Always at your side...

Sport Notes

Field and Clinical Examination Guide

Dawn Gulick

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- ✔ Skin Disorders
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- ✔ Equipment Fitting
- ✔ Pre-Participation Physical Examination
- ✔ Eating Disorder Signs & Symptoms
- ✔ Muscular & Visceral Referral Patterns
- ✔ Illustrated Spine Boarding Technique

and more!

Dedication

I would like to dedicate this manual "Sport Notes" to the single greatest inspiration in my life, my daughter Colleen, AKA Peanut. She has helped me value the things that are truly important in life. She has made parenting an amazing adventure! As a wonderful young athlete, scholar, and person, she has the determination and passion to achieve marvelous things in her life. Thank you for your love and support throughout all of my projects. I love you Peanut!

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The author would like to thank Mueller Sports Medicine for their very generous supply of tape, underwrap, and various orthopedic appliances used in the photographs of this manual. Their cooperation was instrumental in the portrayal of colorful artwork to display the process of taping and wrapping in sports medicine. Thank you!

Sport Notes

Field & Clinical Examination Guide

Dawn Gulick, PT, PhD, ATC, CSCS

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Please note that many tests included in the Ortho tab were borrowed and/or adapted from *Ortho Notes: Clinical Examination Pocket Guide* by Dawn Gulick (2005).

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Resources

Emergency Contacts

Campus Security	
Colleagues	
Team Physician	
Nurse/Health Ctr	
Athletic Director	
Coaches	
Other	
Poison Control	
Suicide Hotline	

Contacts • Phone/E-Mail	
Name Ph:	e-mail:
Name Ph:	e-mail:
Name Ph:	e-mail:
Name Ph:	e-mail:
Name Ph.	e-mail:
Name Ph:	e-mail:
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1

Medical Screening

Preparticipation Physical Evaluation

Questionnaire:	Yes	No
1. Have you ever been hospitalized?		
2. Have you ever had surgery?		
3. Do you take any medications?		
4. Do you take any nutritional supplements?		
5. Do you have any allergies: food, insects, medicine, pollen?		
6. Have you ever been dizzy or passed out?		
7. Have you ever had chest pain?		
8. Do you have a heart murmur?		
9. Has any member of your family died a sudden death before age 50?		
10. Have you ever had a concussion, been knocked out, or become unconscious?		
11. Have you ever had a seizure/convulsion?		
12. Have you ever had a burner/stinger?		
13. Do you have asthma?		
14. Do you have any skin problems?		
15. Do you have diabetes?		
16. Have you ever broken/fractured a bone?		
17. Do you wear contacts?		
18. Do you have any dental appliances?		
19. Do you wear any special equipment to participate in sports?		
20. Have you had a tetanus shot within 5 years?		
21. Do you have nose bleeds?		
22. Do you have headaches?		
23. ♀: Is your menstrual cycle regular?		

Source: Anderson MK, Hall SJ & Martin M (2000); Lillegard WA, Burcher JD & Rucker KS (1999).

Normal Vital Signs & Pathologies That Influence Them

Age	Infant	Child	Adolescent	Adult & Elderly	Increases Due to:	Decreases Due to:
T	98.2°F	98.6°F	98.6°F	98.6°F	Infection, exercise, ↑ blood sugar	↓ hematucrit/ hemoglobin, narcotics, ↓ blood sugar, aging
HR	80–180	75–140	50–100	60–100	Infection, ↓ hematucrit/hemoglobin, ↓ blood sugar, anxiety, anemia, pain, ↓ K, exercise	Narcotics, acute MI, ↑ K
RR	30–50	20–40	15–22	10–20	Infection, ↓ hematucrit/hemoglobin, ↑ blood sugar, pain, anxiety, asthma, acute MI, exercise	Narcotics
SBP	73	90	115	<130	↑ blood sugar, CAD, anxiety, pain, exercise (SBP only)	↓ hematucrit/ hemoglobin, ↓ K, narcotics, acute MI, anemia
DBP	55	57	70	<85		

Classification of Sports

Contact		Noncontact		
Collison	**Limited Impact**	**Strenuous**	**Moderate**	**Nonstrenuous**
Boxing	Baseball	Aerobic dance	Badminton	Archery
Field hockey	Basketball	Crew	Curling	Bowling
Football	Bicycling	Discus	Sailing	Cricket
Ice hockey	Cheerleading	Javelin	Table tennis	Golf
Lacrosse	Diving	Running		Riflery
Martial arts	Equestrian	Shotput		
Rodeo	Fencing	Speed skating		
Rugby	Gymnastics	Swimming		
Soccer	Handball	Tennis		
Water polo	High jump	Weight lifting		
Wrestling	Pole vault			
	Skating			
	Skiing			
	Softball			
	Squash			
	Volleyball			

Source: Sports Medicine Secrets & NJ Dept of Education Athletic Pre-Participation Physical Examination (2005); Lillegard WA, Butcher JD, & Rucker KS (1999).

Recommendations for Competitive Sports Participation

	Contact		Noncontact		
	Collision	Limited Impact	Strenuous	Moderate	Nonstren
Asthma	Yes	Yes	Yes	Yes	Yes
Atlantoaxial instability	No	No	Limited 1	Yes	Yes
Acute illness	RIA	RIA	RIA	RIA	RIA
Carditis	No	No	No	No	No
Concussions	RIA	RIA	Yes	Yes	Yes
Convulsions—controlled	Yes	Yes	Yes	Yes	Yes
Convulsions—uncontrolled	RIA	RIA	Limited 2	RIA	Limited 3
Hypertension—mild	Yes	Yes	Yes	Yes	Yes
Hypertension—mod/severe	RIA	RIA	RIA	RIA	RIA
Congenital heart disease	RIA	RIA	RIA	RIA	RIA
Eye—absence/loss of function	RIA	RIA	RIA	RIA	RIA

Continued

Recommendations for Competitive Sports Participation

	Contact		Noncontact		
	Collision	Limited Impact	Strenuous	Moderate	Nonstren
Kidney—1 absent	No	Yes	Yes	Yes	Yes
Liver—enlarged	No	No	Yes	Yes	Yes
Ovary—1 absent	Yes	Yes	Yes	Yes	Yes
Sickle cell trait	Yes	Yes	Yes	Yes	Yes
Skin pathology	Limited 4	Limited 4	Yes	Yes	Yes
Spleen enlarged	No	No	No	Yes	Yes
Testicle—absent/ undescended	Yes w/protection	Yes w/protection	Yes	Yes	Yes

RIA = requires individual assessment

Limited 1 = swimming—no butterfly, no breast stroke, no diving

Limited 2 = no swimming, no diving, no weight lifting

Limited 3 = no archery or riflery

Limited 4 = no gymnastics, no martial arts, no wrestling

Source: Committee on Sports Medicine: Pediatrics (1988).

Skinfold Assessment for Body Composition

Guidelines:

- All measurements are taking on the same side of the body
- Pick up the skinfold between the thumb & index finger to include 2 thicknesses of skin & sub-q fat
- Calipers should be perpendicular to skinfold about 1 cm from fingers
- Obtain reading within 1–2 second of caliper placement
- Take 3 measurements at each site but rotate sites
- Repeat measurement if difference is >1–2 mm
- Use the average of the 3 measures for the calculation

Skinfold Site & Description	Diagram
Chest/Pects Diagonal fold; ½ way between anterior axillary line & nipple (men) & ⅓ way between anterior axillary line & nipple (women)	
Abdominal Vertical fold; 2 cm lateral to umbilicus	

Skinfold Site & Description	Diagram
Suprailiac Diagonal fold; anterior axillary line just superior to iliac crest	
Triceps Vertical fold; posterior arm ½ way between acromion & olecranon processes	
Thigh Vertical fold; anterior midline of thigh, ½ way between inguinal crease & patella	

Source: Anderson MK, Hall SJ, & Martin M (2000); Jackson AS & Pollock ML (2004).

Men	
Chest	
Abdominal	
Thigh	
Summation	
% Body fat	

Women	
Triceps	
Suprailium	
Thigh	
Summation	
% Body fat	

Women (Age)									
Sum of Skinfolds (mm)	**<22**	**23–27**	**28–32**	**33–37**	**38–42**	**43–47**	**48–52**	**53–57**	**>58**
23–25	9.7	9.9	10.2	10.4	10.7	10.9	11.2	11.4	11.7
26–28	11.0	11.2	11.5	11.7	12.0	12.3	12.5	12.7	13.0
29–31	12.3	12.5	12.8	13.0	13.3	13.5	13.8	14.0	14.3
32–34	13.6	13.8	14.0	14.3	14.5	14.8	15.0	15.3	15.5
35–37	14.8	15.0	15.6	15.5	15.8	16.0	16.3	16.5	16.8
38–40	16.0	16.3	16.5	16.7	17.0	17.2	17.5	17.7	18.0
41–43	17.2	17.4	17.7	17.9	18.2	18.4	18.7	18.9	19.2
44–46	18.3	18.6	18.8	19.1	19.3	19.6	19.8	20.1	20.3
47–49	19.5	19.7	20.0	20.2	20.5	20.7	21.0	21.2	21.5
50–52	20.6	20.8	21.2	21.3	21.6	21.8	22.1	22.3	22.6
53–55	21.7	21.9	22.1	22.4	22.6	22.9	23.1	23.4	23.6
56–58	22.7	23.0	23.2	23.4	23.7	23.9	24.2	24.4	24.7
59–61	23.7	24.0	24.2	24.5	24.7	25.0	25.2	25.5	25.7
62–64	24.7	25.0	25.2	25.5	25.7	26.0	26.7	26.4	26.7
65–67	25.7	25.9	26.2	26.4	26.7	26.9	27.2	27.4	27.7
68–70	26.7	26.9	27.1	27.4	27.6	27.9	28.1	28.4	28.6

Continued

Women (Age)—*Cont'd*									
Sum of Skinfolds (mm)	**<22**	**23–27**	**28–32**	**33–37**	**38–42**	**43–47**	**48–52**	**53–57**	**>58**
71–73	27.5	27.8	28.0	28.3	28.5	28.8	29.0	29.3	29.5
74–76	28.4	28.7	28.9	29.2	29.4	29.7	29.9	30.2	30.4
77–79	29.3	29.5	29.8	30.0	30.3	30.5	30.8	31.0	31.3
80–82	30.1	30.4	30.6	30.9	31.1	31.4	31.6	31.9	32.1
83–85	30.9	31.2	31.4	31.7	31.9	32.2	32.4	32.7	32.9
86–88	31.7	32.0	32.2	32.5	32.7	32.9	33.2	33.4	33.7
89–91	32.5	32.7	33.0	33.2	33.5	33.7	33.9	34.2	34.4
92–94	33.2	33.4	33.7	33.9	34.2	34.4	34.7	34.9	35.2
95–97	33.9	34.1	34.4	34.6	34.9	35.1	35.4	35.6	35.9
98–100	34.6	34.8	35.1	35.3	35.5	35.8	36.0	36.3	36.5
101–103	35.3	35.4	35.7	35.9	36.2	36.4	36.7	36.9	37.2
104–106	35.8	36.1	36.3	36.6	36.8	37.1	37.3	37.5	37.8
107–109	36.4	36.7	36.9	37.1	37.4	37.6	37.9	38.1	38.4
110–112	37.0	37.2	37.5	37.7	38.0	38.2	38.5	38.7	38.9
112–115	37.5	37.8	38.0	38.2	38.5	38.7	39.0	39.2	39.5
116–118	38.0	38.3	38.5	38.8	39.0	39.3	39.5	39.7	40.0

Continued

Women (Age)—*Cont'd*									
Sum of Skinfolds (mm)	**<22**	**23–27**	**28–32**	**33–37**	**38–42**	**43–47**	**48–52**	**53–57**	**>58**
119–121	38.5	38.7	39.0	39.2	39.5	39.7	40.0	40.2	40.5
122–124	39.0	39.2	39.4	39.7	39.9	40.2	40.4	40.7	40.9
125–127	39.4	39.6	39.9	40.1	40.4	40.6	40.9	41.1	41.4
128–130	39.8	40.0	40.3	40.5	40.8	41.0	41.5	41.5	41.8

Men (Age)									
Sum of Skinfolds (mm)	**<22**	**23–27**	**28–32**	**33–37**	**38–42**	**43–47**	**48–52**	**53–57**	**>58**
23–25	9.7	9.9	10.2	10.4	10.7	10.9	11.2	11.4	11.7
8–10	1.3	1.8	2.3	2.9	3.4	3.9	4.5	5.0	5.5
11–13	2.2	2.8	3.3	3.9	4.4	4.9	5.5	6.0	6.5
14–16	3.2	3.8	4.3	4.8	5.4	5.9	6.4	7.0	7.5
17–19	4.2	4.7	5.3	5.8	6.3	6.9	7.4	8.0	8.5
20–22	5.1	5.7	6.2	6.8	7.3	7.9	8.4	8.9	9.5
23–25	6.1	6.6	7.2	7.7	8.3	8.8	9.4	9.9	10.5
26–28	7.0	7.6	8.1	8.7	9.2	9.8	10.3	10.9	11.4

Continued

Men (Age)—*Cont'd*									
Sum of Skinfolds (mm)	**<22**	**23–27**	**28–32**	**33–37**	**38–42**	**43–47**	**48–52**	**53–57**	**>58**
29–31	8.0	8.5	9.1	9.6	10.2	10.7	11.3	11.8	12.4
32–34	8.9	9.4	10.0	10.5	11.1	11.6	12.2	12.8	13.3
35–37	9.8	10.4	10.9	11.5	12.0	12.6	13.1	13.7	14.3
38–40	10.7	11.3	11.8	12.4	12.9	13.5	14.1	14.6	15.2
41–43	11.6	12.2	12.7	13.3	13.8	14.4	15.0	15.5	16.1
44–46	12.5	13.1	13.6	14.2	14.7	15.3	15.9	16.4	17.0
47–49	13.4	13.9	14.5	15.1	15.6	16.2	16.8	17.3	17.9
50–52	14.3	14.8	15.4	15.9	16.5	17.1	17.6	18.2	18.8
53–55	15.1	15.7	16.2	16.8	17.4	17.9	18.5	19.1	19.7
56–58	16.0	16.5	17.1	17.7	18.2	18.8	19.4	20.0	20.5
59–61	16.9	17.4	17.9	18.5	19.1	19.7	20.2	20.8	21.4
62–64	17.6	18.2	18.8	19.4	19.9	20.5	21.1	21.7	22.2
65–67	18.5	19.0	19.6	20.2	20.8	21.3	21.9	22.5	23.1
68–70	19.3	19.9	20.4	21.0	21.6	22.2	22.7	23.3	23.9
71–73	20.1	20.7	21.2	21.8	22.4	23.0	23.6	24.1	24.7
74–76	20.9	21.5	22.0	22.6	23.2	23.8	24.4	25.0	25.5

Continued

Men (Age)—*Cont'd*									
Sum of Skinfolds (mm)	**<22**	**23–27**	**28–32**	**33–37**	**38–42**	**43–47**	**48–52**	**53–57**	**>58**
77–79	21.7	22.2	22.8	23.4	24.0	24.6	25.2	25.8	26.3
80–82	22.4	23.0	23.6	24.2	24.8	25.4	25.9	26.5	27.1
83–85	23.2	23.8	24.4	25.0	25.5	26.1	26.7	27.3	27.9
86–88	24.0	24.5	25.1	25.7	26.3	26.9	27.5	28.1	28.7
89–91	24.7	25.3	25.9	26.5	27.1	27.6	28.2	28.8	29.4
92–94	25.4	26.0	26.6	27.2	27.8	28.4	29.0	29.6	30.2
95–97	26.1	26.7	27.3	27.9	28.5	29.1	29.7	30.3	30.9
98–100	26.9	27.4	28.0	28.6	29.2	29.8	30.4	31.0	31.6
101–103	27.5	28.1	28.7	29.3	29.9	30.5	31.1	31.7	32.3
104–106	28.2	28.8	29.4	30.0	30.6	31.2	31.8	32.4	33.0
107–109	28.9	29.5	30.1	30.7	31.3	31.9	32.5	33.1	33.7
110–112	29.6	30.2	30.8	31.4	32.0	32.6	33.2	33.8	34.4
112–115	30.2	30.8	31.4	32.0	32.6	33.2	33.8	34.5	35.1
116–118	30.9	31.5	32.1	32.7	33.3	33.9	34.5	35.1	35.7
119–121	31.5	32.1	32.7	33.3	33.9	34.5	35.1	35.7	36.4
122–124	32.1	32.7	33.3	33.9	34.5	35.1	35.8	36.4	37.0
125–127	32.7	33.3	33.9	34.5	35.1	35.8	36.4	37.0	37.6

Normative Values for Percent Body Fat

	General Population		Athletes	
20–30 yrs old	**Males**	**Females**	**Males**	**Females**
Lean	<12	<17	<7	<12
Acceptable	12–21	17–28	7–15	12–25
Mod. overwt	21–26	28–3		
Overweight	>26	>33	>15	>25
30–40 yrs old	**Males**	**Females**	**Males**	**Females**
Lean	<14	<19	<9	<14
Acceptable	14–23	19–30	9–17	14–27
Mod. overwt	23–28	30–35		
Overweight	>28	>35	>17	>27
40–50 yrs old	**Males**	**Females**	**Males**	**Females**
Lean	<16	<21	<11	<16
Acceptable	16–25	21–32	11–19	16–29
Mod. overwt	25–30	32–37		
Overweight	>30	>37	>19	>29
50–60 yrs old	**Males**	**Females**	**Males**	**Females**
Lean	<18	<23	<13	<18
Acceptable	18–27	23–34	13–21	18–31
Mod. overwt	27–33	35–40		
Overweight	>33	>40	>21	>31

Signs and Symptoms of Depression

- Sadness; frequent/unexplained crying
- Feelings of guilt, helplessness, or hopelessness
- Suicide ideations
- Problems sleeping

- Fatigue or decreased energy; apathy
- Loss of appetite; weight loss/gain
- Difficulty concentrating, remembering, & making decisions
- Bipolar disorder (manic-depression) – Peak onset is late teens with equal males/females with a strong genetic component. It may be a neurotransmitter abnormality.

Signs and Symptoms of Anabolic Steroid Abuse

- Anxiety & chest pain
- ↓ HDL & ↑ LDL
- BP
- Weight gain in short period of time (10–15 lb in 2–3 wks)
- Acne on face, chest, & upper back
- Needle marks
- Frequent hematomas
- Peripheral edema
- Rapid mood swings & sudden anger ("Roid Rage")
- Growth-plate closure
- Jaundice
- Alopecia
- Tumors & cancer
- Females: abnormal body hair, deeper voice, irregular menstruation
- Males: gynecomastia

Marfan's Syndrome

- Disproportionately long arms, legs, fingers, & toes (lower body longer than upper body)
- Long skull with frontal prominence
- Kyphoscoliosis
- Pectus chest (concave)
- Slender; (sub-q fat)
- Joint hyperextensibility
- Defective heart valves = murmur

- High incidence of dissecting aortic aneurysm
- ↑ Incidence of hernia
- Sleep apnea
- Dislocation of eye lens; myopia
- "Thumb sign" = adduct thumb across palm & flex fingers around thumb; + sign is if thumb extends beyond 5th finger
- "Wrist test" = encircle wrist with thumb & 5th digit of opposite hand; + sign is if they overlap

Source: Anderson MK, Hall SJ, & Martin M (2000).

Eating Disorders

Anorexia		Bulemia
• Under minimal body weight • BMI <18	Wt	• Frequent weight fluctuations • May be obese
• Frequent starving • Self-induced vomiting • Excessive exercise • Diuretics	Habits	• Binge eating • Self-induced vomiting • Laxatives, diuretics • Excessive exercise • Overeating alternating w/periods of starvation
• Fear of being fat • Feels fat even when emaciated	Image Body	• Fear of fatness • Distorted body image
• Depressed • Social withdrawal • Insomnia • Obsessive-compulsive behavior • Seeks perfection • Controlling environment	Social	• Depressed • Low self-esteem • Obsessive-compulsive behavior

Continued

Eating Disorders—*Cont'd*

Anorexia	Physical Symptoms	Bulemia
• Amenorrhea • **Bradycardia** • Hypotension • Arrhythmias • Dry skin, dental caries, anemia, **stress fx,** osteoporosis, brittle nails/hair • Hypoglycemia • Cold sensitivity • ↓ libido • Lanugo		• Erosion of dental enamel, cracking of sides of lips • **Russell's sign** = lesions/calluses on MCPs 2° trauma of self-induced vomiting • **Hypertrophy of salivary glands** (chipmunk-like face) • Weakness & fatigue, seizures • Arrhythmias, **bradycardia** • Hypertensive • Hypoglycemic • Throwing up blood • **Stress fx**

Source: Boissonnault WG (2005); Anderson MK, Hall SJ, & Martin M (2000); Sundgot-Borgen J (2002).

