a Web services committee to oversee the development of these services. The initial efforts in this direction were beset with conflict, which resulted in the sudden resignation of the committee chair and, shortly thereafter, the exit of the Webmaster from the organization. Despite the significant impact of this false start on the remaining committee members, the process was resurrected, and a successful, functional group has subsequently overseen the implementation of Web services according to the original intention.

The sudden demise of the Web services committee illustrates a number of errors in planning that enhanced the likelihood of conflict developing and ensured that there would be little hope of satisfactory resolution once such difficulties were encountered.

In order to describe the events and dynamics, it is useful to document the participants, the process for their selection, and the brief they were given at the group's inception.

The Players

Invitations to serve on the committee were issued by a procedure similar to that used by most committees within the organization. Representatives were selected by the key stakeholders to represent the interests of particular groups. The intent was to create a relatively large, but hopefully inclusive, group able to articulate the concerns that might arise at a relatively early stage of development.

The problem with this approach is that it frequently fails to harness individuals with expertise. Committee members tend to be chosen according to rank rather than skill, and the formation of this committee was no exception. Consequently, the membership was strikingly similar to that of many other committees and lacked individuals with awareness or skill in IT other than the representatives from the IT department.

While this general characteristic was present throughout the membership, some members deserve special mention.

The Committee Chair

The chief executive officer, with the blessing of the IT director, appointed the committee chair. He was a specialist physician who had largely moved from clinical medicine into the research arena and was consequently not as well known to the committee members. This lack of day-to-day clinical credibility and contact ultimately proved to be a major factor in the committee's demise. The committee chair had had some experience with Web technology as a user, and his ability to speak the technical jargon earned him his position as chair. Unfortunately, he was also a person of strong conviction, and although he held a vision of how the project might evolve, it was held rigidly.

The Webmaster

The IT director appointed the Webmaster, who had recently been hired from outside the organization. He had been hired solely for his technical ability since the organization did not possess any other staff members with any of the required skills. He was highly technically competent and had had recent experience in the role in another organization.

Given this recent experience, the Webmaster had a well-defined concept of how the intranet and Internet sites should be managed. He accomplished his tasks efficiently but tended to operate independently. He did not pass on any of his skills to other members of the IT staff and maintained rigid control of access and content production. He insisted that others with lesser skills were at considerable risk of "breaking" the system if they were permitted access.

The IT Director

The IT director had recently been appointed to the position from a clinical department when the position was made vacant by the departure of the previous incumbent. He had had no formal training or previous experience in administering technical projects and from a technical viewpoint was at the mercy of the IT staff. Given the overwhelming adjustments required by his new position, he played only a minor role in the inception of the committee.

The Clinicians

There was significant representation from clinicians on the committee with membership along divisional lines. As a result there was a medical representative, a surgical representative, a nursing representative, and allied health representatives. The rationale for this approach was to provide a broad perspective on content. Very few of the participants had had regular experience in using the Internet.

The IT Staff

There was representation from the IT department management on the committee because technical and resource issues, as well as training were likely to arise. The IT

staff subsequently proved to be important when conflict arose, as they universally supported their technical colleagues rather than the clinicians.

Rules and Assumptions

Once the participants were identified, an inaugural meeting was held to launch the project. By the conclusion of the first meeting several assumptions had been confirmed and a few rules had been defined.

One of the early decisions was to split the project into two distinct domains: the intranet, accessed entirely from within the walls of the institution, and the Internet site, which would be accessible from outside. It was decided that in order to gather experience with the technology the first priority would be to develop the intranet, with the Internet site following.

The intranet would be built in the first instance with a departmental structure with pages allocated to each department and would essentially be a vehicle for displaying contact information, location, a brief statement of purpose, and each department's policies and procedures. This decision was driven strongly by the hospital's engagement in obtaining accreditation and the need for the policies and procedures to be widely available throughout the institution. Because of the time pressure for obtaining accreditation and the need for the policies and procedures to be complete, there was little consideration of how the intranet might contribute beyond this narrow functional role.

By the second or third meeting, the rules for content production and processing were beginning to emerge. It was decided that the authority for content would rest with the department heads. This was aligned with the current delegation of authority for the production of paper-based documents. Individuals within departments would be authors and editors, and department heads would approve content prior to its publication. While this model received universal support, the first sign of conflict began to emerge when the discussion turned to the publication process from department to Web site incorporation.

Conflict

Within the first few meetings a polarizing issue emerged that divided the committee quite sharply into two camps. The clinicians and nontechnical members of the committee felt strongly that the process of publication should be performed at the departmental level. This would mean that with the authority of the department head, individuals within a department could create, edit, and publish directly to the intranet from their offices. This would also mean that quite a large number of individuals would need to be given access to the Web server so that content could be changed. The clinicians felt that this was an essential step to assist in the generation of content. They did not believe that potential authors would create documents if the barriers to publication were high. Similarly, frequently updated documents such as staff rosters and other lists would never be placed on the intranet if there was a risk that they would be out of date.

The Webmaster, supported by the technical staff, voted strongly for a centrally managed model where the only person to place content on the intranet would be the Webmaster. Authors and editors would need to submit documents to the Webmaster

in an electronic format. They would then be "tidied up," translated into HTML, and placed in the correct location. The reason for this approach was largely the fear that unskilled users would break the system. Other reasons included the necessity of maintaining a uniform look and feel, the difficulty in training users, and the cost of supplying appropriate Web authoring software throughout the organization. There was also an unspoken belief among the technical staff that this work was their domain.