Sizing Ambulation Devices

Walker

- In standing, adjust the height of the walker so that the top of the walker reaches the level of the greater trochanter or the ulnar styloid process of the wrist
- If the athlete is unable to stand, this measurement can be taken in supine

Crutches

- In standing, place the tip of the crutch 4–6” to the front & outside of each foot
- Adjust the length so that the axillary pad of the crutch is 2–3 finger widths below the axilla
- If the athlete is unable to stand, this measurement can be taken in supine
- Adjust the hand grip so that the elbow is flexed 25° to 30°

Canes

- In standing, place the cane along side of the leg
- The top of the cane should reach the level of the greater trochanter or the ulnar styloid process of the wrist
- If the athlete is unable to stand, this measurement can be taken in supine

Gait Patterns

4-Points: 2 Canes or Crutches

Sequence: Ⓡ cane/crutch, Ⓛ LE, Ⓛ cane/crutch, Ⓡ LE

3-Points: Walker or 1 Cane/Crutch

Sequence: Device, involved LE, uninvolved LE

2-Points: 1 Cane or Crutch

Sequence: Device with involved LE, uninvolved LE

2-Points: 2 Canes or Crutches

Sequence: Ⓡ cane/crutch with Ⓛ LE, Ⓛ cane/crutch with Ⓡ LE

Ambulatory Strategies

Ascending Stairs or Curbs

- If a handrail is present; place assistive device(s) on opposite side of handrail
- Step up with uninvolved LE
- Step up with involved LE
- Follow with assistive device

Descending Stairs or Curbs

- If a handrail is present; place assistive device(s) on opposite side of handrail
- Place assistive device(s) down on next step
- Step down with involved LE
- Step down with uninvolved LE

Mouthguard

Standard Fitting

- Begin with appropriate size mouthguard, i.e. youth, adult
- Hold mouthguard by loop & submerge in boiling water for 20–30 seconds
- Allow excess water to drain off & place mouthguard into the mouth over the upper teeth
- Do **NOT** bite down or allow lower teeth to touch mouthguard
- Place tongue in roof of mouth & suck as hard as possible for 15–20 seconds
- Rinse mouthguard in cold water
- Inspect for imperfections; trim as needed but do **NOT** reheat

Source: Anderson MK (2002).

Braces

- Athletes with braces should be fitted with a mouthguard that covers both the upper & lower teeth

Helmets

Goal: Achieve a snug fit around all parts of the head. There should not be any gaps between the athlete's head/face & the helmet pads.

Donning

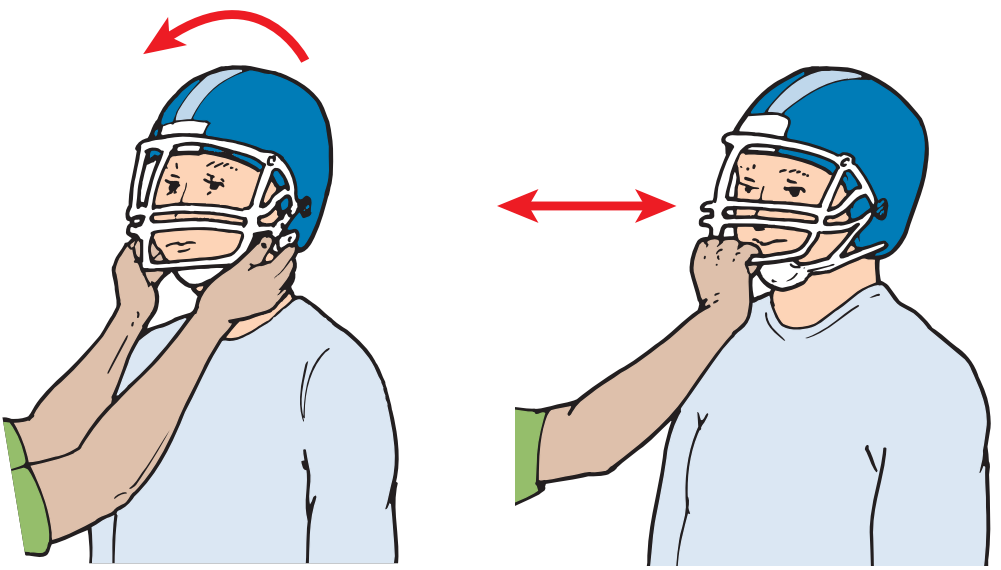
- Proper sizing: measure the circumference of the head 1" above the eyebrow
- Select appropriately sized helmet based on manufacturer's specifications
- Place thumb/fingers in ear holes & spread helmet laterally
- Place helmet directly over head
- Tilt helmet backward & then rotate it forward to pull into position
- Inflate air bladder if needed; always inflate helmet @ an air temperature the athlete intents to participate

Alignment

- Hair should be at competitive length & wet down to mimic game conditions
- Helmet should comfortably grip the head by cupping the back of the occipital protuberance
- Ear holes should line up with ears
  - If ear opening is too high, helmet is too small or overinflated
  - If ear opening is too low, helmet is too large or under-inflated
- Helmet should be 1" above eyebrows
  - If helmet is >1" from eyebrow, helmet is too small
  - If helmet is <1" from eyebrow, helmet is too big
- Mask should be 2–3 finger widths from player's nose
- Mask should not obstruct athlete's visual field
  - If face mask sits too high, helmet is too small
  - If face mask sits too low, helmet is too big
- Cheek pads should be snug against face
- Chin strap should be equal distance from sides of helmet

Testing

- Firm pressure on the top of the helmet should not allow the helmet to migrate over the eyes or contact the bridge of the nose
- Helmet should only turn slightly from side to side
  - When moving the helmet side to side, the nose should stay within the center loop of the facemask
- Helmet should not migrate forward/back
  - Have the athlete clasp his hands behind his head & push the helmet forward; the gap between the helmet & forehead should not be >1 finger width
- Vision check: athlete should have 180° of peripheral vision & 75° up & down
- Wear the helmet for 1 minute then check the color of the forehead. The contact areas may be red but if they are white, then the helmet is too tight



Source: Anderson MK, Hall SJ, & Martin M (2000); Sports Medicine Secrets (2005); Football Foundation (2006); Arnheim DD (1989).

Neck Rolls

- Advocated for athletes with a hx of “burners” or “stingers” & those who wish to prevent them
- Thick, high, & stiff pads inhibit midcervical motion when secured at the base of the neck
- There is not reduction in the axial load of the c-spine when the neck is flexed

Shoulder Pads

Goal: Pad & protect chest, upper back, & shoulders

Types

- Flat = QB & receivers (↓ shoulder protection & ↑ shoulder mobility)
- Cantilevered = linemen & linebackers (↑ shoulder protection & ↓ shoulder mobility)

Fitting

- Measure chest girth @ nipple line
- Select pads based on athlete’s position
- Fit without shirt to visualize anatomic alignment
- Place pads on shoulders & tighten all straps so that no more than 2 fingers can be inserted under any strap
- Laces should be centered over sternum & spine
- A-C joint, entire clavicle, & deltoid should be fully covered
- Entire scapula, rhomboids, & trapezius should be covered
- The inner padding should vertically align with the tip of the shoulder
- Pads should not shift
- Cervical region should not be impinged when arms are abducted

Source: Anderson MK (2002).

Hip Pads

Goal: Pad & protect iliac crest, greater trochanter, & coccyx

Fitting

- Do NOT allow pads to slip down, this will reduce protection of iliac crests & ↑ risk of hip pointers

Emergency Situations—CPR by a Health-care Provider

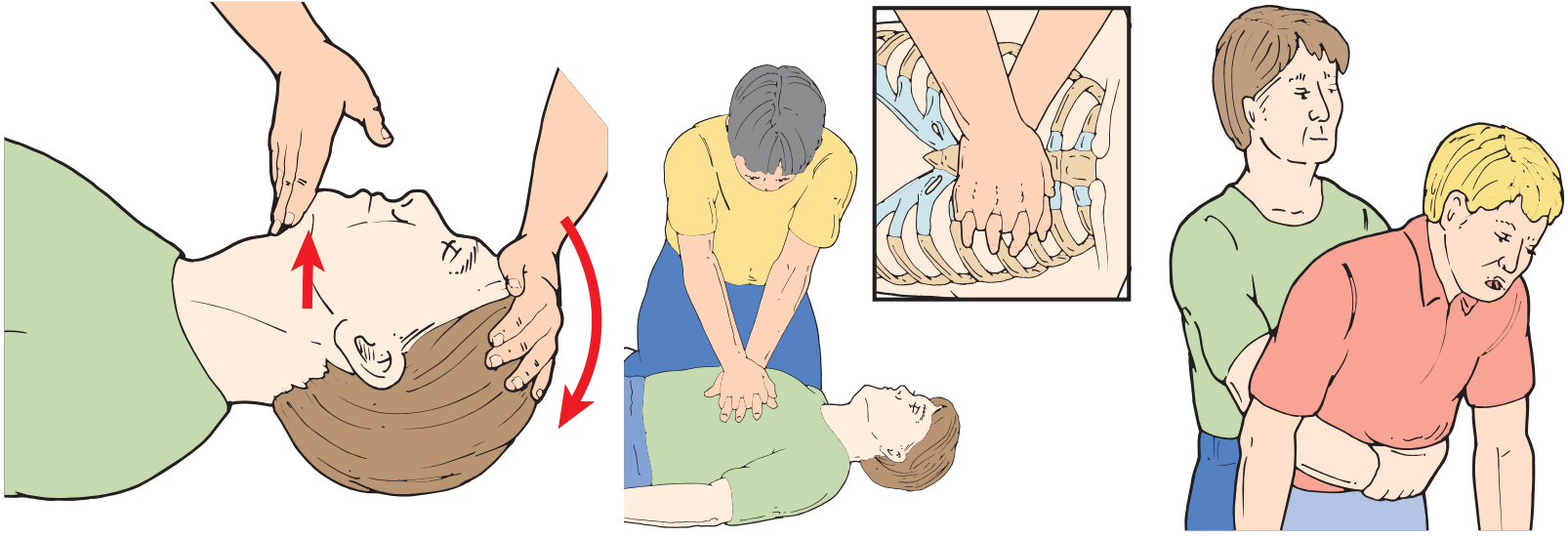
Task	Infant (<1 yr)	Child (1 yr to Adolescent)	Adult (>Adolescent)
EMS	Unwitnessed: Perform 5 CPR cycles then activate EMS Witnessed: Active EMS immediately		Activate immediately
Airway	Head tilt–chin lift (Jaw thrust if neck trauma is suspected)		
Breaths (initial)	2 breaths @ 1 sec each		
Obstructed airway	Back blows & chest thrusts	Abdominal thrusts	
Rescue breathing only	1 breath every 3–5 sec		1 breath every 5–6 sec
Circulation check	Brachial or femoral	Carotid or femoral	Carotid
Compression landmarks	Just below nipple line	Between nipples (center of chest)	
Compression technique	2 fingers or 2 thumbs encircling chest	Heel of 1 hand	Heel of 1 hand & other hand on top
Compression depth	⅓ to ½ depth of chest		1½–2 inches
Compressions: Ventilations	1 rescuer = 30:2 2 rescuers = 15:2		30:2

Continued

Task	Infant (<1 yr)	Child (1 yr to Adolescent)	Adult (>Adolescent)
AED	Not recommended	Unwitnessed: Use child pads after 5 cycles of CPR Witnessed: Use AED as soon as it is available	5 cycles of CPR before shock

Note: If 2 rescuers are available, one should activate EMS while the other begins CPR

Source: AHA (2005).



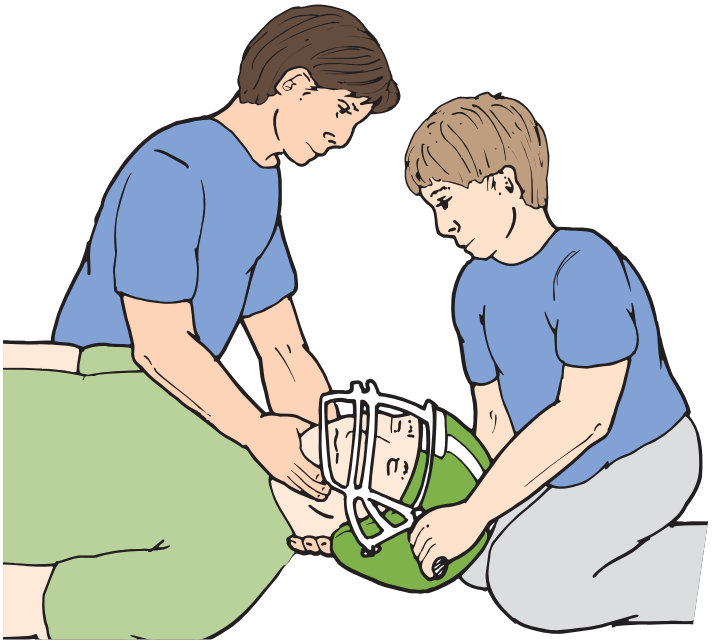
Emergency Situations—Trauma

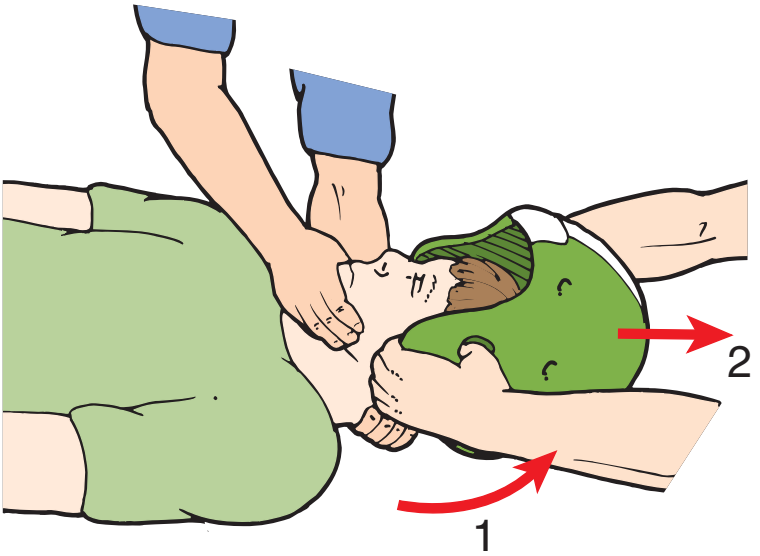
Suspected Spinal Injury

- Assess athlete's level of consciousness, airway, breathing, circulation, & neurological status; if athlete is unconscious & prone, place scissors under athlete's nose to assess breathing (scissors should fog when athlete is breathing)
- Do **NOT** move athlete unless essential to establish/maintain an airway
- Face mask should be removed immediately regardless of respiratory status
  - Stabilize the head & neck by placing index fingers in helmet ear holes
  - Unscrew or cut clips near ear holes to allow face mask to be swung away
- Helmet & chin strap should remain in place unless:
  - Helmet & chin strap do not hold head securely
  - Face mask cannot be removed in <1–2 min.
  - Helmet prevents immobilization for transport
- If helmet is to be removed
  - One medical professional should stabilize head t/o entire process by firmly grasping base of the occiput & maxilla
  - Another medical professional should:
    - Cut, do **NOT** unsnap, chin strap
    - Deflate air pads
    - Remove cheek pads by sliding 2 tongue depressors between the cheek pads & helmet; twist tongue depressors to unsnap pads
    - Tilt the helmet anteriorly to clear the occiput & slide the helmet off the athlete's head
    - Do **NOT** spread the sides of the helmet because this will squeeze the forehead & occiput
    - Remove shoulder pads by cutting center straps
    - Don a rigid cervical collar
- If athlete does not have a pulse, cut open jersey & shoulder pads down the center of the chest to perform CPR

- Posturing that may indicate TBI
  - Decerebrate: head retracted & all extremities extended
  - Decorticate: LE extended but UE flexed at elbow & wrist, fists clenched

Source: Inter-Association Task Force, http://www.acsm.org/AM/Template.cfm?Section=Search&section=Original_Articles&template=/CM/ContentDisplay.cfm&ContentFileID=329.

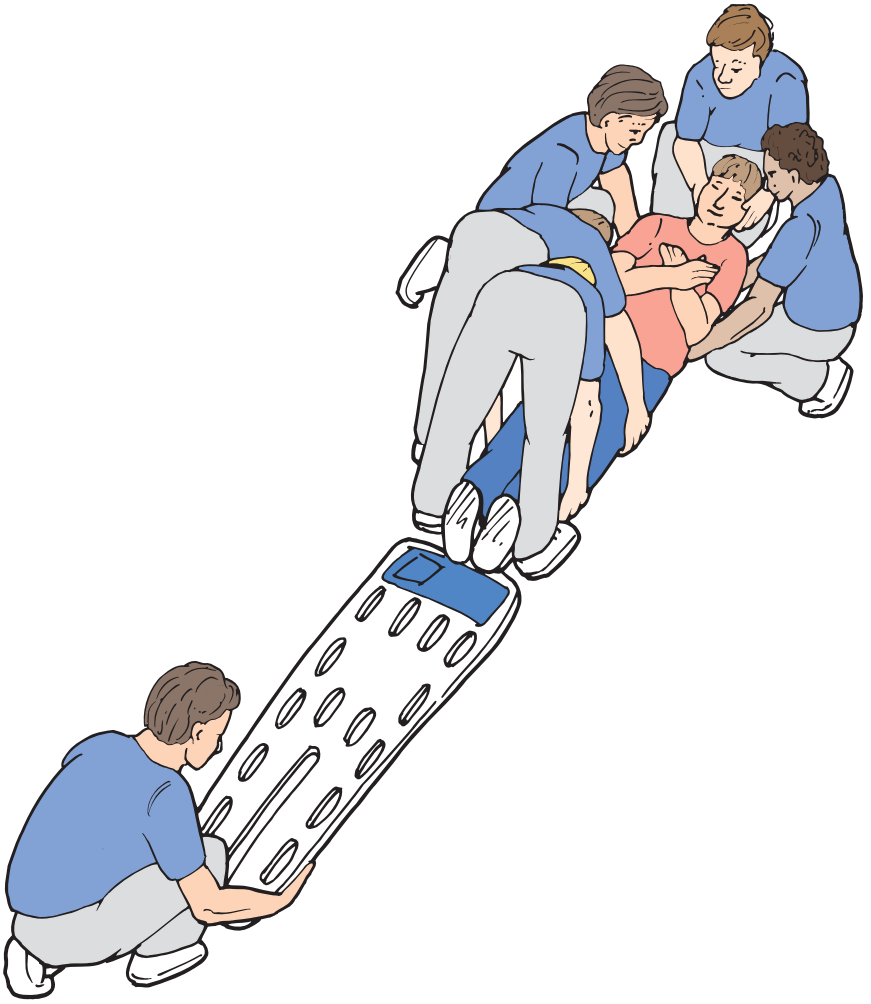




Spine Boarding Technique

Lifting Procedure (recommended)

- Technique requires 7+ people
- Position medical personnel at:
  - Head (1)
  - Shoulders & upper torso (2)
  - Trunk & upper thigh (2)
  - Knees & lower legs (1–2)
  - Spine board (1)
- Stabilize head & neck
- Place the spine board at the feet of the athlete
- On the count of 3, lift the athlete



- Slide spine board into place
- On the count of 3, lower the athlete
- Strap in/secure head then secure other straps
- Have medical personnel all face the same direction; inside foot on the ground & outside knee on ground
- On count of 3, lift the spine board
- On the count of 3, walk with spine board to ambulance