In practice, the Webmaster successfully thwarted all attempts by the clinicians to assume a role in the publishing process by remaining the single conduit to publication. This sufficiently irritated the clinicians to slow the content production process to a trickle. Consequently, the task of achieving publication of the promised policies and procedures lagged, and increasing pressure was brought to bear on the committee chair from the chief executive officer via the IT director.

Showdown

To settle the dispute, the committee chair placed the issue at the top of a subsequent committee meeting's agenda. He had already clearly stated his position as siding with the clinicians. The discussion at the meeting was rapidly reduced to the committee chair arguing with the Webmaster, and the meeting ended without resolution.

Shortly after the meeting the committee chair wrote to the IT director tendering his resignation from the committee, quoting irreconcilable differences with the technical staff. The Webmaster hung on a little longer, but he became increasingly distanced from his technical colleagues and was encouraged to depart.

Resolution

Following the meltdown of the committee, a new committee chair was appointed, a new Webmaster recruited, and the committee, sobered by its recent experience, reached a temporary compromise regarding the issue and concentrated on proceeding with the work required. The project has subsequently been very successful, although there are still differences of opinion regarding the publication process.

Comment

Conflict consists of interactive, opposing behaviors involving two or more people, groups, or larger social systems having incompatible goals.[2] The opposing behaviors may stem from a perceived loss or potential loss of something one or more of the parties has or wants. One of the consistent needs in complex organizations is the need for power.

Organizations are coalitions of individuals and interest groups. There are frequently enduring differences among members. Since most decisions involve the direction and allocation of scarce resources, this engenders conflict, with power being the most important resource. Goals and decisions emerge from bargaining, negotiation, and jockeying for position by different stakeholders.[3]

In this case there was a fundamental struggle for power over the publication process. The clinicians were not going to be edited by the technical staff, and the technical staff were not going to clean up after the amateurs when they broke things.

While this particular sentiment is difficult to erase, a more constructive approach to managing these differences may have averted the crisis encountered. Much of the blame can be laid at the feet of the leadership, particularly the committee chair. The formal leader's style within a group can have a powerful effect on the amount of conflict in the group and how this conflict is managed. A leader who is able to adapt to chang is seen as more competent and is more likely to be effective than one who sticks rigidly to his or her own views.[4] A lack or weakness of skills in running meetings can also be a factor in conflict. For example, research has shown that when a leader fails to help a group separate understanding the problem from making proposals for a solution, this is likely to precipitate unnecessary conflict.[5]

Other contributing factors that set the stage for conflict were: the overly large group size, the selection process that ensured that all the warring factions in the organization would be forced into a closed room while not including those with skills and insight, and the lack of clear direction from the executive at the inception.

Once the defining issue had materialized, the committee chair ensured that it became the focus of the group and personalized differences by aiming criticism squarely at the Webmaster. The Webmaster responded in a passive-aggressive manner that further fuelled the conflict.

Conclusion

Many of the problems could have been avoided by a more appropriate choice of a committee chair, selecting a smaller group, building the group according to expertise, and forwarding any contentious issues for wider discussion at presently existing divisional meetings. The development of terms of reference at the outset would have helped, as would a clear statement of the role of the Webmaster.

There is a persistent difficulty in many IT projects in the public health system when an attempt is made to form functional project groups by aggregating individuals from disparate backgrounds, as was seen in this case. There is an overwhelming need for project groups to include trained informatics professionals who are able to relate to both the technical and clinical members of these groups and thus avoid many of the sources of conflict.

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Whose Job Is It Anyway?

Andrew Buettner

Background

This account focuses on a time of conflict and change within my workplace environment over the course of a year. My workplace is a clinical department within a tertiary referral hospital. The change occurred with the movement of the department away from one largely run by long-standing visiting medical officers (VMOs) to a modern one with a completely new leadership structure. It is necessary to describe the department structure before the details of the conflict can be discussed.

The department's business is the provision of public medical services to patients as well as the training of residents. Traditionally one or two full-time staff (director and staff specialists) ran departments. The bulk of the work was performed by VMOs. A junior consultant usually held a staff position for a few years prior to commencing his or her private practice. There was some stigma associated with retaining such a position beyond a few years, as it was often considered that the individual was unable to establish his or her own practice. Clinicians who spent the majority of their time in private practice and often regarded their public appointments as something akin to charity, held VMO positions. Indeed, in the past they were not even paid but were called "honoraries."

Over the past 10 to 15 years there has been a "sea change" in the structure of many departments. Fewer newly qualified consultants have sought to go out into private practice and have instead opted to remain in public or staff appointments. This has happened for a combination of reasons—improved lifestyle, academic interest, improved remuneration, and the decrease in private health insurance associated with the introduction of Medicare. The pendulum has now swung back. Most newly qualified consultants prefer to remain within staff positions, and there is a slight stigma associated with those who go out into private practice straightaway.

Within my own workplace, staff and VMO positions have not been as sought after as positions at other tertiary referral academic departments. This may be because the hospital does not offer all specialties. It is also associated with a fair number of night calls (frequent callouts at 2 a.m.). As a consequence, the department was largely run with a small number of full-time staff and a larger number of VMOs.

The department has had a checkered history in the recent past. It was one of the first academic departments within its field in the country. Over decades it established an enviable reputation and was responsible for training generations of doctors. After the retirement of a long-serving department head, the next three directors were all long-standing members of the department who had trained under this man. They were thus

all similarly well known within the community. Many of the VMOs had also had long links with the hospital. A number of them had held staff positions within the department before setting up their own private practices.

Unfortunately, prior to the accession of the current director the department was sliding into oblivion. The previous director had been unable to recruit and retain staff, with posts often being filled by short-term locums, some of whom were not well respected. Long-standing and aging VMOs occupied many of the visiting posts. This led to some abuses such as inadequate supervision of junior staff and poor attendance for public clinics if more lucrative private work was available. Matters came to a head when senior hospital management forced the departure of the director.

A new, younger doctor was appointed in his place, and she set about rebuilding the department. Her first priority was attracting new staff. I was recruited to a senior position as a newly qualified consultant. I had trained within a very well-managed department and had been offered a consultant position within it. The offer of such a senior position was too good to refuse, however, so I took it.

Five months after I began, the director became ill and was off work for 4 months during which time I was acting director. Throughout this time I became enveloped in a number of conflicts, all occurring between two separate groups—a number of older VMOs and some staff specialists.

Conflict One

The conflict with VMOs involved rostering arrangements and attendance. As I have already mentioned, some VMOs had worked within the department for many years. As such they were used to things being done in a certain way. A small group of these VMOs often arrived late and performed little supervision or teaching of residents. Assumptions that I made about this group were that they regarded their public practice to be of peripheral importance to them. I found myself in the situation of having to speak to individuals about showing up on time and the importance of properly supervising residents. I found these situations very uncomfortable, as I was dealing with very senior and experienced clinicians who in some cases had practiced medicine longer than I had been alive. Without exception, the VMOs I had talks with all chose to resign their public appointments. In retrospect I feel that I could have handled the situation better, though I am sure that the ultimate outcome would have been the same.

The needs of the department at that time were to have reliable consultant staff. For some of the VMOs their time within the department was a very small fraction of their working week. They were juggling private commitments and other public appointments and often found it difficult to arrive at work on time. As long-standing staff members, they probably felt that they were due some slack in view of their past service. Undoubtedly there would have been some resentment toward somebody who had been on the job 5 minutes telling them what to do. More recognition of their needs on my part could have led to their departing on better terms. The regret also is that the memories of these long-standing members form part of the historical record of the department, a link to the past that is now broken.

Conflict Two

The second major area of conflict was with two staff specialists. I think of this group as the "legacy system." They worked half-time and had either been hired by the previous director or had commenced work early during the tenure of the current director when the staff shortage was acute. Whereas VMOs are responsible only for clinical duties, staff specialists are responsible for some nonclinical duties as well, such as administration, rosters, resident education, etc. These "staffies" form the core of a department. At the time of the director's illness our staff shortages became acute, and a maximum effort was needed from all staff members. I found early on that I could not rely on these legacy staffies to do anything productive. One of these individuals was commencing a private practice outside his hours within the department and was having some of the problems of the VMOs described earlier. He had other administrative responsibilities that he never carried out despite repeated requests. My relationship with him deteriorated to the point that communication broke down. Meetings would be called for which he never showed up. He did petty things to flout my authority, such as making a display of using expensive equipment or drugs that I had previously restricted for budgetary reasons. Fortunately, the situation was resolved when he wished to change the days that he was working. I was then able to say that there was no position available for him on the days he wished to work, and he elected to resign.

The other staff specialist, who knew every aspect of his contract chapter and verse, would only work strictly within those stipulations. As a clinician he was good. He was also reliable but very inflexible. Conflict arose when I made changes to the medical malpractice insurance arrangements. As an employee of the hospital, the hospital provides this insurance. This covers only our public practice, and we still need to have insurance for private practice. It is, however, at a much-reduced rate compared to that for someone who works solely in private. I learned that the department was paying medical malpractice insurance for its members at the much higher private practitioner level rather than at the salaried medical officer level. This benefited only those staff members who worked in private practice and to me seemed to represent a case of the public subsidizing the private system.

After a consultation with the director this practice was changed so that medical malpractice insurance was paid at a level commensurate with that for a salaried medical officer. This had implications mostly for the physician who had a private practice outside his salaried position. He maintained that his contract stipulated that he should be at the higher rate. I had obtained prior legal advice, which said that this was not the case. This staff member ultimately felt that this was the straw that broke the camel's back and resigned.

I felt that his position was indefensible, but that the situation could have been handled better if I had made more of an effort to explain the changes before putting them in place. Ultimately though, I am sure that the same result would have happened.

Reflection

This time of conflict was difficult. All the personalities, including my own, were somewhat aggressive. For my part I ascribed motives to individuals, such as greed, that the individuals concerned obviously would not have thought of in that way.

Changes to a more modern departmental structure were needed. Ultimately, staff that were unable to adapt needed to go. A more diplomatic approach on my part may

have led to their departing on better terms or over a longer time period. Of course, it also could have been perceived as a weakness and led to a continuing malaise. Some of the problems on my part arose from not managing the change well. Some of the staff obviously did not feel involved in the changes and indeed probably felt threatened by them. It was difficult in that there was not a respected leader in charge of the process. Being a newly qualified consultant created a bit of a credibility gap. More effort could have been made to guide staff into what were desirable behaviors. Finally, greater acknowledgment could have been made of the staff that did participate and support the department through the changes.