Motorized Spine Board

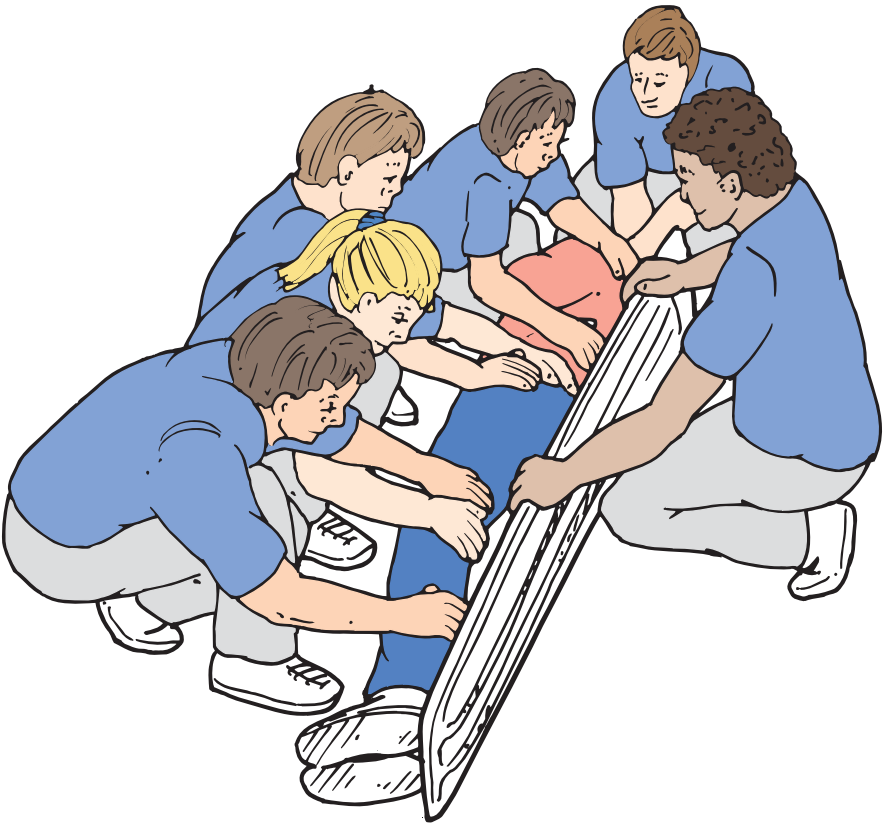
- Technique requires 2–3 people
- Position medical personnel at:
  - Head (1)
  - Spine board (1–2)
- Stabilize head & neck by kneeling along side of the athlete
- Place the spine board at the head of the athlete
- Lift the head ~¼″–½″ to clear the roller @ the front of the motorized spine board
- Switch on the power to the motorized spine board & monitor the athlete as the spine board "crawls" under the athlete
- Strap in/secure head then secure other straps
- Have medical personnel all face the same direction; inside foot on the ground & outside knee on ground
- On count of 3, lift the spine board
- On the count of 3, walk with spine board to ambulance

Rolling Procedure

- Technique requires 5–6 people
- Position medical personnel at:
  - Head (1)
  - Shoulders & upper torso (1)
  - Trunk & upper thigh (1)
  - Knees & lower legs (1)
  - Spine board (1)
- Stabilize head & neck
- Place the spine board at the side of the athlete
- On the count of 3, roll the athlete on his/her side

- Slide spine board into place
- On the count of 3, roll athlete onto spine board
- Strap in/secure head then secure other straps
- Have medical personnel all face the same direction; inside foot on the ground & outside knee on ground
- On count of 3, lift the spine board
- On the count of 3, walk with spine board to ambulance

Source: Almquist J (2006); Swartz EE, Nowak J, Shirley C, & Decoster LC (2005); http://www.uwosh.edu/phys_ed/athtrain/program.



Signs & Symptoms of a Possible Pneumothorax

- Sudden, sharp chest pain
- Shortness of breath &/or difficulty breathing
- Asymmetrical chest mov'ts
- Chest tightness
- Lightheadedness
- ↓ or absent breath sounds
- ↓ BP
- Tachycardia
- Cyanosis

Source: Anderson MK, Hall SJ & Martin M (2000).

Red Flags of Eye Injuries

- Sudden loss of vision
- Bilateral dilated pupils
- Unequal pupils
- Abnormal or painful eye mov't
- Raccoon eyes
- Blood in the eye
- Photophobia
- Floaters, flashes or a "curtain falling over the eye" (detached retina)
- Damaged or displaced contact lens that cannot be removed
- Itching, burning, watery eye (pinkeye)

Source: Anderson MK, Hall SJ & Martin M (2000); Rodriguez JO, Lavina AM Agarwal A (2003).

Treatment of Foreign Bodies in the Eye

- If needed, evert upper eyelid over cotton swab
- Use sterile irrigation solution &/or moist sterile cotton swab to remove foreign body
- Refer if foreign body cannot be removed

Source: Rodriguez JO, Lavina AM & Agarwal A (2003).

Emergency Management for a Dislocated Tooth

The Athlete	The Tooth
■ Don sterile gloves ■ Control bleeding with sterile gauze & compression ■ Rinse mouth with saline solution ■ Replace the tooth in the socket ■ Bite down gently on gauze to keep it in place or use athlete's mouthguard to maintain position ■ Refer to dentist immediately	■ Hold the tooth by the crown ■ Do not rub the tooth ■ Rinse the tooth with milk or saline (do **NOT** use tap or drinking water as this will damage the periodontal ligament cells) ■ Replace tooth in socket ■ If unable to replace in the socket, transport in milk, saline, or Save-a-Tooth device

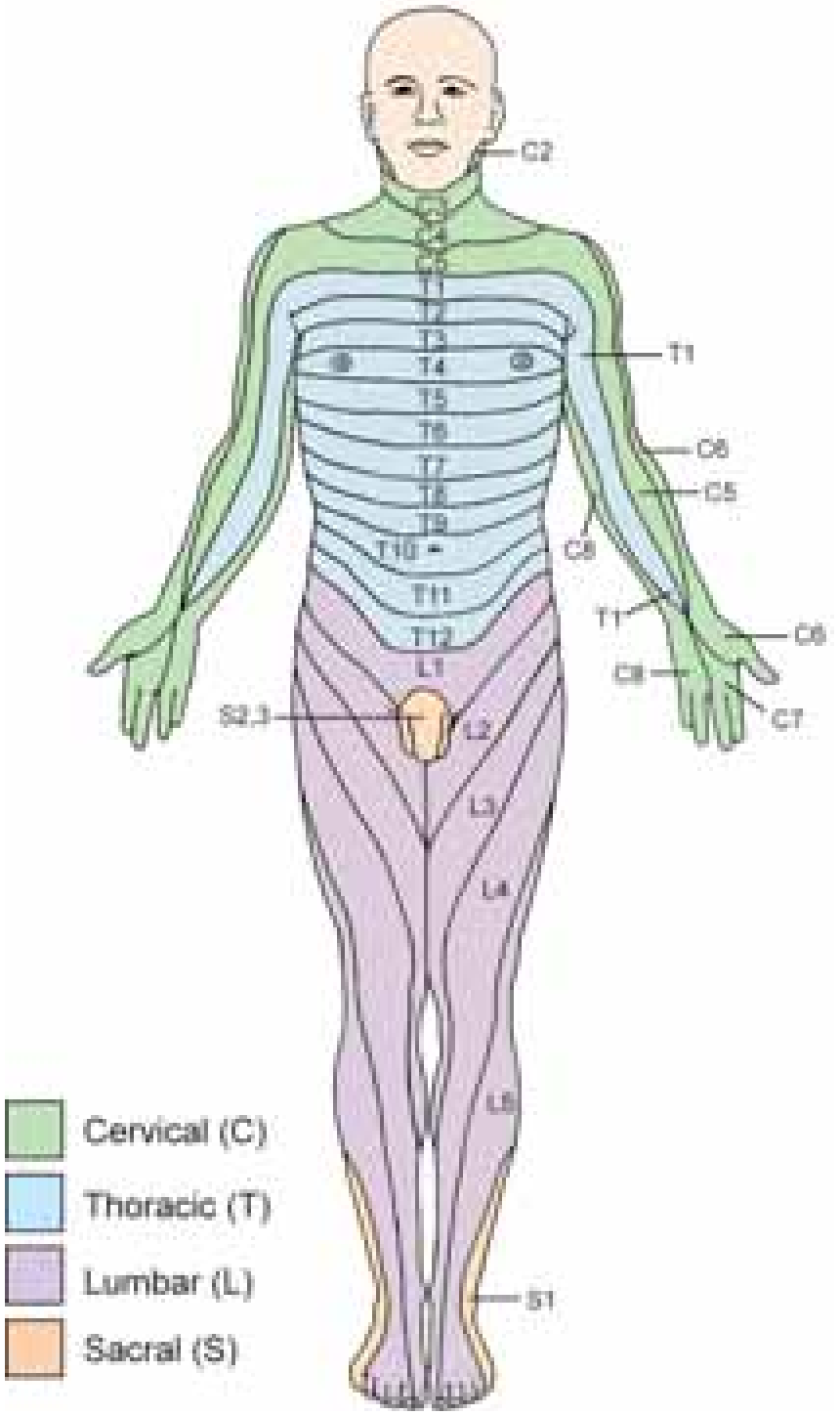
- If tooth is replaced in socket within 30 minutes, there is a 90% chance of successful implantation
- Success rate falls to 5% if replacement takes more than 2 hours

Source: Anderson MK, Hall SJ & Martin M (2000); Lillegard WA, Butcher JD & Rucker KS (1999).

Cranial Nerves

Nerve	Function	Test
I. Olfactory	Smell	Identify odors with eyes closed
II. Optic	Vision	Test peripheral vision with 1 eye covered
III. Oculomotor	Eye mov't & pupillary reaction	Peripheral vision, eye chart, reaction to light
IV. Trochlear	Eye mov't	Test ability to depress & adduct eye
V. Trigeminal	Face sensation & mastication	Face sensation & clench teeth
VI. Abducens	Eye mov't	Test ability to abduct eye past midline
VII. Facial	Facial muscles & taste	Close eyes & smile; detect various tastes – sweet, sour, salty, bitter
VIII. Vestibulocochlear (Acoustic)	Hearing & balance	Hearing; feet together, eyes open/closed x 5 sec; test for past-pointing
IX. Glossopharyngeal	Swallow, voice, gag reflex	Swallow & say "ahh"
X. Vagus	Swallow, voice, gag reflex	Use tongue depressor to elicit gag reflex
XI. Spinal Accessory	SCM & trapezius	Rotate/SB neck; shrug shoulders
XII. Hypoglossal	Tongue mov't	Protrude tongue (watch for lateral deviation)

Dermatomes



Source: Taber's Cyclopedic Medical Dictionary (2005).

Neuromuscular Relationships

Motion Segment	Nerve Root	Myotome	Dermatome	Reflex
Occ–C1	C1	∅	Skull vertex	∅
C1–2	C2	Neck flexion: Rectus capitis & SCM	Temple, forehead, occiput	∅
C2–3	C3	Neck SB: Trapezius & splenius capitis	Cheek, neck	∅
C3–4	C4	Shoulder elevation: Levator scapula & trapezius	Clavicle & upper scapula	∅
C4–5	C5	Shoulder abd: Deltoid, supra/infraspinatus, biceps	Anterior arm: Shoulder to base of 1st digit	Biceps
C5–6	C6	Elbow flex/Wrist ext: Biceps, ECRL, ECRB, supinator	Anterior arm to lateral forearm, 1st & 2nd digits	Brachioradialis
C6–7	C7	Elbow ext/wrist flex: Triceps, FCU, FCR	Lateral forearm, 2nd, 3rd, & 4th digits	Triceps
C7–T1	C8	Thumb ext/UD: EPL, EPB, FCU, ECU	Medial arm & forearm to 4th & 5th digits	Triceps

Continued

Neuromuscular Relationships—*Cont'd*

Motion Segment	Nerve Root	Myotome	Dermatome	Reflex
T1–2	T1	∅	Medial forearm to base of 5th digit	∅
T2–3	T2	∅	Pectoralis & midscapula to medial upper arm & elbow	∅
T3–5	T3–5	∅	Upper thorax	∅
T5–7	T5–7	∅	Costal margins	∅
T8–12	T8–12	∅	Abdominal & lumbar regions	∅
T12–L1	L1	Iliacus	Back to trochanter & inguinal region	∅
L1–2	L2	Psoas, iliacus, & adductors	Back to mid-anterior thigh to knee	Cremasteric
L2–3	L3	Quads	Back & upper buttock to distal anterior thigh & knee	Adductor

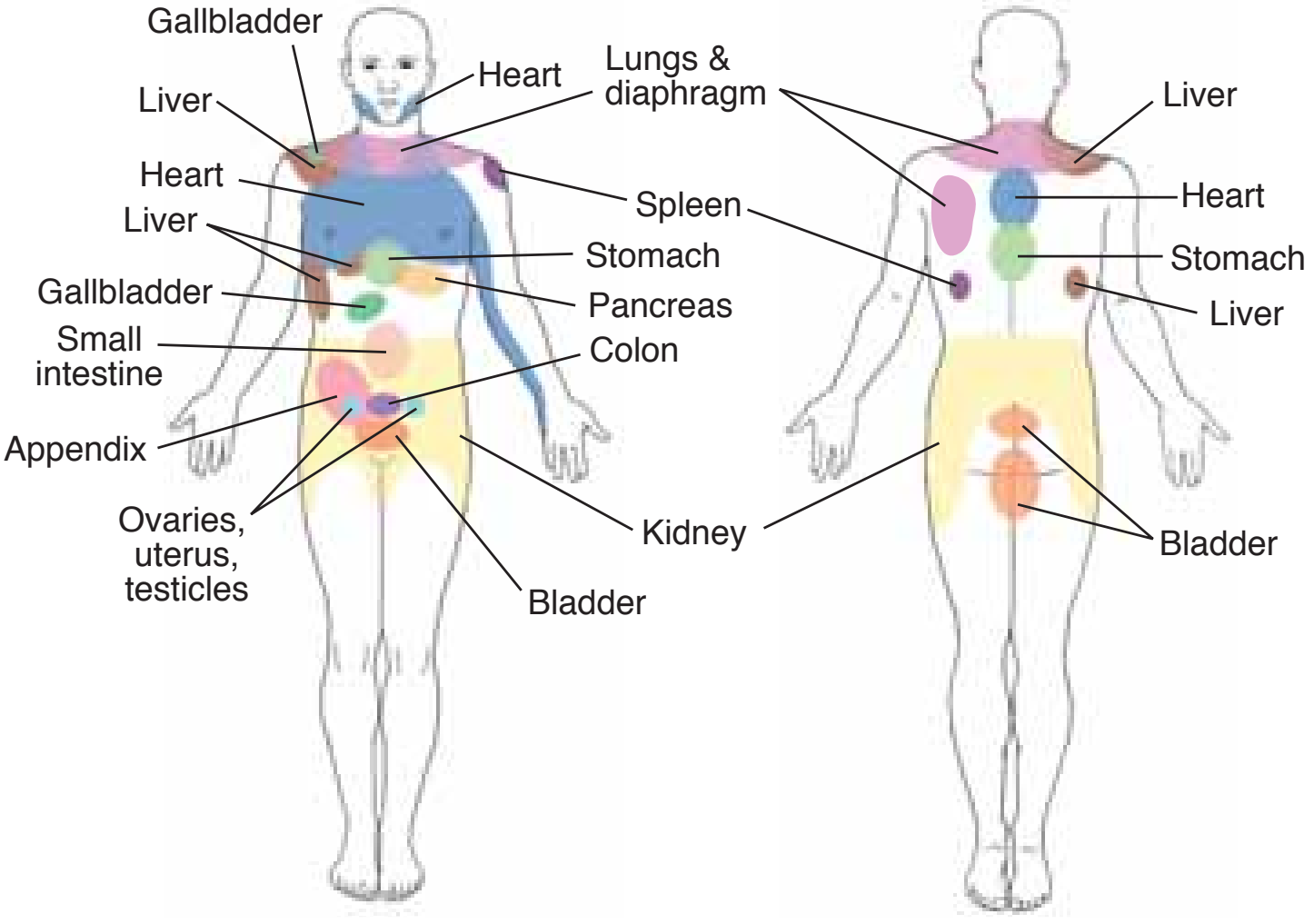
Continued

Neuromuscular Relationships—*Cont'd*

Motion Segment	Nerve Root	Myotome	Dermatome	Reflex
T1–2	T1	∅	Medial forearm to base of 5th digit	∅
L3–4	L4	Anterior tibialis	Medial buttock to lateral thigh, medial tibia, & big toe	Patella
L4–5	L5	Extensor hallicus longus	Posterior lateral thigh, lateral leg, dorsum of foot, & toes 1, 2, 3	Tib posterior, med. hamstrings
L5–S2	S1–2	Gluteales, hamstrings, peroneales, gastroc-soleus	Posterior thigh & leg, lateral foot & heel	Achilles
S2–3	S3	∅	Groin, medial thigh to knee	∅
S3–4	S4	Bladder & rectum	Perineum & genitals	∅

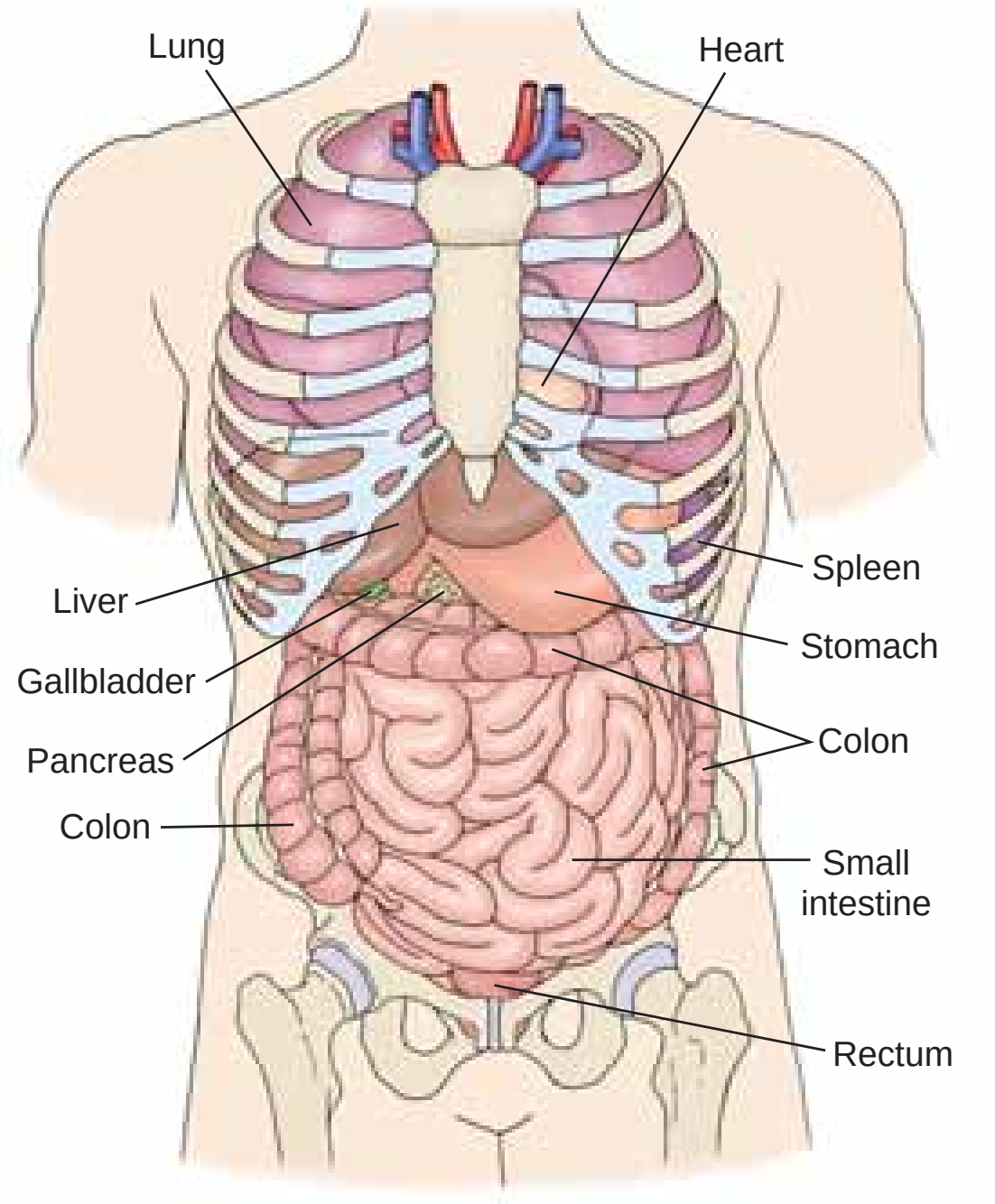
Visceral Innervations & Referral Patterns

Segmental Innervation	Viscera	Referral Pattern(s)
C3–5	Diaphragm	C-spine & anterior shoulders
T1–5	Heart	Anterior neck, chest, Ⓛ UE
T3/4–6/7	Esophagus	Substernal & upper thorax
T5–6	Lungs	T-spine
T6–8	Spleen	Ⓛ shoulder & upper 1/3 of arm
T6–10	Stomach	Upper abdomen & T-spine
	Bile duct	Upper abdomen, mid T-spine
T7–10	Gallbladder	Ⓡ UQ, right T-spine
	Liver	Ⓡ T-spine & Ⓡ shoulder
T5/6–10/11	Pancreas	Upper abdomen, low T-spine & upper L-spine
T7–10	Small intestine	Mid T-spine & umbilicus
T10–11	Testes/ovaries	Lower abdomen & sacrum
T10–12	Appendix	Ⓡ LQ, umbilicus
T10–L1	Kidney	High posterior costovertebral angle, radiates around flank
T10–L1 S2–4	Uterus Prostate	L/S & T/L junction Sacrum, testes, T/L junction
T11–L1	Bladder	Sacral apex, suprapubic, & upper thighs
T11–L1	Large intestine	Lower abdomen, L-spine
T11–L2 S2–4	Ureter	Costovertebral angle, groin, suprapubic, & medial thigh



Source: Gulick DT (2006).