The return of my director from illness was welcomed. She has a smoother style and better people skills. It is still a standing joke within the department that when she is ill or takes a holiday, leaving me in charge, somebody will get the sack.

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All for the Want of a Plan . . .

ANONYMOUS

This account centers on an information system, MedCare, installed in several public hospitals in 1999 under pressure to achieve year 2000 (Y2K) compliance. MedCare had been developed in another country; thus, the corporate office was overseas, and a small regional office (in a state separate from the sites) managed the product locally. The stage was set for conflict by all the usual factors accompanying a rushed information system implementation, including poor planning, ambiguous contracts, and insufficient training. It took the entrance of a new player on the scene, Ms. Black, to ignite the escalating conflict. The "sparks" involved two fairly trivial administrative tasks—preparing an enhancement estimate and completing a questionnaire.

Background

Ms. Black was hired by the state Department of Health Services (DHS). She was responsible for all information systems throughout the state. She did not personally use MedCare, or work in a hospital, but was politically powerful. The position was created subsequent to MedCare being installed, so she was not involved at the beginning of the process. Each hospital had a system supervisor who managed MedCare at each individual hospital site and acted as the point of contact between that hospital and MedCare's regional office. Mr. Brown was employed by the MedCare regional office to manage the system. He was the contact between the local hospitals and the MedCare overseas corporate office where all the development took place.

Conflict Flashpoints

The Enhancements Procedure

The enhancements procedure was the method by which the sites, in theory, could incorporate changes into the software. Written into the contract with the state was MedCare's commitment to provide twenty-five "free development days" annually to be used for adding enhancements to MedCare. This meant that enhancement requests had to be agreed on and prioritized among all the sites and approved by MedCare.

The enhancement procedure included the following steps:

1. Each site's system supervisor completes an enhancement request template for each enhancement they would like.

2. The request is sent to the MedCare corporate office where it is entered into the enhancement database and assigned a unique number.
3. The request is either declined (and removed from the enhancement database with the reasons communicated to the system supervisor concerned) or accepted.
4. The twenty-five free development days belong to the sites collectively, however. A report listing all the accepted enhancement requests is distributed annually to the system supervisors of each hospital, providing the opportunity for these requests to be reviewed and discussed. This report includes a "prioritization table" providing the following:
   a. The identification number of the enhancement
   b. The enhancement title
   c. An estimate of the amount of development time required given in a range of days, i.e., 1 to 5 days for relatively straightforward enhancements, 5 to 10 days for moderately complex enhancements, 10 to 20 days for complex enhancements, etc.
   d. A field in which the system supervisor can assign a priority to the enhancement by awarding it a number of points.
5. The system supervisors have 4 weeks to return the list of requests to MedCare, prioritized by importance to their hospital site.
6. MedCare totals the points and ranks the requests in order. The corporate office schedules the enhancement work, beginning with the highest-priority enhancements, and goes down the list until the twenty-five free development days have been used.

This enhancement procedure had been accepted at other MedCare client sites, and had worked at these hospital sites without serious problems as well, until Ms. Black was appointed. She wanted an estimate quoted in number of days (–/+10 percent) on the prioritization table—not in a range of days. To quote Ms. Black: "It simply is not feasible to quote between 10 to 20 days, and even when providing these numbers to call them estimates. I really can't see what the problem is with providing a more accurate account of the provision of service requested as it is considered standard procedure."

In response MedCare argued that (1) to estimate with this degree of accuracy for all the enhancements, the 25 days of development time would be used up preparing estimates, leaving no time to develop and test any of the enhancements, and (2) prioritization of the enhancements should be largely based on functionality, with the time estimate used as a guide. MedCare would thus only agree to a tentative target, and quote a range of days for the enhancement report.

Because the estimation process had not been described and recorded in detail and had been approved by Ms. Black's predecessors, both parties stuck to their idea of how things should be done. There was no process in place for managing changes in the enhancement estimation process—resulting in an impasse with Ms. Black refusing to allow her system supervisors to take part in the enhancements procedure.

MedCare decided they had to continue with the existing enhancements procedure for that year at least, to fulfill their commitments to their other clients, who were satisfied with the range-of-days estimation offered by MedCare used to prioritize enhancements. This provoked Ms. Black further, and she stated in a memo:

As I had mentioned in several earlier correspondences, we have not voted on these enhancements due to not being supplied an accurate number of programming days. It is disappointing to see MedCare proceed with the enhancements when we have asked on numerous occasions for an accurate amount to be provided on programming days. I reiterate that these enhancements may

have been selected by other clients, but that we have not endorsed them, and as such, we will not relinquish our entitlement to our allocation of development resources.

This stance created contract problems, as MedCare had agreed to provide Ms. Black's hospitals with enhancements but unfortunately had not documented exactly how this was going to be done. If only it had been realized that "once all project stakeholders agree to the estimation procedure, one can engage in rational negotiations about the inputs to the estimate (feature set and resources) rather than irrational arguments about the outputs (budget and schedule)."[1] A written and agreed-on estimation procedure within the enhancement procedure could have prevented these problems between MedCare and Ms. Black.

The Questionnaire

MedCare sent out an annual questionnaire entitled "System Supervisor Satisfaction Questionnaire" to gain qualitative feedback from users about the MedCare product and services. The system supervisors usually completed the document and e-mailed it back to the regional office for compiling.