Visceral Diagram



Source: Gulick DT (2006).

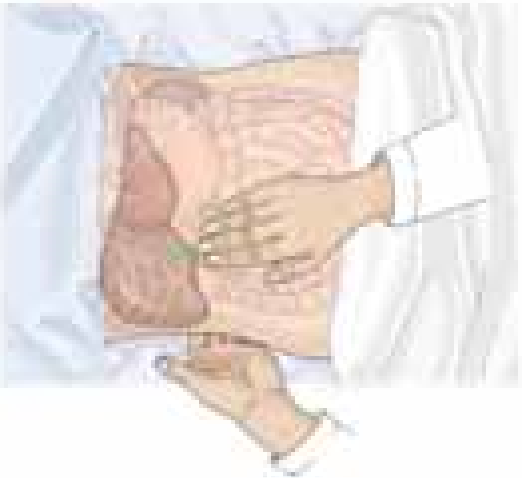
Visceral Palpation

Blumberg's Sign Rebound tenderness for visceral pathology

- In supine, select a site away from the painful area & place your hand perpendicular on the abdomen
- Push down slow & deep, hold for a moment then lift up quickly
- **Red flag:** (+) = pain on release; (−) = no pain

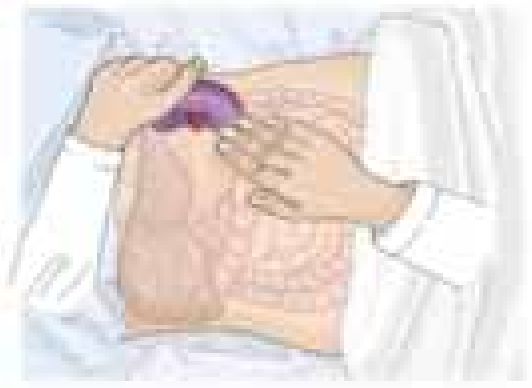
Murphy's Sign for the Gallbladder

- Place fingers to Ⓡ of rectus just below rib cage
- Ask patient to take a deep breath
- **Red flag:** Sudden pain & abdominal muscle tensing that ceases inspiration is suggestive of gallbladder pathology; pain also ↑ with FB



Spleen

- With patient in supine, stand on the Ⓡ & reach across with your Ⓛ hand to patient's ribs at the mid-axillary line
- Place Ⓡ hand at the Ⓛ costal margin (fingers pointing to Ⓛ shoulder)
- Press in & up
- Ask patient to take an "abdominal" breath & the edge of the spleen will move toward your fingers
- **Red flag:** reproduction of symptom(s); if spleen is palpable, it is probably enlarged



Kehr's Sign for the Spleen

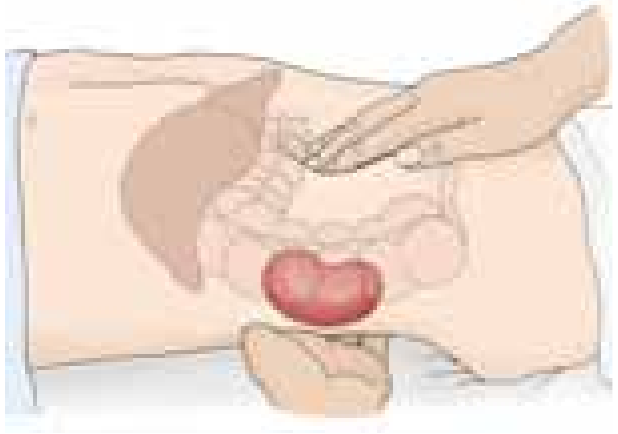
- With patient in supine, raising the foot of the bed (Trendelenburg position)
- **Red flag:** the presence of blood or other irritant in the peritoneal cavity will result in severe Ⓛ shoulder pain a few minutes after the LE are elevated

Liver Palpation

- With patient in supine, place left hand under the patient parallel to 11th & 12th ribs & lift upward
- With your Ⓡ hand at the costal margin, lateral to the rectus (fingers pointing toward the clavicle), gently press up & in
- Ask patient to take an "abdominal" breath & you should feel the liver edge move toward your fingertips on the abdomen
- Follow the liver contour for irregularities & note tenderness
- **Red flag:** reproduction of symptom(s)

Right Kidney

- With patient in supine, place Ⓛ hand under the patient between the ribs & iliac crest
- Place your Ⓡ hand on the Ⓡ abdomen just below the ribs with your fingers pointing left
- Ask patient to take an "abdominal" breath & try to "capture" the right kidney between your fingers
- Repeat with hands reversed for Ⓛ kidney
- **Red flag:** reproduction of symptom(s)

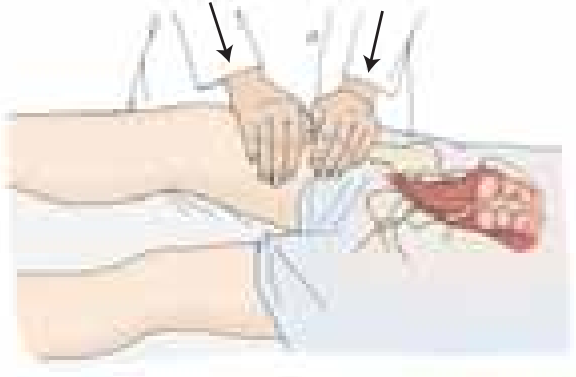


McBurney's Point for the Appendix

- In supine, identify the point that is half the distance between the Ⓡ ASIS & umbilicus
- Apply vertical pressure to this point
- **Red flag:** ↑ abdominal pain is a (+) test

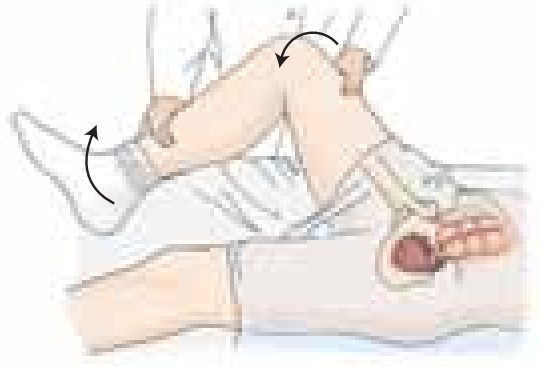
Psoas Sign for Appendicitis

- In supine, place hand above patient's Ⓡ knee & resist hip flexion
- Alternative technique: In Ⓛ side-lying, hyperextend Ⓡ LE
- **Red flag:** ↑ abdominal pain is a (+) test



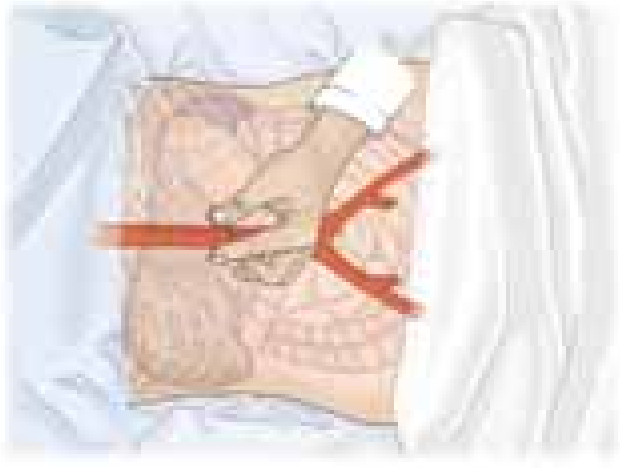
Obturator Sign for Appendicitis

- In supine, raise the patient's Ⓡ LE with the knee in flexion
- Rotate the LE into IR @ the hip
- **Red flag:** ↑ abdominal pain is a (+) test



Aorta

- Supine with hips/knees flexed
- At the upper abdomen, halfway between xiphoid & umbilicus, just Ⓛ of midline, press firm & deep to palpate the pulsation of the aorta
- Place your thumb on one side & your index/middle finger on the other side
- Palpate for a prominent lateral expansion of the aorta (aortic aneurysm)
- Alternative technique: Use index/middle fingers of both hands
- **Red flag:** aortic pulse width >2 cm; back pain with palpation; bruit on auscultation



Source: Gulick DT (2006).

ARONEN SHOULDER RELOCATION TECHNIQUE

Purpose: Relocate a dislocated shoulder

Position: Seated

Technique: Flex hip & place interlaced hands around flexed ipsilateral knee; relax shoulder & allow wt of LE to traction the shoulder back into place

Interpretation: + result = dramatic reduction in pain with relocation

STIMSON SHOULDER RELOCATION TECHNIQUE

Purpose: Relocate a dislocated shoulder

Position: Prone with involved UE hanging over the side

Technique: Tie a 5 lb wt onto the wrist (do not hold in hand) & allow wt to traction shoulder back into place (may take up to 20 min.)

Interpretation: Dramatic reduction in pain with relocation

ROCKWOOD SHOULDER RELOCATION TECHNIQUE

Purpose: Relocate a dislocated shoulder

Position: Supine with a sheet wrapped around the athlete's upper rib cage (into the axilla)

Technique: Have one person apply a counter pressure in the contralateral direction by pulling on the ends of the sheet while another person applies in-line traction to the involved UE

Interpretation: Dramatic reduction in pain with relocation

Neurological Pathology

Possible Signs of a Skull Fracture

- Bleeding or fluid from ears &/or nose
- Palpable depression or crepitus
- Deep laceration or severe bruise to the scalp
- Loss of consciousness; convulsion
- Unequal pupils; visual disturbance
- Raccoon eyes = discoloration under both eyes
- Battle sign = discoloration behind the ear
- Confusion, irritability, drowsiness, nausea, vomiting
- **Watch for bradycardia & hypertension = a sign of ↑ intracranial pressure**

Management of a Suspected Skull Fracture

- Stabilize head & neck
- Activate EMS
- Monitor ABCs
- Take vital signs & recheck every 5 minutes
- Watch for raccoon eyes or Battle sign
- Palpate skull & C-spine
- Cover wounds but do NOT apply pressure

Source: Anderson MK, Hall SJ & Martin M (2000); http://health.allrefer.com/health/skull-fracture-symptoms.html.

Seizure Procedure

- Note time of onset of seizure
- Remove objects that could be a potential source of injury
- Remove glasses & loosen clothing prn
- Protect athlete's head but do not attempt to restrain the athlete
- Never place an object in the athlete's mouth
- After seizure, note time, ensure an open airway in side-lying
- If the seizure lasts more than 5 minutes, activate EMS
- Monitor athlete (including vital signs) until all symptoms clear or athlete is referred

Source: Anderson MK, Hall SJ & Martin M (2000).

Signs & Symptoms of Increasing Intracranial Pressure

- Severe headache
- Nausea, vomiting
- Cushing's triad = ↑ SBP, ↓ PR, & irregular respirations
- Irregular pupils & tracking
- Change in behavior; lethargy
- ↑ body temperature
- Seizures

Source: Anderson MK, Hall SJ & Martin M (2000); http://www.nlm.nih.gov/medlineplus/ency/article/000793.htm.

Concussion Procedure

- Assess athlete
- Monitor athlete (including vital signs) at 5-min intervals until all symptoms clear or athlete is referred
- Athletes may not return to play until they are asymptomatic at rest & with exertion for >20 minutes
- Athletes should be disqualified if there is a LOC, amnesia >15 minutes, symptoms in the "Physician Referral Checklist" are present

- If disqualified, athletes should be symptom-free for 7 days before returning to play
- Consider permanent disqualification with ≥ 3 concussions

Source: Guskiewicz KM, Bruce SL, Cantu RC, Ferrara MS, Kelly JP, McCrea M, Putukian M & Valovich McLeod TC (2004).

Physician Referral Checklist for Concussions

Symptoms requiring referral on the day of the injury:

- Loss of consciousness
- Amnesia lasting >15 min
- Neurological deterioration
- ↓ level of consciousness
- ↓ or irregular respirations
- ↓ or irregular pulse
- ↑ BP
- Cranial nerve deficits
- Unequal/dilated/unreactive pupils
- Raccoon eyes (fx)
- Battle sign (fx)
- Change in mental status
- Seizure
- Vomiting
- Motor, sensory, balance deficits on the field

Symptoms requiring referral on the day(s) after the injury:

- Any findings in the day-of-injury category
- Postconcussion symptoms worsens
- Increase in number of symptoms reported
- Symptoms interfere with athlete's daily functions (sleep, cognition)

Source: Guskiewicz KM, Bruce SL, Cantu RC, Ferrara MS, Kelly JP, McCrea M, Putukian M & Valovich McLeod TC (2004); Heck J & Rosa R (2001).

Concussion: Graded Symptom Checklist

Name: _____

Symptom	Time of Injury	2–3 Hr Post	24 Hr Post	48 Hr Post	72 Hr Post
Blurred vision					
Dizziness					
Drowsiness					
Excess sleep					
Easily distracted					
Fatigue					
Feel “in a fog”					
Feel “slowed down”					
Headache					
Inappropriate emotions					
Irritability					
Loss of consciousness					
Loss of orientation					
Memory problems					
Nausea					
Nervousness					
Personality changes					
Poor balance/ coordination					
Poor concentration					
Ringing in ears					
Sadness					
Seeing stars					
Sensitivity to light					

Continued

Concussion: Graded Symptom Checklist—*Cont'd*

Symptom	Time of Injury	2–3 Hr Post	24 Hr Post	48 Hr Post	72 Hr Post
Sensitivity to noise					
Sleep disturbance					
Vacant stare/ glassy-eyed					
Vomiting					

Scoring: 0 = not present, 1 = mild, 3 = moderate, 6 = most severe

Source: Guskiewicz KM, Bruce SL, Cantu RC, Ferrara MS, Kelly JP, McCrea M, Putukian M, Valovich McLeod TC (2004).

Standardized Assessment of Concussion (SAC)

Athlete: _____

Date: _____ **Time:** _____

Baseline Injury	Day 1	Day 2	Day 3	Day 4	Day 5
Orientation:			**Scoring**		
Month:			0		1
Date:			0		1
Day of week:			0		1
Year:			0		1
Time (within 1 hour):			0		1

Total Orientation Score (1 point each): _____

Immediate Memory: Read the list of words & athlete repeats back in any order (all 3 trials of each row must be completed)

	Trial 1	Trial 2	Trial 3
Elbow	0 1	0 1	0 1
Apple	0 1	0 1	0 1
Carpet	0 1	0 1	0 1
Saddle	0 1	0 1	0 1
Bubble	0 1	0 1	0 1

Total Memory Score: _____

Concentration: Read string of numbers & have athlete repeat the digits backward (if correct go to next row, if incorrect read trial 2)

Trial 1	Trial 2	Score
4 – 9 – 3	6 – 2 – 9	0 1
3 – 8 – 1 – 4	3 – 2 – 7 – 9	0 1
6 – 2 – 9 – 7 – 1	1 – 5 – 2 – 8 – 6	0 1
7 – 1 – 8 – 4 – 6 – 2	5 – 3 – 9 – 1 – 4 – 8	0 1

Months in reverse order: must complete entire sequence for 1 pt

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan

Total Concentration Score: _____

Delayed Recall: Ask athlete to recall the words previously read

Elbow Apple Carpet Saddle Bubble

Total Delayed Recall Score (1 point each): _____

SAC Scoring Summary:

Orientation = _____ out of 5

Immediate Memory = _____ out of 15

Concentration = _____ out of 5

Delayed Recall = _____ out of 5

Overall Total Score = _____ **out of 30**

Scoring of the SAC **must** be compared to a baseline test; a drop of 3.5 points has been found to be significant Sensitivity 94%; Specificity 76%

Source: Guskiewicz KM, Bruce SL, Cantu RC, Ferrara MS, Kelly JP, McCrea M, Putukian M & Valovich McLeod TC (2004); Barr WB & McCrea M (2001); Valovich TC, Perrin DH & Gansneder BM (2003); McCrea M (2001); Heck J & Rosa R (2001); Kelly JP (2001); Starkey C & Ryan J (2003).

Balance Error Scoring System (BESS)

Phase 1: Standing on a firm surface

- With feet together & hands on hips, close eyes for 20 sec
- Single leg stance with hands on hips; close eyes for 20 sec
- Tandem stance with hands on hips; close eyes for 20 sec

Phase 2: Standing on medium density foam

- With feet together & hands on hips, close eyes for 20 sec
- Single leg stance with hands on hips; close eyes for 20 sec
- Tandem stance with hands on hips; close eyes for 20 sec

Scoring: 1 point for each of the following errors:

- Opening eyes
- Taking hands off hips
- Taking a step or falling
- Flexing or abducting the hip >30°
- Lifting foot or heel off the floor
- Staying out of the test position for more than 5 sec
- **If unable to maintain any of the test position for 5 sec, a score of 10 is scored**

Results: A score >25% higher than the baseline test is abnormal; this test may be influenced by a practice effect with repeated administration

Source: Starkey C & Ryan J (2003); Oliaro S, Anderson S & Hooker D (2001); Valovich TC, Perrin DH & Gansneder BM (2003).

Rivermead Post Concussion Symptoms Questionnaire (RPQ)

Scale: 0 = not experiencing at all
1 = no more of a problem than usual
2 = a mild problem
3 = a moderate problem
4 = a severe problem

Compared with before the injury, do you now or in the past 24 hours suffer from:					
Headaches	0	1	2	3	4
Feeling of dizziness	0	1	2	3	4
Noise sensitivity	0	1	2	3	4
Sleep disturbances	0	1	2	3	4
Fatigue, tiring more easily	0	1	2	3	4
Being irritable, easily angered	0	1	2	3	4
Feeling depressed or tearful	0	1	2	3	4
Feeling frustrated or impatient	0	1	2	3	4
Forgetfulness, poor memory	0	1	2	3	4
Poor concentration	0	1	2	3	4
Taking longer to think	0	1	2	3	4
Blurred vision	0	1	2	3	4
Light sensitivity	0	1	2	3	4
Double vision	0	1	2	3	4
Restlessness	0	1	2	3	4
Total score: _____					

Source: King NS, Crawford S, Wenden FJ, Moss NEG & Wade DT (1995); Heck J & Rosa R (2001).