Ms. Black's feelings about this were stated as follows: "Please note that I have asked sites to delay completion of the user satisfaction survey, as it should be discussed at the next state meeting. I have concerns with some of the questions as they are very subjective rather than objective."

MedCare argued that (1) this was a MedCare questionnaire, not a DHS questionnaire, and so MedCare should administer it, and (2) MedCare was canvassing the individual opinions of the actual users (system supervisors), not the collective opinion of users.

The end result was that MedCare's questionnaire was sent to Ms. Black, who distributed it to her sites and then collected and correlated the responses on her own. MedCare felt, rightly or wrongly, that the motive behind this action was to prevent any "good feedback" from the actual users reaching the regional office that could then be used to argue their case with Ms. Black and DHS.

With Hindsight . . .

The first step on the road to these conflicts was insufficient planning. A robust, agreed-on, and therefore enforceable enhancement procedure would have been a good start. If this had been coupled with an agreed-on change control process detailing how to make changes to the enhancement procedure if the need arose, the conflict regarding the estimation process could have been better managed. Similarly, if there had been a documented, agreed-on process for gathering feedback from the end users, it would have been easier for MedCare to maintain this line of communication.

Conclusion

The root causes of these conflicts, like most conflicts were:

- *Poor planning.* Exactly how MedCare was going to be managed within the sites had not been given enough thought. The hierarchies and work practices of the clients, and the contracts signed with them, were very different.

- *Poor documentation.* Documentation was almost universally poor, starting with the original contracts and going on to include the enhancements procedure.
- *Poor adherence to the procedures in place.* Even where procedures existed, they were unclear and often ignored.
- *Poor communication.* The distances and time zones involved should have made those involved focus on setting up clear, formal, regular communication paths. Instead it was a case of good luck rather than good management if a message got through.

If the above bases had been covered, the chances of anyone being able to derail the enhancements procedure or a satisfaction survey would have been reduced and the working environment of all involved improved.

Reference

1. McConnell S. *Software Project Survival Guide.* New York: Microsoft Press, 1998.

28
Fail to Plan, Plan to Fail

Janette Gogler

Background

I applied for a position within the organization I worked for and got the job. It had a good title, sounded progressive, and was in health informatics. With this new position I inherited a telehealth project that had already been in progress for more than 12 months and proved to be immersed in problems. The local health department funded the project, which involved fourteen metropolitan hospitals and rural hospitals in a partnership. One organization was the lead, managed the project, and accepted all the responsibility for the project's objectives. This telehealth project had to demonstrate savings from patient or clinician travel and revenue where possible. A steering committee composed of seven members, a committee chair, the project manager, and a representative from the funding body was formed and met irregularly. In my opinion, the objectives were ambitious considering the resources, the time frame, and the change management involved. My initial assessment was that this was a technology solution looking for a problem.

There was no time to receive an orientation to the project, so all the corporate knowledge went out the door when the previous project manager and project officer left the organization. What I found was a lack of project documentation—including poor documentation of decisions made at previously held meetings. I could not even find a project plan. A high-level project plan existed, but that was all. It appeared that much communication had occurred by e-mail; no regular project summary reports or even regular financial statements or updated issues logs were available. It is never easy walking into a project already under way, but a project without a documentation trail is even more difficult.

The Conflict

Poor project planning, lack of leadership, incredibly poor project documentation, a poor context in which to progress, a knowledge deficit among steering committee members, and an overall lack of trust between the rural sites and the metropolitan sites were all problems that I faced. There was also an assumption by most members of the committee that "If we build it, they will come," but telehealth needs more than a positive outlook to work; it requires coordination, people at the other end, a patient, and so forth.

Early on in the project life cycle a major external dependency failed. This dependency related to being able to link two healthcare organizations' networks. At this time

one of the options was to close the project. However, the steering committee elected to work around the dependency, and further costs (not to the project) were incurred by one of the parties. This decision led to conflict, as an opinion existed that these costs should have been shared across the rural and metropolitan sites. I was not involved at the time, but I have the feeling that this was a difficult time for the project. There was a desperate desire for the project to survive, and as a result of the above investment, the party concerned wanted an early deliverable from the project.

I believe that this event was likely where the conflict started, and it continued up until the actual implementation. There always seemed to be a "them-vs.-us" attitude across the steering committee, between those representing the rural and the metropolitan sites. This attitude and suspicion continued throughout the project and made my job really difficult. I had to be careful not appear to be favoring one group over the other.

Stakeholders and Personalities

This project had many masters—the health department, the chief executive officers (CEOs) from the rural sites represented on the steering committee, and the metropolitan representatives.

Committee members

Unfortunately, the meetings held over the previous 12 months had focused on failed technical issues. The committee members did not have enough real knowledge about technical matters to understand the decisions; they were "guided" not by the project manager but by one or two members who appeared to have an understanding of the technical issues and tended to dominate the meetings. When I joined the project, this continued to happen, but as I gained more knowledge, I was in a position to challenge some comments and make recommendations. I was not always successful in getting the recommendations through either, as once again these personalities dominated the meetings.

The meetings became an attempt to keep one member happy with any decisions made rather than have equal representation and voting on decision making. He was a bully and was not "managed" by other members or the committee chair. Unfortunately, the committee chair was not strong enough to run a good meeting. She also had a knowledge deficit related to technical matters and did not request further information for the members or try to become better informed. The focus was always on the technical; the clinical protocols and policies were tabled without question and signed.