Torg Concussion Classifications

	Grade 1	Grade 2	Grade 3	rade 4	Grade 5
LOC	No	No	No	Yes <5 min	Yes >5 min
Confusion	None	Slight	Moderate	Severe	Severe
Amnesia	No	<30 min post-traumatic amnesia	Retrograde & <30 min post-traumatic amnesia	Retrograde & >30 min post-traumatic amnesia	Retrograde & >24 hours post-traumatic amnesia
Residual symptoms	No	Perhaps	Sometimes	Yes	Yes
Dizziness	No	Mild	Moderate	Severe	Usually severe
Tinnitus	No	Mild	Moderate	Severe	Often severe
Headache	No	May be dull	Often	Often	Often
Disorientation & unsteadiness	Minimal if any	Some	Moderate	Severe (5–10 min)	Often severe (>10 min)
Blurred vision	No	No	No	Not usually	Possible
Personality changes	No	No	No	Possible	Possible

Source: Vegso IJ & Torg JS (1991).

American Academy of Neurology Concussion Grading Scale	
Grade 1 Mild	No LOC, transient confusion, symptoms resolve in <15 min
Grade 2 Moderate	No LOC, transient confusion, symptoms last >15 min
Grade 3 Severe	Any LOC (seconds or prolonged)

Cantu Evidence-Based Grading System for Concussion	
Grade 1 Mild	No LOC, post-traumatic amnesia <30 min, symptoms <24 hrs
Grade 2 Moderate	LOC <1 min, **or** post-traumatic amnesia ≥30 min & <24 hrs, **or** symptoms ≥ ≥24 hrs & <7 days
Grade 3 Severe	LOC ≥1 min **or** posttraumatic amnesia ≥24 hrs, **or** symptoms ≥7 days

Source: American Academy of Neurology (1997); Cantu RC (2001).

Emergency Situations: Environmental

Hypothermia

Symptoms:

- Shivering; motor impairment
- Loss of mental focus
- Shallow & irregular RR
- Slow & weak PR
- ↓ BP
- Dilated pupils
- Skin may be pale, numb, waxy
- Athlete may report burning or itching
- Speech slow & slurred
- Severe status—athlete just wants to go to sleep

Treatment:

- Reduce respiratory heat loss
- **Warm athlete**
- Monitor vital signs & CNS status
- Transport promptly
- Blistering & ulcerations may occur in severe cases; affected area should be kept dry & open to the air

Heat Illnesses

Prevention

- Drink 2 cups of fluids (~500 mL) 2 hours before exercise
- Drink 4 cups (~1000 mL) of fluid/hour of activity with ~10–15 g of carbohydrate/cup of fluid

Intrinsic Factors	Extrinsic Factors
• Hx of heat illness • Poor conditioning • Elevated body fat • Dehydration/overhydration • Fever; GI illness • Salt deficiency • Sunburn or rashes • Medications, alcohol, caffeine • "Warrior" mentality	• Prolonged/intense activity without breaks • High temperatures/humidity • Clothing & equipment that prevents evaporation • Lack of education/awareness • Failure to recognize warning signs

Source: NATA, Inter-Association Task Force on Exertional Heat Illnesses (2000); Binkley HM, Beckett J, Casa DJ, Kleiner DM & Plummer PE (2002); American College of Sports Medicine (1996).

Exertional Hyponatremia	
Symptoms: • Low blood sodium levels; copious urine with low specific gravity • CNS changes: Confusion, convulsions, altered cognitive functioning 2° cerebral edema • Respiratory changes 2° pulmonary edema • Headache, nausea, vomiting • Swelling of hands & feet	Treatment: • If sodium levels cannot be determined, do not attempt to hydrate • Transport as soon as possible
Dehydration	
Symptoms: • Dry mouth, thirst • Irritability, discomfort • Headache, apathy • Muscle cramps, weakness • Flush skin • Dizziness, vomiting, nausea	Treatment: • Cease activity • Move to a cool environment • **Rehydrate** with at least 2 cups of fluid/pound of body weight lost • Mild stretch to cramping muscles

Heat Exhaustion

Symptoms:

- Physical fatigue, chills
- Dehydration w/active sweating
- Ataxia, poor coordination
- Dizziness, syncope
- Pale with profuse sweating
- Throbbing headache, nausea, vomiting, diarrhea
- GI & muscle cramps
- ↑ HR (weak), ↑ RR
- ↓ BP (small pulse pressure)
- Tingling in hands & feet
- ↓ urine output (if no urine in 6–12 hrs, ↑ risk of acute renal failure

Treatment:

- **Rehydrate** with chilled water or sports drink
- Move to a cool environment
- Remove equipment & excess clothing
- Cool athlete
- Monitor vital signs & CNS status
- Transport if rapid improvement is not noted

Exertional Heat Stroke

Symptoms:

- CNS changes: Disorientation, irritability, combative, ↓ mental acuity, emotional instability, incoherent speech
- Absence of sweating
- Nausea, vomiting, diarrhea
- Headache, dizziness
- ↑ HR (bounding), ↑ RR
- ↓ DBP (wide pulse pressure)

Treatment:

- **Cool athlete** with aggressive & immediate cold water immersion, cold spray, ice packs, cold towels, fans while waiting for EMS
- Monitor vital signs & CNS status
- Transport promptly

Hydration Recommendations

- Beverages 50°–59°F @ 6%–8% carb concentration
- Drink 17–20 oz of water/sport drink 2–3 hrs before exercise
- Drink 7–10 oz of water/sport drink 10–20 min before exercise
- Ingest 1 g carb/min during exercise (2 g carb/oz = 30 oz/hr or 8 oz every 15 min)
- Within 2 hrs after exercise, drink 20–24 oz/lb of body wt lost

Return to Play

Athlete must be:

- Symptom free
- Fully hydrated
- Cleared by a physician

Source: NATA, Inter-Association Task Force on Exertional Heat Illnesses (2000); Binkley HM, Beckett J, Casa DJ, Kleiner DM & Plummer PE (2002).

Photosensitive Drugs

Athlete must be cautioned about sun exposure if taking any of the following medications:

- Tetracyclines
- Sulfonamides
- Thiazides

Source: Lillegard WA, Butcher JD & Rucker KS (1999).

Signs & Symptoms of Asthma

- Chest tightness
- Coughing (especially at night)
- Prolonged SOB
- Difficulty sleeping
- Wheezing (especially after exercise)
- Inability to catch one's breath
- Use of accessory muscles of respiration
- RR >25 bpm
- Peak flow <80% of predicted or baseline value

Source: Miller MG, Weiler JM, Baker R, Collins J & D'Alonzo G (2005).

Asthma

Triggers

- Respiratory infections
- Cigarette smoke pollutants
- Allergic reactions
- Exercise
- Cold environments
- Stress

Signs & Symptoms

- Prolonged expiration
- SOB; difficulty breathing
- Wheezing
- Cough

Asthma Inhalers

- **Short-acting bronchodilator** = immediate symptom relief; e.g., albuterol (Proventil, Ventolin), pirbuterol (Maxair)
- **Long-acting bronchodilators** = up to 12 hrs of symptom relief; e.g., salmeterol (Serevent); formoterol (Foradil)
- **Corticosteroids** = long-term prevention of symptoms, may take up to 7 days for peak effectiveness; e.g., ,beclomethasone dipropionate (QVAR); fluticasone (Flovent); budesonide (Pulmicort); triamcinolone acetonide (Azmacort); flunisolide (AeroBid)
- **Nonsteroidals** = long-term prevention of inflammation; e.g., Cromolyn, nedocromil
- **Corticosteroid + bronchodilator** = long-acting combination; e.g., Advair

Asthma Action Plan

Green Zone: Doing well

- No cough, wheeze, chest tightness, SOB
- Can perform usual activities
- Peak flow is >80% of normal
- Continue long-term control medications

Yellow Zone: Getting worse

- Presence of cough, wheeze, chest tightness, SOB
- Waking @ night 2° symptoms
- Can perform some, but not all, usual activities
- Peak flow is 50%–80% of normal
- Add quick-acting med until in Green Zone
- Once in Green Zone, continue quick-acting meds every 4 hrs for 1–2 days
- If symptoms do not return to Green Zone after 1 hr, call MD

Red Zone: Medical alert

- Very SOB
- Quick-relief meds do not help
- Cannot do usual activities
- Lips/fingernails are blue
- Peak flow is <50% of normal
- Take quick-acting medication
- If peak flow does not improve by 15% after 3 doses of quick-acting meds over 1 hr, go to hospital or call ambulance

Athlete Information: Asthmatic

Name: _____

Emergency contact: _____

Normal peak flow: _____

Medications:

Short-acting: _____

Long-term: _____

Triggers:

Exercise	Respiratory infection	Odors
Animals	Temperature changes	Pollens
Foods	Molds	Other

Last asthmatic episode: _____

Peak flow: _____ Time: _____

_____ Time: _____

_____ Time: _____

Source: AAFA, 1-800-7-ASTHMA.

Normal Predicted Average Peak Expiratory Flow (L/min)

Normal Children & Adolescents

Height (inches)	Peak Expiratory Flow		Height (inches)	Peak Expiratory Flow
43	147		55	307
44	160		56	320
45	173		57	334
46	187		58	347
47	200		59	360
48	214		60	373
49	227		61	387
50	240		62	400
51	254		63	413
52	267		64	427
53	280		65	440
54	293		66	454

Asthma attack: Failure to experience a 15% increase in Peak Expiratory Flow after 2 puffs of an inhaler within 5 minutes should consider emergency care

Source: Nunn I & Gregg AJ (1973).

Allergic Reactions

Causes of Anaphylaxis

- **Foods:** Peanuts, tree nuts, shellfish, milk, soy, wheat, eggs
- **Medications:** Penicillin, sulfa antibiotics, allopurinol, seizure & anti-arrhythmics, NSAIDs, muscle relaxants, vaccines
- **Insect venom:** Bees, wasps, yellow jackets, hornets, fire ants
- **Latex:** Gloves, balloons, condoms, rubber bands
- **Exercise**

Symptoms

- Hives; itching or redness of skin
- Swelling–throat, lips, tongue, & periorbital
- Difficulty breathing & swallowing
- Metallic taste or itching in mouth
- Abdominal cramps, nausea, vomiting, diarrhea
- ↑ HR; anxiety
- Rapidly ↓ BP
- Weakness; loss of consciousness

Emergency Treatment

- Immediate injection of epinephrine (adrenaline)
  - 0.01 mg/kg body wt
  - 0.3 mg EpiPen is for athletes >30 kg (66 lbs)
  - 0.15 mg EpiPen Jr is for athletes <30 kg (66 lbs)
- Epinephrine constricts blood vessels, relaxes muscles of lungs & airways, ↓ swelling, ↑ HR
- Seek emergency care (epinephrine is only effective for 10–15 min)

Source: Joint Task Force on Practice Parameters (1998); www.epipen.com.

Lightning Safety

Recommendations for Athletic Safety

- Flash-to-Bang Method = on the lightning flash, begin to count until the associated clap of thunder is heard; if the time is 30 seconds, the fields should be cleared & shelter should be obtained
- Do **NOT** seek shelter near trees, flagpoles, or light poles
- Cordless/cellular phones are safer to use than "land"-line phones
- Anyone feeling skin tingling, their hair standing on end, or hearing crackling noises should assume the **lightning-safe position** (crouched on ground with feet together, wt on balls of feet, head lowered, & ears covered)

Source: Walsh KM, Bennett B, Cooper MA, Holle RL, Kithil R, & Lopez RE (2000).

Diabetic Signs & Symptoms

Hypoglycemia (rapid onset)	**Hyperglycemia (gradual onset)**
Blood glucose<50–60 mg/dL	Blood glucose (BG)>180 mg/dL
Skin is pale, cool, diaphoretic	Skin is dry & flushed
Intense hunger	Intense thirst
Disoriented or agitated	Fruity breath odor (acetone)
Dizziness	Rapid & weak pulse
Headache	Deep, exaggerated respiration
Slurred speech	Blurred vision
Tachycardic	Dizziness; nausea; vomiting
Tingling of face, tongue, lips	Weakness
Poor motor function	Cramping
LOC	Increased urination
	LOC/seizure
Treatment	**Treatment**
10–20 g of oral carbohydrates • 4–6 oz soda, OJ • 4 packets of sugar • 5–7 Lifesavers If unconscious, place sugar or honey under tongue Monitor & repeat as needed Resume activity 15 minutes after **all** symptoms resolve	Insulin treatment as follows: BG 150–200 mg/dL: 2 units BG 201–250 mg/dL: 4 units BG 251–300 mg/dL: 6 units BG 301–350 mg/dL: 8 units BG 351–400 mg/dL: 10 units

Source: Anderson MK, Hall SJ & Martin M (2000); Lillegard WB, Butcher JD & Rucker KS (1999); emedicine.com.

Methods to Prevent Hypoglycemia During Exercise

- Eat meals 1–3 hours before exercise
- Preexercise BG should be between 100–200 mg/dL
- Eat carbohydrate supplements every 30–60 minutes of exercise
- Reduce insulin dosage during exercise by 15%–25%

Source: Lillegard WB, Butcher JD, & Rucker KS (1999).

Emergency Situations – Behavioral

Characteristics of Athletes at Risk for Suicide

- Considerable athletic success before sustaining an injury
- Serious injury that requires surgery
- Long & arduous rehab with sports restriction
- Lack of preinjury competency upon return to sport
- Being replaced in their position by a teammate

Source: Smith AM & Milliner EK (1994); NATA Press release (Jan 25, 1995).

Emotional Responses of Athletes to Injury Questionnaire

1. If you could be anything you wanted to be in life, what would that be?
2. List in order of preference the sports & activities in which you participate.
3. What are your reasons for participating in sport?

   Rank 10 = high & 0 = low:

   Stress management ____ Fun____

   Pursuit of excellence____ Socialization____

   Personal improvement____ Self-discipline____

   Weight management____ Outlet of aggression____

   Competition____ Other____

   Fitness____
4. Would you describe yourself as an athlete?
   1(absolutely not)...2.....3.....4.....5(absolutely yes)
5. What specific goals do you have in sport?
6. Have they changed since the injury? Yes ____ No ____

   If yes, how?
7. What is the nature of your injury?
8. In what sport were you injured?

   How did it happen?
9. When during the season did the injury occur?

   Circle one: before.....mid.....end
10. Are you encouraged in sport by significant others?

    Yes _____ No _____
11. Do you interpret this support as:

    Pressure _____ Reluctant support ____ Just right _____

12. Who exerts most of the pressure?

    Self ____ Father ____ Mother ____ Coach ____ Other ____

13. How many hours per week were you in practice or competition before the injury?

    0–2 3–5 6–10 11–15 16–20 21–25 26–30 31 & over

14. Were you under any recent stress (life changes) before the injury? Yes _____ No _____

    If yes, could you please describe?

15. Do you have a strong family support system or close friends who know about your injury? Yes _____ No _____

    If yes, who are they?

16. How have you been feeling emotionally since the injury?

17. How would you rank these emotions in significance as to how you are feeling because of the injury?
    Rank: 12 = high, 0 = low

Helpless _____	Frustrated _____	Optimistic _____
Tense _____	Shocked _____	In pain _____
Bored _____	Discouraged _____	Relieved _____
Depressed _____	Frightened _____	
Angry _____		

18. If 0% is no recovery, what percentage of recovery have you made to your preinjury status?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

19. When is your estimated date of return to sport?

20. Do you have fears about returning to sport?

    Yes ____ No ____

    If yes, what are they?

21. Are you a motivated person for exercise?

    1 2 3 4 5 6 7 8 9 10

    (not at all) (extremely)

22. What is your current rehabilitation program?

    Which exercises _____ Times/day _____ Times/week _____

23. Are you able to work out on exercise equipment or modalities?

    Yes ____ No ____

    If yes, please describe

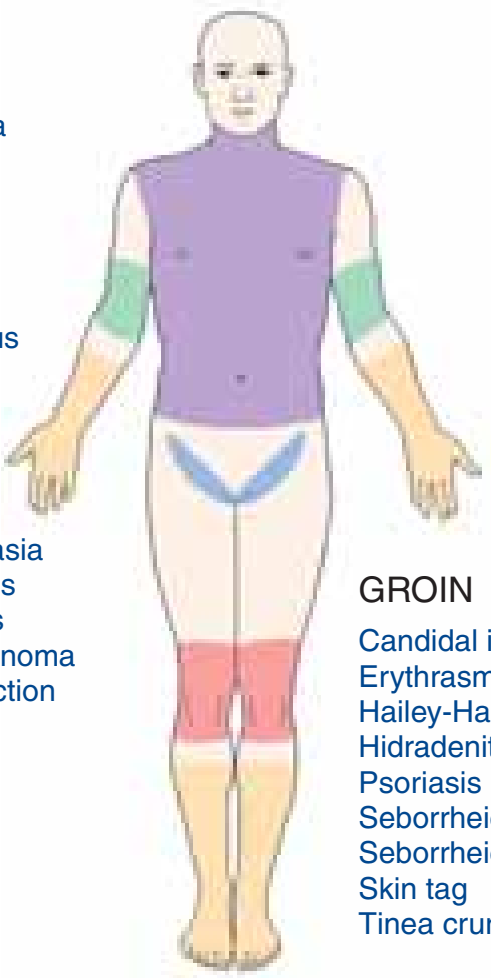
Criteria:

Source: Smith AM & Milliner EK (1994).

Integumentary

FACE

Acne
Actinic keratosis
Basal cell carcinoma
Contact dermatitis
Dermatomyositis
Herpes simplex
Impetigo
Keratoacanthoma
Lupus erythematosus
Melasma
Nevus
Perioral dermatitis
Rosacea
Sarcoidosis
Sebaceous hyperplasia
Seborrheic dermatitis
Seborrheic keratosis
Squamous cell carcinoma
Varicella-zoster infection
Vitiligo



GROIN

Candidal intertrigo
Erythrasma
Hailey-Hailey disease
Hidradenitis suppurativa
Psoriasis
Seborrheic dermatitis
Seborrheic keratosis
Skin tag
Tinea cruris

LIMBS

Atopic eczema
Bullous pemphigoid
Cellulitis
Dermatofibroma
Erythema multiforme
Granuloma annulare
Henoch-Schönlein purpura
Keratosis pilaris
Lichen planus
Melanoma
Nevus
Psoriasis
Pyoderma gangrenosum
Seborrheic keratosis
Stasis dermatitis
Ulcer
Vasculitis

GENITALIA

Herpes simplex
Lichen planus
Lichen sclerosus
Molluscum contagiosum
Psoriasis
Scabies
Syphilis (chancre)
Wart
Zoon's balantis

TRUNK

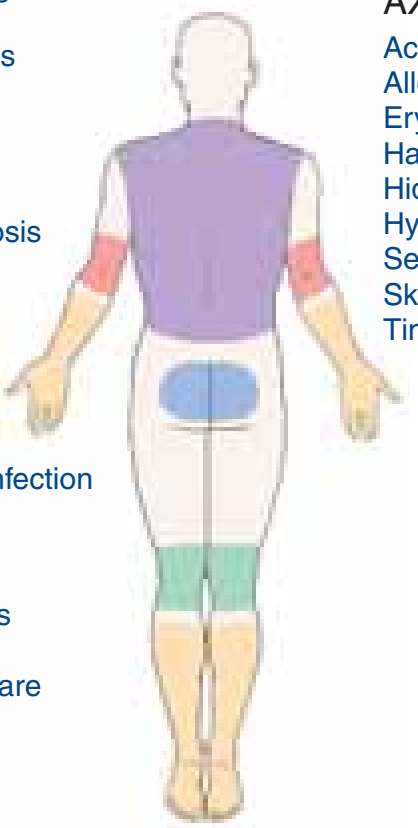
Acne
Basal cell carcinoma
Cherry angioma
Darier disease
Drug eruption
Epidermal cyst
Folliculitis
Grover disease
Keloid
Lipoma
Melanoma
Molluscum contagiosum
Morphea
Mycosis fungoides
Neurofibroma
Nevus
Pityriasis rosea
Psoriasis
Seborrheic keratosis
Skin tag
Striae
Syphilis
Tinea corporis
Tinea versicolor
Urticaria
Varicella-zoster infection

FEET

Contact dermatitis
Corn
Granuloma annulare
HFMD
Keratoderma
Lichen planus
Nevus
Onychomycosis
Plantar wart
Psoriasis
Tinea pedis

SCALP

Actinic keratosis
Alopecia areata
Androgenetic alopecia
Dermatitis
Epidermal or pilar cyst
Nevus
Pediculosis (lice)
Psoriasis
Seborrheic dermatitis
Squamous cell carcinoma
Tinea capitis



AXILLA

Acanthosis nigricans
Allergic contact dermatitis
Erythrasma
Hailey-Hailey disease
Hidradenitis suppurativa
Hyperhydrosis
Seborrheic dermatitis
Skin tag
Tinea corporis

HANDS

Actinic keratosis
Atopic eczema
Contact dermatitis
Erythema multiforme
Granuloma annulare
HFMD
Hyperhidrosis
Keratoacanthoma
Lichen planus
Psoriasis
Scabies
Syphilis
Warts

Source: From Barankin B & Freiman A, (2006).

Angioma (Cherry Angioma)

Description: Dome-shaped (0.5–5.0 mm), cherry-red bump; benign vascular growth that appears primarily on the trunk; may bleed profusely if disrupted; may increase in number & size with age

Etiology: Unknown

Rx: Biopsy prn

Source: From Barankin, B & Freiman A (2006).

Atopic Dermatitis

Description: Excoriated, erythematous, scaly patches that itch; found on head, face, & extensor surfaces of infants, flexor surfaces of children, & hands of adults

Etiology: Cutaneous immune dysfunction with strong family hx; may be triggered by sweat, contact sensitivity, infection, anxiety

Rx: Remove irritant, wash with mild soap (Dove®), topical HCC

Source: From Barankin B & Freiman A (2006).

Basal Cell Carcinoma

Description: Most common form of skin cancer; nonhealing papule or nodule with rolled border & central crust or ulceration that bleeds; occurs on head or face; waxy appearance

Etiology: Chronic UV exposure, genetics, immunosuppression

Rx: Cryotherapy, excision

Source: From Barankin B & Freiman A (2006).

Black Heel

Description: Black discoloration of the posterior aspect of the heel

Etiology: Trauma-induced hematoma due to quick starts & stops that result in damage to blood vessels

Rx: No immediate care is needed; may explore properly fitting shoes

Candidiasis (Oral = Thrush)

Description: Initially painful, pruritic, red rash that progresses to fissuring & maceration.

Etiology: Yeast infection 2° immunosuppression, DM, HIV, AIDS, prolonged antibiotic or corticosteroid use, heat & friction

Rx: Antifungal agent

Source: From Barankin B & Freiman A (2006).

Cellulitis

Description: Local pitting edema, erythema, skin has a "glossy" & "stretched" appearance, warm to touch, & tender; fever; joint stiffness; mm aches

Etiology: Strep or Staph infection associated with local trauma, abrasion, or insect bite; postsurgical

Rx: Antibiotics; cellulitis of the face requires prompt medical attention; athletes with cellulitis should not participate until condition resolves

Source: From Barankin B & Freiman A (2006).

Contact Dermatitis

Description: Reaction may vary from mild redness to open sores; red, edematous rash with itching

Etiology: Inflammatory reaction to a toxin

Rx: Identify & remove irritant; moisturize, topical corticosteroid

Source: From Barankin B & Freiman A (2006).

Eczema

Description: Scaly, itchy plaques that ooze & crust over; occurs most often on the knees & elbows

Etiology: Dry skin &/or cold climates

Rx: Moisturize; topical steroids

Source: From Barankin B & Freiman A (2006).

Folliculitis

Description: Superficial pustules on any body area with hair; may involve enlarged lymph nodes; may be contagious

Etiology: Bacterial infection of a hair follicle 2° damage, blockage, or friction

Rx: Remove irritant & apply topical antibacterial agent

Source: From Barankin B & Freiman A (2006).

Hand, Foot, & Mouth Disease

Description: Numerous small blisters on fingers & toes that resemble red halos; mouth & throat ulcers; may include fever, malaise, loss of appetite

Etiology: Coxsackievirus that usually begins in the throat; highly contagious; spread by direct contact

Rx: Topical lidocaine & acetaminophen/ibuprofen; antibiotics do not help; cold milk & ice cream soothe throat ulcers

Source: From Barankin B & Freiman A (2006).

Herpes Simplex

Description: Burning & itching precede reddened region & oral mucosal erosions that crust over in 7–10 days

Etiology: Viral infection

Rx: Oral antiviral agent (topical antiviral agents are of no benefit); consider chronic therapy for >6 outbreaks/yr

Source: From Barankin B & Freiman A (2006).

Herpes Zoster (Shingles)

Description: Painful, blistering, red rash that erupts in clusters along a dermatomal distribution for several days; crusting occurs over 2–4 wks

Etiology: Varicella zoster virus that lies dormant in sensory nerve roots for years; likelihood of reactivation increases with age; may be contagious to a person who has not had chicken pox

Rx: Oral antiviral agents

Source: From Barankin B & Freiman A (2006).

Hives (Urticaria)

Description: Raised, itchy, red welts/wheals with clearly defined areas

Etiology: Allergic reaction to foods (fish, eggs, nuts, strawberries), drugs (ASA, codeine, penicillin, sulfa), & insect stings

Rx: Eliminate irritant; antihistamine; EpiPen under severe conditions

Source: From Barankin B & Freiman A (2006).

Impetigo

Description: Itchy, superficial red blisters that ooze & become crusty pustules

Etiology: Staph or strep infection that is spread by direct contact with the fluid from the blisters; highly contagious; do not share linens or clothing

Rx: Topical & oral antibiotics

Source: From Barankin B & Freiman A (2006).

Jogger's/Tennis Toe

Description: Hematoma formation & distal toe nail discoloration

Etiology: Repeated sliding forward of the foot in the shoe such that the toes & toenail collide with the front of the shoe. Mechanical stresses result in a hematoma

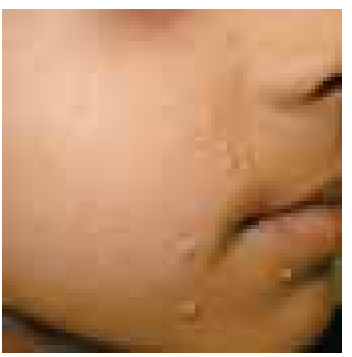
Rx: Acute treatment includes drainage of the hematoma under the nail to ↓ pressure; long-term care involves properly fitting shoes or orthotics

Molluscum Contagiosum

Description: Flesh colored, 2–5 mm dome-shaped papules; common locations are head, neck, & UE; painless; no redness

Etiology: Viral infection caused by poxvirus

Rx: Typically resolve spontaneously; top of nodule may be opened with a sterile needle & the waxy contents squeezed out; liquid nitrogen cryotherapy can also be used



Source: From Barankin B & Freiman A (2006).

MRSA (Methicillin-Resistant Staphylococcus Aureus)

Description: Red, swollen, painful abscess filled with pus

Etiology: Staph bacteria that most commonly affect people in the hospital, after sx, in long-term care, or on dialysis. Can also occur in athletes who share equip't, towels, razors

Rx: Drain abscess & identify an appropriate antibiotic (Vancocin, Bactrim, Septra)

Pediculosis (Lice)

Source: From Barankin B & Freiman A (2006).

Description: Gray-white eggs or lice that look like dandruff adhere to the hair shaft; itching may be absent to severe

Etiology: Infestation by 6-legged, wingless insects; spread by direct contact or infected objects

Rx: Medicated shampoo; vinegar soaks (1:1 vinegar: water); lice can survive up to 10 days on clothing, bedding, or carpets; eggs can live more than 2 wks

Poison Ivy

Description: Rash of small blisters that appear in a line or streak; rash appears 4 hrs to 10 days after contact, depending on the sensitivity & amount of exposure; the rash itself is not contagious

Etiology: Direct contact with the offending plant

Rx: If able, cleanse skin with rubbing alcohol within 10 min of contact & then rinse w/water; after 10 min, topical steroids, antihistamines, & Aveeno oatmeal baths will control itching

Source: From Gulick D (2006).

Psoriasis

Description: Itchy "salmon-colored" patches with thick, dry, white scales that peel off; usually found on scalp & extensor surfaces

Etiology: Genetic &/or environmental factors

Rx: Topical/oral corticosteroid agents, phototherapy; dandruff shampoos, moisturizers

Source: From Barankin B & Freiman A (2006).

Ringworm

Description: Ring-sized blotch (½–1″ diameter) that is scaly with clear center; itchy; may increase in size over time

Etiology: Fungal infection; contagious via direct contact with infected person or object

Rx: Body will build a natural immunity in ~ 15 weeks but an antifungal cream will resolve the rash faster

Source: From Gulick D (2006).

Scabies

Description: Debilitating itching that is worse @ night; thin pencil mark line that is evidence of burrows in genitals, finger webs, & flexor creases

Etiology: Parasite infection that is transmitted by direct contact

Rx: Prescription agents applied to the entire body; wash all clothing & linens in hot water

Source: From Barankin B & Freiman A (2006).

Squamous Cell Carcinoma

Description: Second most common form of skin cancer; malignant, slow growing, firm nodule that may become a rough, scaly papule on a sun-exposed area

Etiology: UV-damage, burns, chemical agents (tar), immunosuppression

Rx: Excision (including some surrounding tissue), liquid nitrogen cryotherapy

Source: From Barankin B & Freiman A (2006).

Syphilis

Description: Stage 1 = genital chancre; Stage 2 = reddish brown macules/papules on palms & soles; pink nodules on genitals; Stage 3 = CNS abnormalities

Etiology: Sexually transmitted spirochete that results in systemic pathology

Rx: Penicillin

Source: From Barankin B & Freiman A (2006).

Tinea Pedis

Description: Dry scaly feet with macerated plaques between the toes; mild itching

Etiology: Fungal infection preceded by hot & humid environments where sweating & occlusive footwear is involved

Rx: Antifungal agents (topical powders, creams, sprays, shampoos)

Source: From Barankin B & Freiman A (2006).

Varicella (Chicken Pox)

Description: Rash that starts on head & trunk; continues to spread for 3–5 days; resembles "dew drops on rose pedals"; erythematous macules to papules to vesicles

Etiology: Low fever 1–2 days before rash; infectious 4 days prior to when lesions appear until crusting (~ 5 days later)

Rx: Oral antiviral therapy

Source: From Barankin B & Freiman A (2006).

Warts

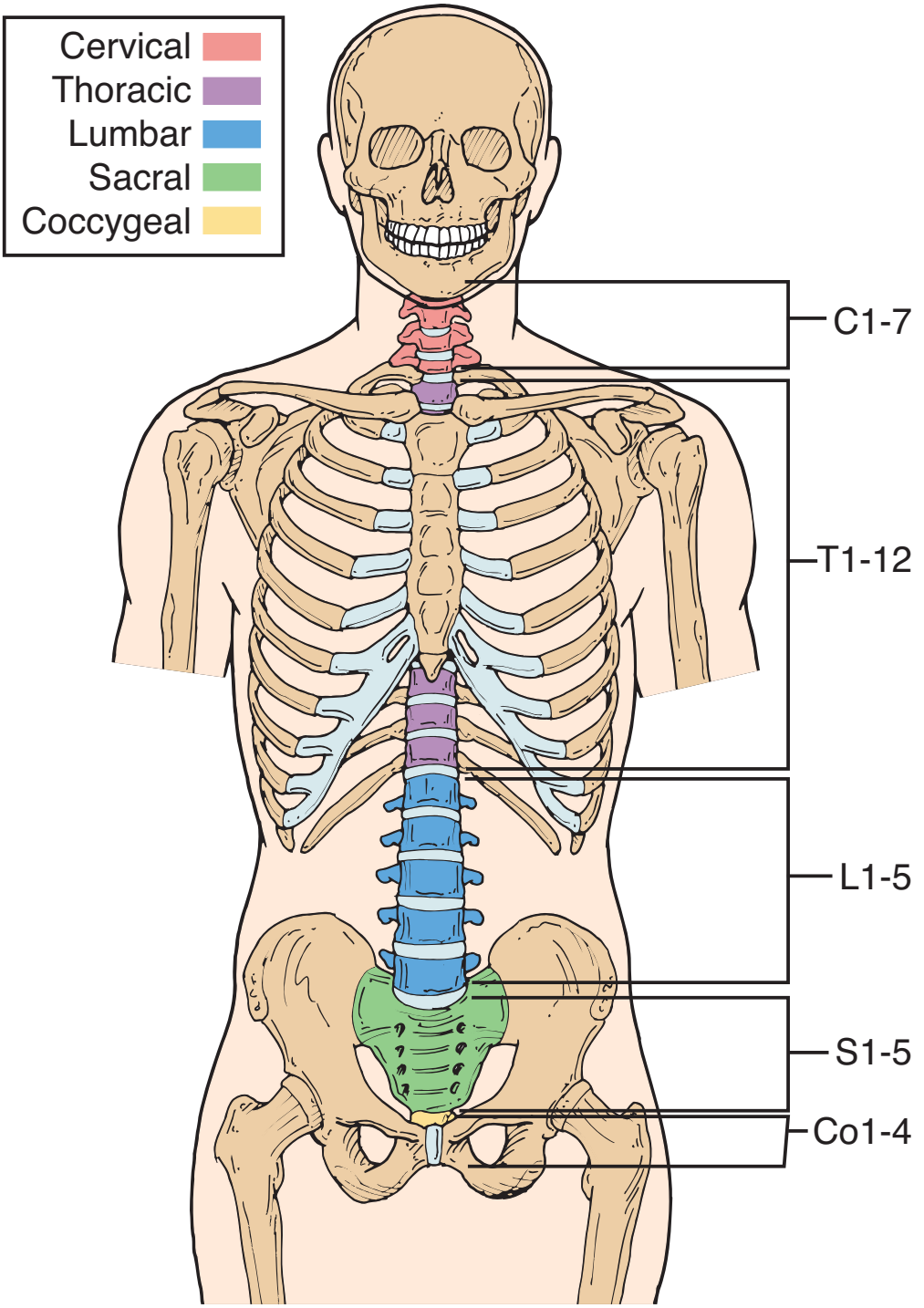
Description: Raised, rough, dome-shaped nodules with dark spots (thrombosed capillaries)

Etiology: Benign cutaneous tumors 2° viral infection (HPV)

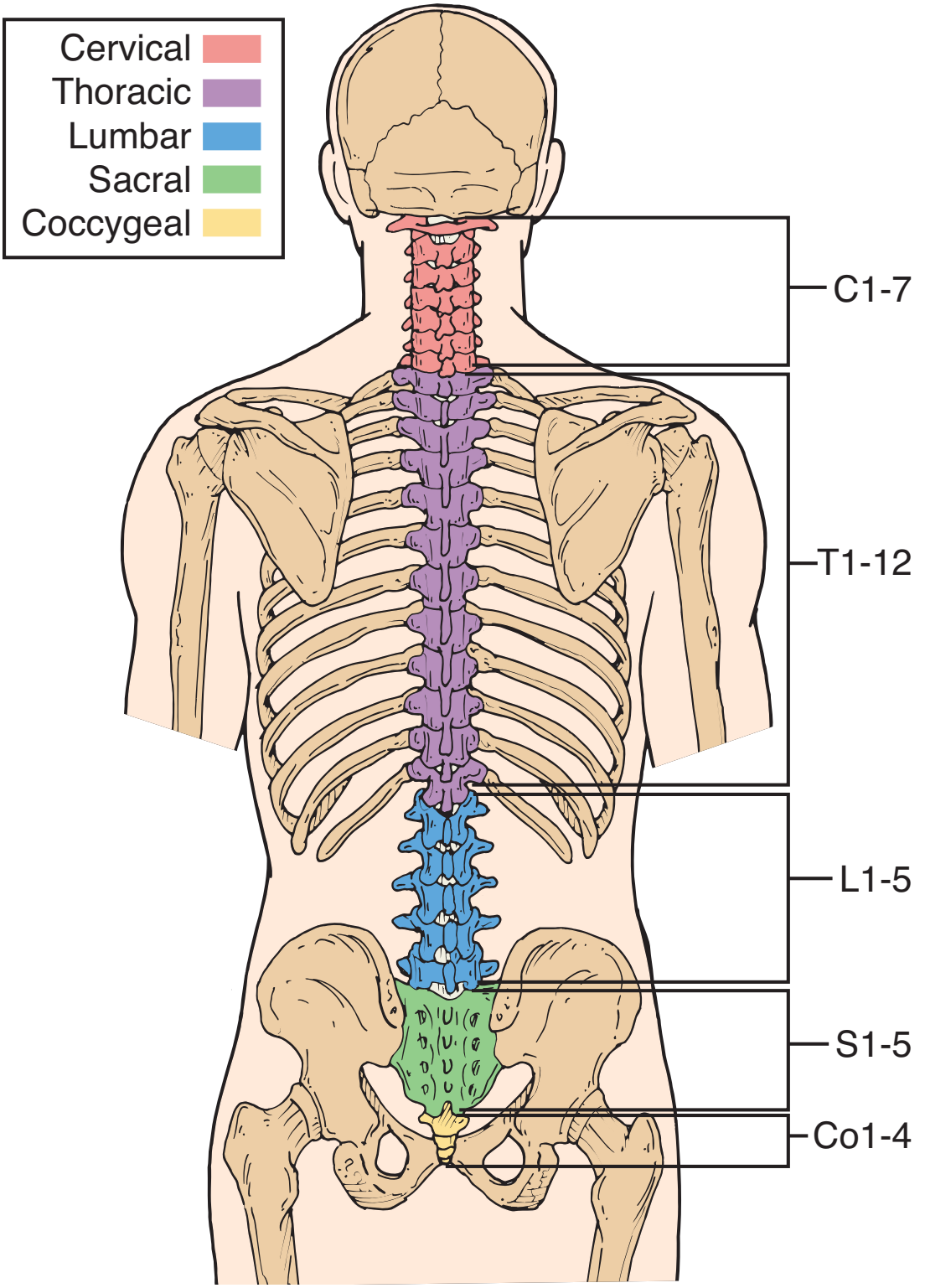
Rx: Many spontaneously resolve but often come back; OTC removal kits can be used; duct tape can also be applied for 6 days, remove, wash, & file the wart, reapply duct tape until the wart is gone

Source: From Barankin B & Freiman A (2006).

Musculoskeletal Pathology



Anterior


Cervical
Thoracic
Lumbar
Sacral
Coccygeal
C1-7
T1-12
L1-5
S1-5
Co1-4
Posterior

Surface Landmarks for Palpation

Vertebra	Landmark
C1	1 finger-width below mastoid process 2 finger-widths below occipital protuberance
C2	Angle of the mandible 3 finger-widths below occipital protuberance
C3–4	Posterior to hyoid bone
C6	Posterior neck @ level of the cricoid cartilage
C7	Most prominent cervical spinous process
T2	Superior aspect of the scapula
T4	Spine of the scapula
T7	Inferior angle of the scapula
T10	Xiphoid process
T12	Lowest (12th) floating rib
L3	Posterior to umbilicus
L4	Iliac crest
L5	Lumbar dimples
S2	PSIS
Tip of coccyx	Ischial tuberosities

Source: Anderson MK, Hall SJ & Martin M (2000).