Because of the 12-month slippage, the health department was greatly concerned about the viability of the project. Were they ever going to see some deliverables from the investment they had made? The conflict became worse as more stakeholders became involved in different expectations of what the project could deliver.

Assumptions

I made assumptions that there would be clear project documentation, that a detailed project plan would exist, and that I would "just pick up" and continue on with the project management process. In retrospect, it seems that politics and conflict dominated

the project and that no controls were in place because of lack of structure, inadequate planning, and poor project documentation and reporting. The telehealth proposal was written in a short time frame without adequate consultation and realistic clinical studies. Considering the diversity of the objectives and geographical areas, the medicolegal aspects and payment options all needed to be considered in a feasibility study prior to commitment. This would have confirmed if the objectives were realistic.

Very little time was allotted to project planning. I don't believe that, once the proposal was prepared and the project initiation document written, any further planning occurred. It was a classic case of "fail to plan, plan to fail," and getting a sign-off at each stage of the plan would have obtained the emotional buy-in of all concerned as they contributed and began to understand the project in its entirety.

Resolution

First, I stopped any further activity on the telehealth project until we had a plan signed off on by the steering committee. I broke the large project into parts. I worked with another "resource person" to develop the plan—commencing with a "test" of the technical aspects followed by a pilot phase and then a rollout to lead sites and finally to all sites.

Next, I created some project structure to share the responsibility for this distributed work. I also formed a technical committee, to move highly technical discussions away from the steering committee, so only recommendations were made. This worked well. I believe the committee just did not have any concept of the work involved in getting the project under way from a clinical perspective. They viewed this as a technology rollout rather than a clinical effort requiring change management, with policies and procedures based on using this technology for clinical teleconsultations.

I organized monthly steering committee meetings, where regular project summary reports were provided, issues and risk logs, scope changes, and exception reports. I also documented the exception reports and scope changes retrospectively. I had all these documents signed off by the committee. It demonstrated the poor minute taking and unacceptable lack of documentation and was an eye opener for the committee members.

Another area of conflict was the budget. There was concern that the project overhead was paying for other unrelated costs for the lead site. I began providing regular financial statements. This meant that the committee could make decisions to fund an extension to the project manager's position for salary, increase a resource, or limit the purchase of equipment.

I also kept all communications within the steering committee meetings unless it was necessary to inform all the committee members by e-mail of an item or problem. The previous manager had e-mailed only some of the members to discuss issues and did not include others. I did not want to continue this as a form of project communication.

Conclusion—Lessons Learned

I learned that:

- Group conflict and poor decision making can result from a collective knowledge deficit and poor communication methods. It is worth acknowledging this, and pro-

viding the information required, so that committee members really are empowered to make decisions as a committee and not allow one member to dominate the decision making.

- The most important phase in a project is the planning phase. It is really the make-or-break stage, and if not done properly, delays the project and creates conflict. I learned that unresolved conflict continues throughout the lifetime of a project and in the end is habit forming.
- Emphasizing a project's structure, process, and outcome works. Imposing project structure and creating a reporting and documentation process achieve a better outcome—even if scope changes are made along the way.
- It is possible to inherit an out-of-control project and turn it around—and it comes at a cost.

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Founding Fathers Health Corporation: Idealism and the Bottom Line

Richard Dykstra, Lara Fournier, Manish Parekhji, and Qin Ye

Background

Founding Fathers Health Corporation (FFHC) is a not-for-profit healthcare organization located in the southeastern region of the United States. It includes a staff model health maintenance organization (HMO), a very successful preferred provider organization (PPO), and thirteen hospitals in three states. Colonist's First Medical Center (CFMC) is a 460-bed hospital with 1,600 medical staff members and is one of two FFHC hospitals in a large metropolitan area in Virginia. Eighty of the physicians associated with CFMC are part of the staff model HMO, while another 120 are members of practices owned by FFHC.

Although it is a very large organization, the culture is consensus-driven and characterized as "polite." While this makes for a very pleasant work environment, it sometimes stands in the way of frank and open discussion. It is difficult to express strongly emotional or differing ideas or positions because of the backlash that could result from clashing with the polite culture. When a problem arises, there is much frustration in attempting to gain the system's attention. Although consensus is the goal of decision making, the sheer size and scope of the organization means decisions are often made at anonymous and invisible organizational levels. Many find it difficult to find the person or office responsible for correcting a problem when a grievance arises.

A tradition of promoting from within has perpetuated the culture of the "civil tongue"—placing limits on career growth for more outspoken individuals. Recently, however, FFHC has been filling more management positions with candidates from outside the organization. These newcomers are more willing to speak out and challenge the established culture. It remains to be seen whether the organizational culture will tolerate them and the change that they might represent.

CFMC has been widely regarded throughout FFHC as an early adopter of electronic medical record (EMR) systems. Although it has had some notable failures in the past, it is moving to overcome its history through the establishment and support of a professional informatics department. The chief information officer (CIO), Ben Arnold, has witnessed two failed implementations in the past 5 years.

Betsy Ross, R.N., M.S. with a master's degree in informatics, has had a long history of patient advocacy. She was hired nearly 4 years ago as chief implementation officer at CFMC, shortly after CFMC suffered an embarrassing failure in a poorly planned implementation of an electronic admitting system at the hospital.

Since then, Ross has worked closely with a charismatic physician, Dr. John Adams, who was then the director of medical informatics at CFMC. Together they envisioned

and formed a six-person information technology (IT) facilitation group whose goal was to make information systems available and, most importantly, functional for the clinical staff at the two local hospitals and at the associated clinics of CFMC. Dr. Adams, a technology champion, served as the leader and manager of this energetic group.