Temporomandibular Joint (TMJ) Tests

TMJ AUSCULTATION: Used to identify poor joint kinematics or joint/disk damage; place stethoscope over TMJ, just anterior to tragus of ear, clinician listens for presence of joint sounds; very sensitive to finding a problem but not specific in the identification of the structure

Interpretation:

- Opening click = click as condyle moves over posterior aspect of disk in an effort to restore normal relationship; disk is anterior to condyle; the later the click, the more anterior the disk

- Reciprocal click = in opening, the disk reduces as the condyle moves under the disk & in closing, a second click is heard as the condyle slips posteriorly & the disk becomes displaced anteriorly

LATERAL POLE

Purpose: Assess soft tissues of TMJ

Position: Face client with clinician's index fingers palpating lateral pole of TMJ

Technique: Open & close mouth several times

Interpretation: + test = ↑ or reproduction of symptoms incriminating LCL or TMJ ligament

EXTERNAL AUDITORY MEATUS

Purpose: Assess posterior disk

Position: Face client, clinician inserts little fingers into client's ears

Technique: While applying forward pressure with fingers, client opens & closes mouth repeatedly

Interpretation: + test = ↑ or reproduction of symptoms

DYNAMIC LOADING

Purpose: To mimic TMJ loading to differentiate between TMJ & muscle pain

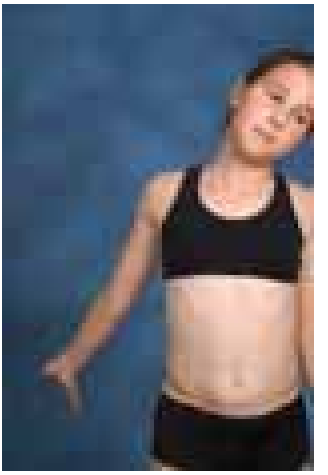
Position: Sitting with roll of gauze between molars on 1 side

Technique: Client bites down on gauze roll

Interpretation: Compression occurs on contralateral side & distraction on ipsilateral side of gauze; + test = ↑ or reproduction of symptoms @ TMJ

Upper Limb Neurodynamic Tests

MEDIAN NERVE TEST

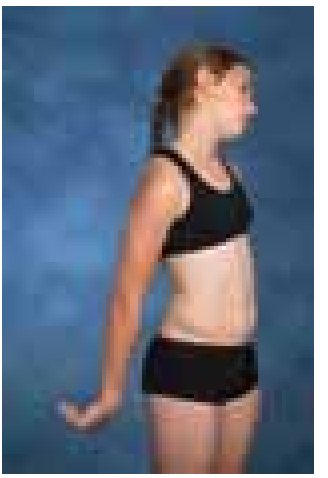


Position: Supine or sitting with contralateral cervical SB & ipsilateral shoulder depressed

Technique: Extend UE in plane of scapula with elbow extended, forearm supinated, & wrist/fingers extended

Interpretation: + test = pain or paresthesia into median nerve distribution of UE

RADIAL NERVE TEST

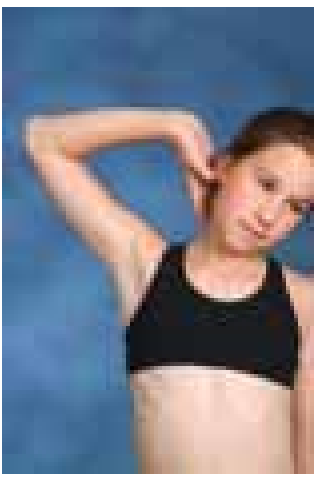


Position: Supine or sitting with contralateral cervical SB & ipsilateral shoulder depressed

Technique: Extend UE with elbow extended, forearm pronated, wrist flexed, & fingers extended

Interpretation: + test = pain or paresthesia into radial nerve distribution of UE

ULNAR NERVE TEST



Position: Supine or sitting with ipsilateral shoulder depressed

Technique: Abduct shoulder to 90° with ER, flex elbow, pronate forearm, extend wrist/fingers in an attempt to place the palm of the hand on the ipsilateral ear

Interpretation: + test = pain or paresthesia into ulnar nerve distribution of UE

Spine Tests

Burner/Stinger	
Mechanism = nerve root impingement 2° cervical compression or traction of the brachial plexus	
Signs &/or Symptoms: • Unilateral burning pain or paresthesia into the C5–6 distribution • Transient UE weakness	**Intervention:** • Activity restriction, ice, & cervical collar prn • Athlete can return to play when all symptoms resolve • If symptoms persist >15 min, medical referral should be made for radiographs/imaging

Source: Lillegard WA, Butcher KD & Rucker KS (1999); North American Spine Society (2002) at http://www.spine.org/articles/stingers.cfm.

SLUMP TEST

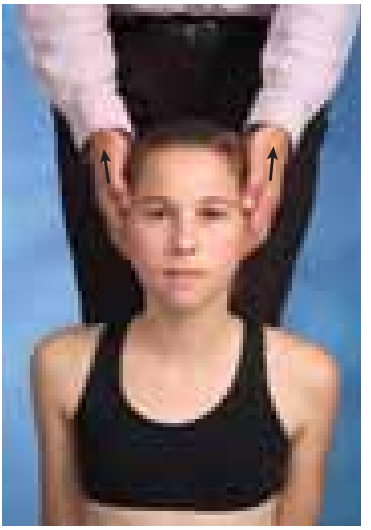
Purpose: Assess neural mobility

Position: Sitting with trunk in slumped posture

Technique: While sustaining neck flexion, sequentially add knee extension of 1 LE & then dorsi-flexion; repeat with other LE

Interpretation: + test = reproduction of symptoms; compare bilaterally

CERVICAL FORAMINAL DISTRACTION TEST



Purpose: Assess cervical mobility, foraminal size, & nerve root impingement

Position: Supine or sitting

Technique: Clinician imparts a controlled distraction force of the c-spine to ↑ the IVF space & decompress the facet joints

Interpretation: + test = ↓ or centralization of symptoms implies an effective means of intervention; pain = spinal ligament tear, annulus fibrosis tear/inflammation, large disk herniation, muscle guarding

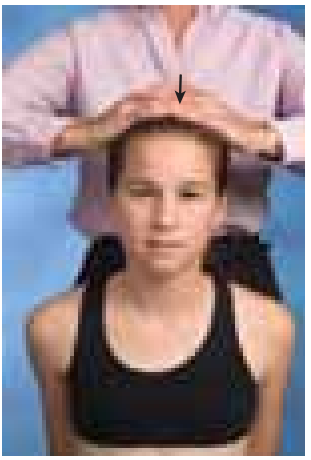
SPURLING'S TEST/CERVICAL QUADRANT SIGN

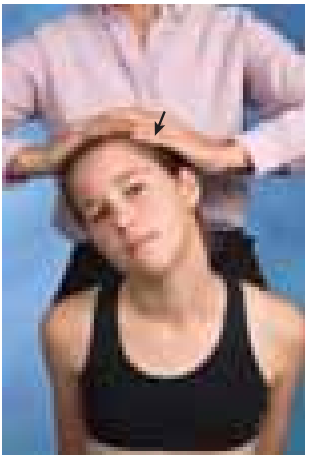
Purpose: Assess nerve roots & IVF

Position: Seated

Technique: Stand behind client with clinician's fingers interlocked on top of head & compress (axial load) with c-spine in slight extension & lateral flexion

Interpretation: + test = referred or reproduction of pain; implicates a variety of structures related to compromise of the IVF





VERTEBRAL ARTERY TEST

Purpose: Test for integrity of internal carotid arteries

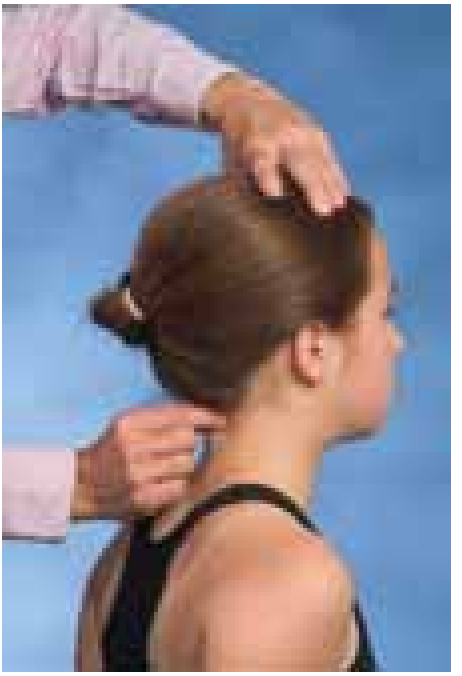
Position: Supine

Technique: Place hands under client's occiput to passively extend & SB c-spine then rotate to ~ 45° & hold × 30 sec; engage client in conversation while monitoring pupils & affect; repeat with rotation to opposite direction

Interpretation: + test = occlusion of vertebral artery inhibits normal blood flow & may result in nausea, dizziness, diplopia, tinnitus, confusion, nystagmus, unilateral pupil changes

ALAR LIGAMENT TEST

Purpose: Assess alar ligament integrity



Position: Supine

Technique: While palpating spinous process of C2, slightly SB head

Interpretation: Under normal conditions, Ⓡ rotation & SB tightens Ⓛ alar ligament & flexion tightens both. Thus, SP should move immediately in the contralateral direction to SB. **(+) test** = a delay in SP mov't of C2 may indicate pathology of the alar ligament (most common in client's with RA)

TRANSVERSE LIGAMENT TEST

Purpose: Assess transverse portion of cruciform ligament

Position: Supine with head cradled in the clinician's hands

Technique: PA glides are used to locate the anterior arches of C2; once identified, the C2 arches are stabilized posteriorly with the clinician's thumbs & the client's occiput is lifted with the cupped hands to translate the head forward; this glides the head & C1 anterior on C2; hold for 15–30 seconds

Interpretation: + test = vertigo, nystagmus, paresthesia into face or UE & indicates A-A instability 2° pathology of transverse ligament

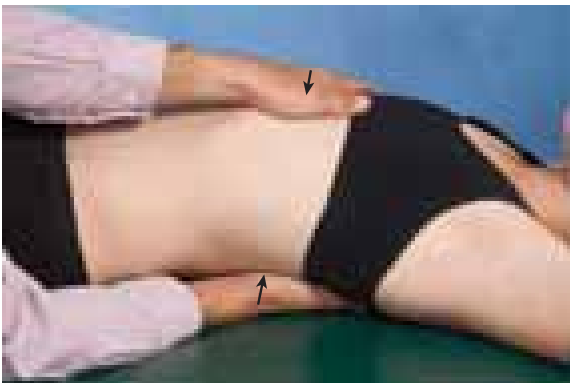
LATERAL & AP RIB COMPRESSION

Purpose: Assess ribs for fx

Position: Supine

Technique: With clinician's hands on the lateral aspect of the rib cage, compress bilaterally; repeat with hands on the front & back of the chest

Interpretation: + test = pain due to rib fracture or costochondral separation



MOTION TEST

Purpose: Assess costal mobility

Position: Supine

Technique: Palpate AP mov't of ribs as client inhales/exhales

Interpretation: During inspiration, ribs 1–6 should ↑ in AP dimension while ribs 7–10 should ↑ in lateral dimension via bucket handle action & ribs 8–12 should ↑ in lateral dimension via caliper action; + test = inhibited rib mov't with exhalation suggests an elevated rib; inhibited rib mov't with inhalation suggests a depressed rib

BEEVOR'S SIGN

Purpose: Assess abdominal musculature

Position: Supine with knees flexed & feet on mat

Technique: Head & shoulders are raised off the mat while mov't of the umbilicus is observed

Interpretation: Umbilicus should remain in a straight line; + test depends on direction of mov't; mov't distally = weak upper abdominals, mov't proximally = weak lower abdominals, mov't up & Ⓡ = weak muscles in Ⓛ lower quadrant, mov't down & Ⓛ = weak muscles in the Ⓡ quadrant

QUADRATUS TEST

Purpose: Assess quadratus lumborum muscle strength

Position: Ipsilateral side-lying on elbow

Technique: Lift ipsilateral hip to align back & LE

Interpretation: + test = inability to lift hip = weakness

STANDING/SITTING FORWARD FLEXION TEST

Purpose: Assess mobility of ilium or sacrum

Position: Standing or sitting

Technique: Palpate PSIS while client slowly FB with LE straight & hands reaching toward the floor

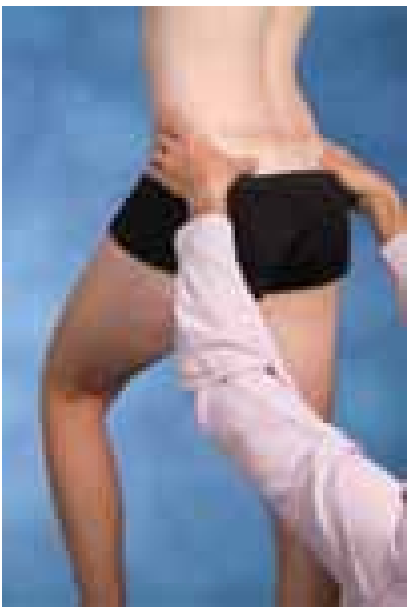
Interpretation: Segmental mov't should begin with L-spine, then sacrum, & then innominate; (+) test = asymmetrical mov't with the pathological side being the one that moves more

GILLET'S MARCH TEST

Purpose: Assess innominate mobility

Position: Standing

Technique: While clinician palpates inferior aspect of Ⓡ PSIS with 1 thumb & medial sacral crest (S2 @ the level of the PSIS) with 1 thumb, client is asked to flex Ⓡ hip to 90°–120°; repeat other side



Interpretation: Normal = L-spine Ⓛ SB & Ⓡ rotation should be accompanied by Ⓡ innominate rotating posterior & sacrum rotating Ⓛ; + test = asymmetrical PSIS mov't, pop/click, or reproduction of pain

SUPINE TO SIT TEST

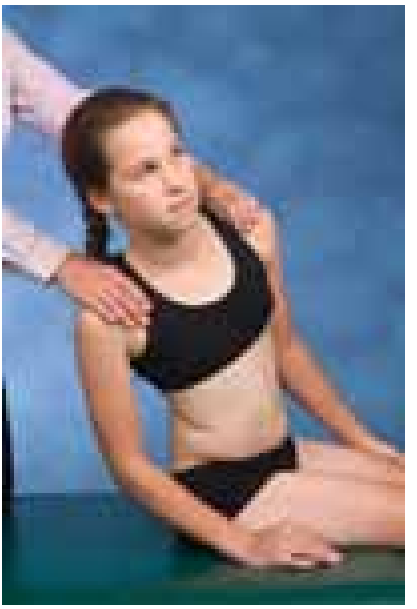
Purpose: Assess position of the ilium

Position: Supine with both LEs extended

Technique: Palpate medial malleolus as client performs a long sit-up (Be careful not to rotate the trunk while sitting up)

Interpretation: + test = a short-to-long leg position = posterior ilium rotation; a long-to-short leg position = anterior ilium rotation

LUMBAR QUADRANT TEST



Purpose: Assess nerve roots & IVF

Position: Standing or sitting

Technique: Assist the client in extending spine & SB ipsilaterally with rotation contralaterally & then apply overpressure through the shoulders; repeat to other side

Interpretation: + test = radicular symptoms are due to nerve root compression whereas local pain incriminates the facet joints

STOOP TEST

Purpose: Differentiate neurogenic vs. vascular intermittent claudication

Position: Standing

Technique: Client walks briskly until symptoms appear & then flexes forward or sits

Interpretation: + test = if symptoms are quickly relieved with FB, claudication is neurogenic; can also perform on a stationary bike

SLR TEST

Purpose: Assess neural mobility

Position: Basic SLR test position = hip flexion, adduction, IR with knee extended

Technique: Add each of the following motions to implicate specific nerves

Interpretation: + test = reproduction of symptoms

Modification for Nerve Bias:	Nerve Implicated:
A. Dorsiflexion	Sciatic nerve
B. Dorsiflexion, eversion, & toe extension	Tibial nerve
C. Dorsiflexion & inversion	Sural nerve
D. Plantarflexion & inversion	Common peroneal nerve

A

B

C

D

PRONE KNEE BENDING

Purpose: Assess neural mobility

Position: Basic test position = prone with hips extended

Technique: Add each of the following motions to implicate a specific nerve.....

Interpretation: + test = reproduction of symptoms

Modification for Nerve Bias:	Nerve Implicated:
Knee flexion	Femoral nerve (L2–4)
Hip adduction with knee flexion	Lateral femoral cutaneous nerve
Hip abduction, ER, knee extension, & ankle dorsiflexion & eversion	Saphenous nerve

SI POSTERIOR COMPRESSION TEST (Anterior Gapping)

Purpose: Assess for SI pathology

Position: Supine with clinician's hands crossed over client's pelvis on ASISs

Technique: Apply a lateral force to the ASISs through the hands

Interpretation: + test = reproduction of SI joint pain

SI POSTERIOR GAPPING TEST (Compression of iliac crests)

Purpose: Assess for SI pathology

Position: Side-lying

Technique: Apply a downward force through the anterior aspect of the ASIS to create posterior gapping of the SI

Interpretation: + test = reproduction of SI joint pain

HOOVER TEST

Purpose: Assess malingering

Position: Supine

Technique: Hold client's heels of (B) LEs in clinician's hands, ask client to lift 1 leg out of a hand

Interpretation: + test = client does not lift the leg & there is no downward force exerted by the contralateral limb

TMJ & Spine Tests	Sensitivity	Specificity	Reference
TMJ-digital palpation of a click	43	75	Dworkin
Slump	83	55	Stankovic
Cervical foraminal distraction	40–44	90–100	Viikari-Juntura; Wainner/Fritz
Spurling's test	30–60	74–100	Tong; Viikari-Juntura; Wainner/Fritz
Forward flexion test	17	79	Levangie
Gillet's march test	8–43	68–93	Dreyfuss; Levangie
Supine to sit	44	64	Levangie
SLR	76–96	10–45	Albeck; Knuttson; Kosteljanetz
SI compression	7–69	69–100	Albert; Laslett; Russell
SI gapping/distraction	4–60	81–100	Albert; Blower/Griffin; Laslett; Russell
SI cluster = standing flexion, PSIS palpation, supine to long-sit, prone knee flexion	82	88	Cibulka
SI cluster = distraction, thigh thrust, Gaenslen's, compression, sacral thrust	91	78	Laslett/Young
SI cluster = thigh thrust, distraction, sacral thrust, compression	88	78	Laslett/Aprill

Source: From Gulick D (2005).