FFHC, the parent of CFMC, has licensed a functional EMR called MedPro from a national vendor and has successfully implemented it in their HMO offices and other FFHC-owned clinics and practices. They have also developed a strong IT infrastructure with the expertise to manage the associated databases and the network hardware and software. Physician order entry (POE) has become a top priority for senior management, and implementation is in the planning stages with a rollout set to occur in the next 8 months.

A New Joint Venture

Drs. Ben Franklin and Tom Jefferson, physicians in one of CFMC's owned practices, have decided to go out on their own and form their own private clinic called Pioneer Clinic. These enterprising physicians have long considered themselves "systems thinkers" and have been frustrated by the inefficiencies of the established practice of health care in the United States. This has fueled their ambition to "start from scratch" in designing a new, state-of-the-art clinic from the ground up. They will no longer be employed by FFHC but plan to maintain close ties and will continue to retain patient admitting privileges at CFMC. They have been involved in several FFHC electronic systems implementations and have seen the difficulties associated with implementing such systems in established organizations. It is their fervent goal to build an electronic, virtually paperless clinic by implementing the best software systems and the most modern technologies available. Both are very familiar with the MedPro medical record system and want to use it in their new venture.

Drs. Franklin and Jefferson presented a joint venture proposal to senior management several months ago, in part requesting system services and the use of MedPro at their new state-of-the-art clinic. This idea of a joint venture is new to the FFHC system but has been viewed favorably to date. Dr. Adams (head of the IT facilitation group), chief executive officer (CEO) Jim Madison and, to a lesser extent, CIO Ben Arnold, are proud of the health system's mission to provide the most advanced medical care to all persons living in the region. Facilitating a regional medical record to privately owned clinics would be seen as fostering this mission. Pioneer Clinic's innovative plans seem to resonate with the FFHC corporate culture and mission.

This venture is likely to result in more prestige for the institution and may signify an incremental step toward a new era of medical systems and insurers cooperating with private clinicians to improve patient care in the region. It could also serve as a model for the introduction of electronic medical systems into more rural areas that traditionally lack the necessary resources and infrastructure. Ross has heard of only one other healthcare system in the Northeast that has had early success in a similar arrangement with private clinical practices. She hopes that this new joint venture can serve as an opportunity for her to become part of an exciting informatics project.

Initially, the joint venture proposal was met with enthusiasm by FFMC, and plans were drawn up to provide network support and the MedPro EMR at cost—primarily because of the positive and innovative image this would provide for FFMC. Ross sees this venture as carrying on the 80-year-old altruistic tradition of FFHC. She begins her research and finds that such a project could not only be feasible but also would benefit

FFHC in many different ways. The potential benefits of providing technical support to Pioneer Clinic include:

- Building prestige
- Fostering good community relations
- Being consistent with FFMC's mission to provide the most advanced medical care
- Providing a "test bed" for new and innovative ideas and a potential for more corporate contracts.

The Promotion

Dr. Adams has been so successful as director of the IT facilitation group that he has been promoted to the newly created position of regional medical information officer. He will now be responsible for informatics throughout the three states in which FFMC operates. With this change in his duties, he will no longer be able to lead the IT facilitation group at CFMC, and this responsibility has now been given to Ross. It is a functional, synergistic team with committed team members. Three of them, however, have been offered promotions within the system and either have left or will be leaving soon. This has created a vacuum within the group. Dr. Adams' attention is consumed in dealing with the region's informatics needs. The region has not had the information system success that has occurred locally at CFMC, and there are demands on most of his time and attention elsewhere.

The Problem

Lately, things have changed. For all the initial enthusiasm and despite positive feedback from Ross about the feasibility of the joint venture project, CIO Ben Arnold has begun to lose interest in the project. Important meetings that would further its progress have been canceled by Arnold. The reasons for this shift are unclear. Ross has asked for explanations and has been told that the "change in the business model" of Pioneer Clinic is problematic and that the project is on hold. There are also suggestions that "no profit" means "no go" for the venture. Since the promotion of Dr. Adams, Ross has reported directly to Arnold. Although she has argued forcefully, as forcefully as she dares, given the polite culture of the organization, she feels she is steadily losing ground.

She finds herself alone with no support from those directly above her in the hierarchy, yet she is determined to see the project implemented. In conversations with physicians from other small clinics in the city, she has found enthusiastic support for it, and this feeds her conviction. She feels that it is simply too late to back out for personal and public relations reasons.

Although the arrangement with Pioneer Clinic would not produce financial gain for CFMC or FFHC, it would foster close relations with the clinic and hopefully would serve as a model for developing similar agreements with many more private clinics in the future. The relationship with Pioneer Clinic could demonstrate a strategy for integrating medical records and care in other geographical areas.

As an idealist and a patient advocate, Ross is deeply troubled by the inability to envision and enable a potentially significant enhancement in patient care. FFHC has an 80-

year history of philanthropy and devotion to public health and welfare. She feels that abandoning the project is the wrong decision for FFHC because it diverges from its tradition. It would be an example of FFHC simply not doing the right thing. She is certain that Dr. Adams and CEO Madison would favor the project if they knew all the details and fears that they are not fully informed of what is happening.

Power and Politics

Dr. Adams' promotion out of the local CFMC area and into the regional FFHC has created a wave of change in the organization's IT hierarchy. Not only does this change mean that much responsibility has shifted to Ross, but there have also been further shifts and promotions that have left her department understaffed. She has been given more responsibility and has fewer resources to manage it.

Ross is now dependent on the CIO, Ben Arnold, in order to go forward with the Pioneer Clinic project. Where she formerly enjoyed a familiar relationship with Dr. John Adams, she is now reporting to a different person, and the lack of familiarity may be limiting her own feelings of power. This may be related to the newness of their working relationship and might disappear as they learn to work together.

On the other hand, Arnold could be exercising his legitimate power as CIO in a relatively objective manner—making, what he feels, are the best decisions for the organization. He may also be engaging in political behavior by stalling the clinic project and being relatively uncommunicative about his reasons. The underlying goal may be to force Ross to acknowledge his authority in the organization's hierarchy.

Where Ross had enjoyed an open and communicative relationship with her former boss, Dr. Adams, she is now faced with having to report directly to Ben Arnold, who is of the "old school," where politeness reigns instead of frank discussion. Her attempts to obtain an adequate explanation of Arnold's waning interest in the project have been unsatisfying. Arnold may have good reasons for his stance, but they are not being communicated to Ross. He may perceive that he has told her everything she needs to know and that anything more is out of her domain.

Some of the issues regarding communication have resulted from the established culture of CFMC. Its culture of politeness instead of openness comes at a significant price. We have seen that it can impede the flow of new ideas. Also, although on the surface it may make CFMC appear to be a great place to work, the stifled communication within this organization could create significant waves of frustration and discontent that could lower morale.

Ross's idealism and passion for patients and the apparent change in the corporate philosophy have placed her in a difficult position. Her attitudes now seem to be in conflict with those of the larger organization or, at least, with those of the CIO. This dissonance may be heightened because of her increased responsibilities and new working relationship with Arnold. At the moment, she feels her ability to influence the situation is minimal. She could change her attitude and continue on in her new position, leave the organization, or directly address this issue and see if it leads to change.

Question

Read the options that follow. Which option would you pursue?

Analysis

- *Option 1.* Do nothing. Put the project on the back burner.

  Pros: This option represents the path of least resistance. Avoiding "rocking the boat" by going against Ben Arnold would be more harmonious with the organization's culture. Her position in the organization would be safe. Arnold's uncommunicated reasons for not pursuing the project may in fact be good ones. By staying with the organization she will be able to guide others with her knowledge and authority.

  Cons: While this may be the safest route for Ross, it clearly goes against her beliefs and her personality. She is a social advocate and is passionate about what she believes. To just "lie low" may be an unacceptable compromise that could leave her frustrated and possibly push her to leave the organization. There are also Drs. Jefferson and Franklin who deserve an explanation if the project is canceled. She could lose respect and trust among these physicians and the other independent clinicians at CFMC by appearing to make promises that she cannot keep. This in turn would serve to undermine any of her future efforts.
- *Option 2.* Come up with new ideas for a compromise solution that would not only benefit the participating clinics but would also be a profitable venture for CFMC.

  Pros: If this solution were acceptable to both parties, it would increase the likelihood of a successful venture. CFMC could generate some revenue as an application service provider (ASP) by licensing access to the EMR and other clinical systems to Pioneer Clinic for a fee. CFMC could enter into more relationships like this with additional private clinics, which could bring prestige to it as a pioneer in the advancement of IT services to private clinics. The affiliate relationship between CFMC and Pioneer Clinic would be kept alive. Ross could gain credibility and respect, as well as accomplish her goals.

  Cons: It may be difficult for both parties to agree on a compromise solution. There may not be enough resources available to pursue any type of solution. Ross could be perceived as spending too much time on a "lost cause" when her time is more urgently needed elsewhere. Her relationship with the CIO could deteriorate.
- *Option 3.* Consult with her trusted colleague, Dr. Adams. If he feels this is worth pursuing, request a meeting with CIO Arnold and Dr. Adams to discuss the project in more detail. Dr. Adams could serve as the facilitator in this discussion.

  Pros: This may be risky because Ross will be bypassing the chain of command, but the risk is mitigated because Arnold does not report to Dr. Adams, or vice versa. His involvement could appear less threatening and may encourage more open discussion than Ross was able to elicit alone. The result of this meeting, whether the outcome is favorable or not, may bring a more peaceful closure to the issue and force a more successful working relationship with the CIO. By providing an example of how conflict can surface and be addressed, it may also serve to liberalize the flow of ideas within the organization. If successful, she might be perceived among members of the organization as someone who can get things done.

  Cons: This could still be perceived as "going above rank." Arnold could think that Ross is taking advantage of the friendship she has with Dr. Adams to leverage some power over him. He could resent this move and refuse to participate. He could participate but be as unforthcoming as he was before. The project could remain stalled, and the relationship between Ross and Arnold could be damaged. Once her inability to control the situation is exposed, Dr. Adams may lose confidence in her abilities to act independently or to rise to the occasion.

Conclusion

Ross is faced with the realities of an organization struggling to sustain a profitable business while staying true to its long tradition of philanthropy and devotion to public welfare and social idealism and revelations. She has discovered that the benevolent, altruistic organization for which she works may not be as benevolent as she once thought. She will need to work from within the organization, temporarily setting aside her disappointment and disillusionment to work for the larger organizational good.

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