Acromioclavicular Tests

CROSS-BODY ADDUCTION TEST

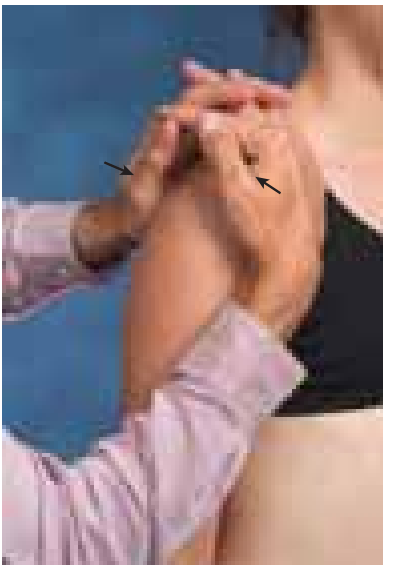
Purpose: Assess for AC pathology

Position: Seated

Technique: Shoulder flexed to 90°, horizontally adduct the UE

Interpretation: + test = pain @ AC joint

AC SHEAR TEST



Purpose: Assess for AC sprain

Position: Seated; UEs at side

Technique: Clinician interlaces fingers & surrounds the AC joint; squeezing the hands together compresses the AC joint

Interpretation: + test = pain or excessive mov't is indicative of damage to the AC ligaments

AC test	Sensitivity	Specificity	Reference
AC shear	100	97	O'Brien

CORACOCLAVICULAR LIGAMENT TEST

Purpose: Assess CC ligament

Position: Side-lying on the unaffected side

Technique: Place affected UE behind back, palpate CC ligament while stabilizing clavicle; pulling inferior angle of scapula away from ribs to stress the conoid portion; pulling medial border of scapula away from the ribs stresses the trapezoid portion

Interpretation: + test = pain

Shoulder Tests

EMPTY CAN TEST

Purpose: Test supraspinatus muscle

Position: Seated

Technique: Elevate UE 90° in plane of the scapula with IR, resist elevation

Interpretation: + test = reproduction of pain &/or weakness

FULL CAN TEST

Purpose: Test supraspinatus muscle

Position: Seated

Technique: Elevate UE 90° in plane of the scapula with ER, resist elevation

Interpretation: + test = reproduction of pain &/or weakness

DROPPING SIGN

Purpose: Test infraspinatus muscle

Position: Seated

Technique: Shoulder at side with 45° of IR & 90° elbow flexion, resist ER

Interpretation: + test = reproduction of pain &/or weakness

HORNBLOWER'S (PATTE'S TEST)

Purpose: Test teres minor muscle

Position: Seated

Technique: Shoulder in 90° abd & elbow flexed so that the hand comes to the mouth (blowing a horn)

Interpretation: + test = reproduction of pain &/or inability to maintain UE in ER

GERBER'S LIFT-OFF SIGN

Purpose: Test subscapularis muscle

Position: Seated

Technique: Hand in the curve of lumbar spine, resist IR

Interpretation: + test = reproduction of pain &/or weakness; inability to lift off; (good test for ruptures, questionable for partial tears or in presence of impingement) if unable to assume the position, perform the belly press

BELLY PRESS OR NAPOLEON SIGN

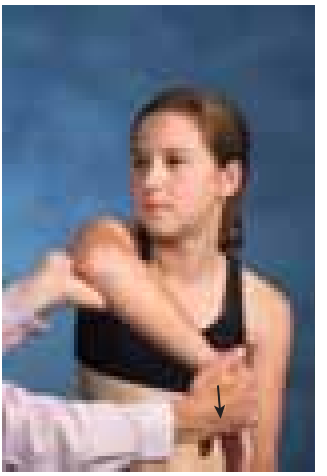
Purpose: Test subscapularis muscle

Position: Seated

Technique: Hand on the belly, press the hand into the belly

Interpretation: + test = reproduction of pain &/or inability to IR; substitution may result in UE elevation

HAWKINS/KENNEDY TEST



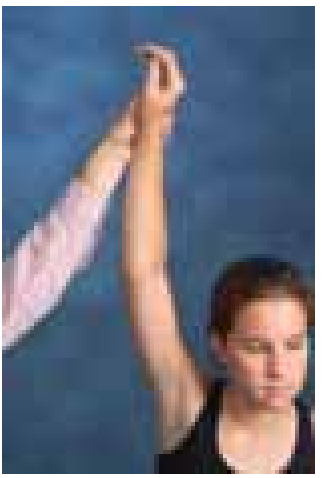
Purpose: Test for impingement

Position: Seated

Technique: Place shoulder in 90° of flexion & maximal IR

Interpretation: + test = shoulder pain due to impingement of supraspinatus between greater tuberosity against coracoacromial arch

NEER'S TEST



Purpose: Test for impingement

Position: Seated

Technique: Passively take UE into full shoulder flexion with humerus in IR

Interpretation: + test = pain may be indicative of impingement of the supraspinatus or long head of the biceps

IMPINGEMENT RELIEF TEST

Purpose: Confirm impingement

Position: Seated

Technique: Perform an inferior glide of the GH joint prior to elevating the UE to the Neer position

Interpretation: + test = reduction or no pain when elevation is accompanied by an inferior glide

SULCUS SIGN

Purpose: Assess for inferior instability or AC px

Position: Sitting with shoulder in neutral & elbow flexed to 90°

Technique: Palpate shoulder joint line while using proximal forearm as a lever to inferiorly distract humerus

Interpretation: + test = ≥ 1 finger-width gap @ the shoulder joint line or AC joint

APPREHENSION TEST

Purpose: Assess for anterior instability

Position: Supine

Technique: Abduct the shoulder to 90° & then begin to ER

Interpretation: + test = pain or apprehension by the client to assume this position for fear of shoulder dislocation

JERK TEST

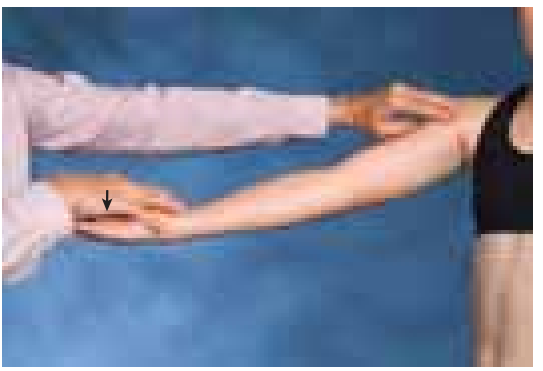
Purpose: Assess posterior instability

Position: Sitting with UE in IR & shoulder/elbow flexed to 90°

Technique: Grasp client's elbow & load the humerus proximally while passively moving the UE into horizontal adduction

Interpretation: + test = a sudden jerk/clunk as the humeral head subluxes posteriorly; a second jerk/clunk may occur when the UE is returned to the abducted position

SPEED'S TEST



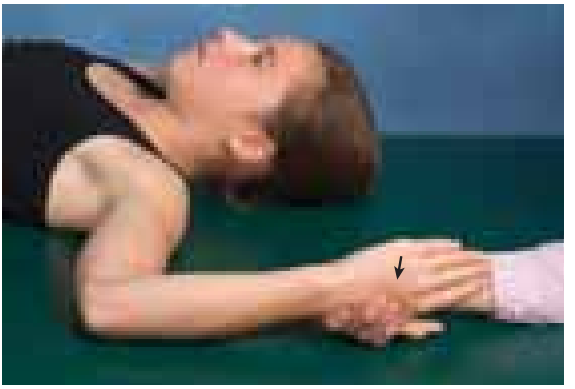
Purpose: Assess for biceps tendonitis or labrum px

Position: Seated with shoulder elevated 75°–90° in the sagittal plane, elbow extended, & forearm supinated

Technique: Resist elevation

Interpretation: + test = pain with biceps tendonitis & sense of instability with labral px

BICEPS LOAD TEST



Purpose: Assess labrum

Position: Supine in 90°–120° of shoulder abduction & 90° of elbow flexion

Technique: Load the biceps by resisting elbow flexion/ supination

Interpretation: + test = biceps tugs on the labrum (SLAP) & reproduces the pain

PAIN PROVOCATION TEST

Purpose: Assess labrum

Position: Supine in 90° shoulder abduction & 90° elbow flexion

Technique: Traction the biceps by passively taking the forearm into maximal pronation

Interpretation: + test = biceps will tug on labrum & reproduces the pain in the superior region of the joint line (superior labrum)

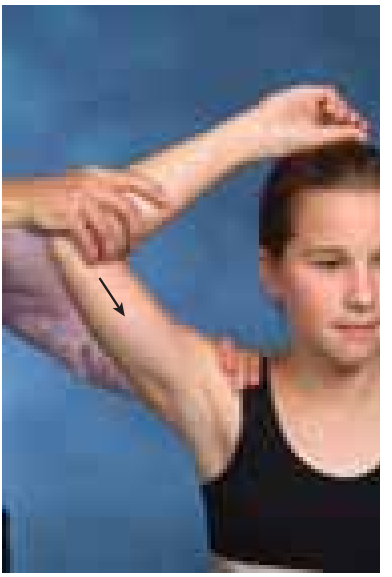
CRANK TEST

Purpose: Assess labrum

Position: Seated with UE elevated to 160° & elbow flexed to 90°

Technique: Administer compression down the humerus while performing IR/ER

Interpretation: + test = pain or clicking (greater accuracy than MRI)



Source: From Gulick D (2005).

KIM TEST

Purpose: Assess labrum

Position: Seated with UE elevated in the plane of the scapula ~ 130° & elbow flexed to 90°

Technique: Administer a compressive force down the humerus

Interpretation: + test = pain or clicking

O'BRIEN'S TEST

Purpose: Assess for labrum or AC joint problem

Position: Seated with UE in 90° of elevation, 10° of horiz add, & maximal IR (pronation)

Technique: Resist elevation in IR then repeat in ER (supination)

Interpretation: + test = pain in IR < ER; pain "inside" shoulder is labrum & pain "on top" of shoulder is AC

YERGASON'S TEST

Purpose: Assess THL & labrum

Position: Seated with shoulder in neutral, elbow flexed to 90°, & forearm supinated

Technique: Resist elbow flexion with supination

Interpretation: + test = pain with tenosynovitis; clicking, or snapping with torn THL (with resistance from pronation to supination)

Shoulder Tests	Sensitivity	Specificity	Reference
Rotator cuff			
Empty can–pain	44–100	50–90	Hertel; Itoi; Leroux; Park; Ure
Empty can–weakness	77	68	Itoi
Full can-pain	66	64	Itoi
Full can-weakness	77	74	Itoi
Drop sign	20	100	Hertel
Gerber's lift-off	62–89	98–100	Gerber; Hertel
Impingement			
Hawkins Kennedy	72–92	25–66	Calis; Park; Tennet
Neer's	68–95	25–68	Park; Walsworth
Instability			
Jerk	73	98	Kim, Park
Labral tears			
Speed's	9–100	70–87	Guanche; O'Brien
Biceps load	91	97	Kim/Ha/Ahn
Pain provocation	17–100	90	Mimori; Parentis
Crank	39–91	67–93	Guanche; Liu
Kim	80	94	Kim, Park
Forced abduction	67	67	Nakagawa
O'Brien's	47–100	41–98	Burkhart; Guanche; McFarland; O'Brien
Yergason's	9–12	93–96	Guanche

Thoracic Outlet Syndrome (TOS)

"Rule of the Thumb": For all TOS tests, rotation of the head follows the thumb

ADSON'S TEST

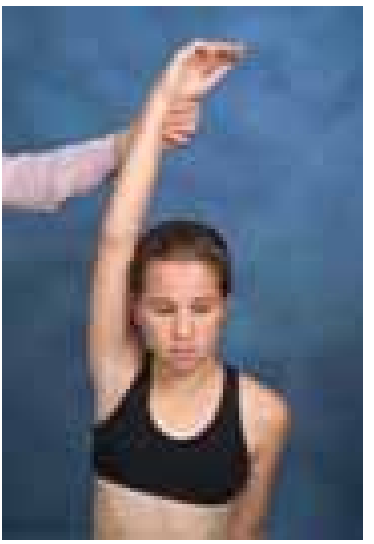
Purpose: Assess for TOS @ scalene triangle

Position: Seated

Technique: While palpating radial pulse, move UE into abd, ext, & ER, then client rotates head toward the involved side, takes a deep breath & holds it

Interpretation: + test = absent or diminished radial pulse with symptoms reproduced

WRIGHT'S HYPERABDUCTION TEST



Purpose: Assess for TOS @ coracoid/rib & pect minor

Position: Seated

Technique: While palpating radial pulse, passively abduct UE to 180° in ER, have client take a deep breath & hold it

Interpretation: + test = absent or diminished radial pulse with symptoms reproduced

MILITARY BRACE (COSTOCLAVICULAR) TEST

Purpose: Assess for TOS @ 1st rib & clavicle

Position: Seated

Technique: While palpating radial pulse, retract shoulders into extension & abduction with the neck in hyperextension (exaggerated military posture)

Interpretation: + test = absent or diminished radial pulse with symptoms reproduced

ALLEN'S TEST

Purpose: Assess for TOS @ pect minor

Position: Seated

Technique: In 90° shoulder abduction & 90° elbow flexion, turn head away, take a deep breathe & hold it

Interpretation: + test = absent or diminished radial pulse with symptoms reproduced

TOS Tests	Sensitivity	Specificity	Reference
• Adson's		74–89	Rayan/ Jensen
• Wright's—pulse • Wright's—pain	70 90	53 29	Gillard
• Hyperabduction—pulse • Hyperabduction—pain	52 84	90 40	Gillard
• Roos	82–84	30–100	Cook; Gillard
• Adson's + Wright's (pain)	79	76	Gillard
• Adson's + Roos	72	82	
• Adson's + Hyperabd (pain)	72	88	
• Adson's + Wright's (pulse)	54	94	
• Wright's (pain) + Roos	83	47	
• Wright's (pain) + Hyperabd (pain)	83	50	
• Wright's (pulse) + Hyperabd (pulse)	63	69	

Elbow Tests

VARUS STRESS

Purpose: Assess LCL/RCL

Position: Elbow slightly flexed, humerus stabilized proximal to elbow (testing in prone enhances stabilization)

Technique: Apply a varus force to the joint line to stress the LCL

Interpretation: + test = pain or joint gapping/instability

VALGUS STRESS

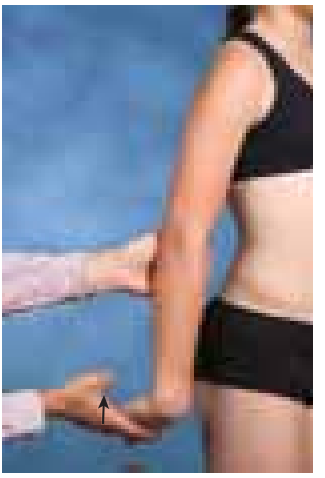
Purpose: Assess MCL/UCL

Position: Elbow slightly flexed, humerus stabilized proximal to elbow (testing in prone enhances stabilization)

Technique: Apply a valgus force to the joint line to stress the MCL

Interpretation: + test = pain or joint gapping/instability

MILL'S TEST



Purpose: Assess for lateral epicondylitis

Position: UE relaxed, elbow extended

Technique: Passively stretch into wrist flexion & pronation

Interpretation: + test = pain @ the lateral epicondyle or the proximal musculotendinous junction of the wrist extensors

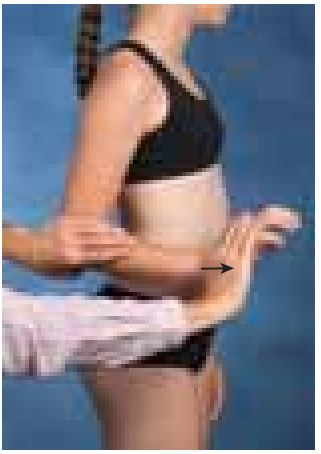
COZEN'S SIGN

Purpose: Assess for lateral epicondylitis

Position: UE relaxed, elbow extended

Technique: Resist supination & wrist extension OR resist middle finger extension (extensor digitorum)

Interpretation: + test = pain @ lateral epicondyle or proximal musculotendinous junction of wrist extensors



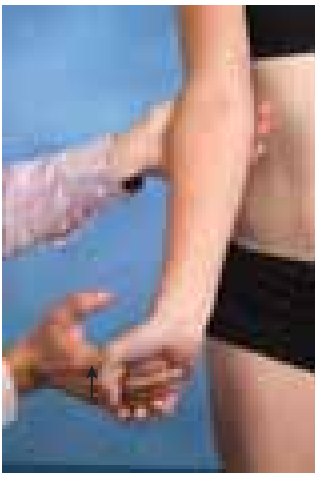
PASSIVE TEST

Purpose: Assess for medial epicondylitis

Position: UE relaxed, elbow extended

Technique: Stretch into wrist extension & supination

Interpretation: + test = pain @ medial epicondyle or proximal musculotendinous junction of the wrist flexors



RESISTIVE TEST

Purpose: Assess for medial epicondylitis

Position: UE relaxed, elbow extended

Technique: Resist pronation & wrist flexion

Interpretation: + test = pain @ the medial epicondyle or proximal musculotendinous junction of wrist flexors

PRONATOR TERES TEST

Purpose: Assess for median nerve entrapment

Position: UE relaxed in supported position

Technique: Resist pronation of forearm

Interpretation: + test = pain along the palmar aspect of the first 3 digits (median nerve distribution)

POSTEROLATERAL or ROTATORY INSTABILITY

Purpose: Assess for elbow instability

Position: Elbow extended

Technique: Apply an axial load with a valgus stress & supination

Interpretation: + test = elbow subluxes with extension & relocates with flexion

CUBITAL TUNNEL PROVOCATION TEST

Purpose: Assess ulnar nerve

Position: Elbow in 20° flexion

Technique: Place index & long fingers on ulnar nerve (just proximal to the cubital tunnel; hold pressure for 60 sec)

Interpretation: + test = pain & tingling in the distribution of the ulnar nerve (4th & 5th digits)

Source: Novak CB, Lee GW, Mackinnon SE & Lay L (1994).

TINEL'S TEST

Purpose: Assess ulnar nerve

Position: Elbow in slight flexion

Technique: Tap the groove between the olecranon & medial epicondyle

Interpretation: + test = pain & tingling in the distribution of the ulnar nerve (4th & 5th digits)

Elbow Tests	Sensitivity	Specificity	Reference
• Pressure provocation for cubital tunnel	55 (30 sec) 89 (60 sec)	98	Novak
• Flexion test for cubital tunnel	32 (30 sec) 75 (60 sec)	99	Novak
• Tinel's (cubital tunnel)	28	23	Kuhlman

Wrist & Hand Tests

WRIST VARUS TEST

Purpose: Assess RCL

Position: Stabilize radius/ulna proximal to wrist in neutral position

Technique: Apply a varus stress to the wrist

Interpretation: + test = joint line pain or gapping/instability

WRIST VALGUS TEST

Purpose: Assess UCL

Position: Stabilize radius/ulna proximal to wrist in neutral position

Technique: Apply a valgus stress to the wrist

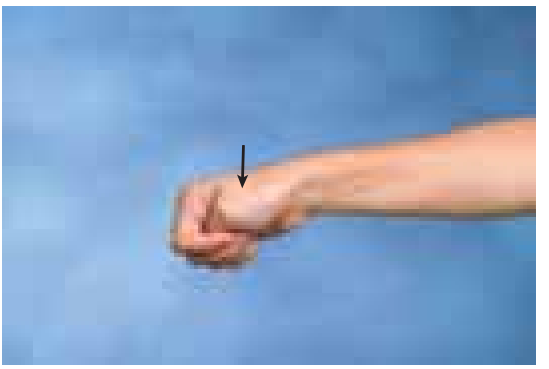
Interpretation: + test = joint line pain or gapping/instability

FINKELSTEIN'S TEST

Purpose: Assess for de Quervain's syndrome

Position: Form a fist around the thumb

Technique: Ulnarly deviate the wrist



Interpretation: + test = pain along EPB & APL

PHALEN'S TEST

Purpose: Assess for CTS

Position: Hands relaxed

Technique: Maximally flex the wrists so the dorsal surfaces of the hands are in full contact with each other; hold for up to 1 minute

Interpretation: + test = numbness or tingling into the median nerve distribution

REVERSE PHALEN'S TEST (Prayer Sign)

Purpose: Assess for CTS

Position: Hands relaxed

Technique: Maximally extend the wrists so the palms of the hands are in full contact with each other; hold for up to 1 minute

Interpretation: + test = numbness or tingling into the median nerve distribution

FLICKING MANEUVER

Purpose: Assess for CTS

Position: Wrist in neutral position

Technique: Perform a flicking motion with the wrist as if shaking down a thermometer

Interpretation: + test = reproduction of pain

TFCC PRESS TEST/ SUPINATED LIFT TEST

Purpose: Assess TFCC

Position: Elbow flexed at 90° & forearm supinated

Technique: Client is asked to lift up against resistance (like lifting a table via wrist flexion)

Interpretation: + test = compression with UD will ↑ pain @ TFCC

TFCC LOAD TEST

Purpose: Assess TFCC

Position: Wrist in ulnar deviation

Technique: Apply a longitudinal load through the 5th metacarpal bone to the TFCC

Interpretation: + test = pain @ TFCC

MURPHY'S SIGN

Purpose: Assess for lunate dislocation

Position: Make a fist

Technique: Observe alignment of MCP joints

Interpretation: + test = 3rd MCP is level with 2nd & 4th, (normally 3rd MCP should project beyond 2nd & 4th)

ALLEN'S TEST

Purpose: Test for occlusion of radial or ulnar artery

Position: Hand relaxed, supported in supination

Technique: Clinician compresses both radial & ulnar arteries at the wrist while client clenches hand several times to drain blood out. With client's hand open, clinician releases pressure on the radial artery—normal hand coloration should return in <5 seconds; repeat & release ulnar artery

Interpretation: + test = difference between the 2 vessels with respect to refill time or taking >5 seconds for coloration of tissue to return to normal

FROMENT'S SIGN

Purpose: Assess for adductor pollicis weakness 2° ulnar nerve paralysis

Position: Client holds a paper between thumb & index finger

Technique: Clinician tries to tug the paper away

Interpretation: + test = flexion of thumb DIP via FPL will result if the adductor pollicis muscle is impaired by an ulnar nerve px

PHALANX VARUS/VALGUS TEST

Purpose: Assess MCL & LCL

Position: With finger(s) in neutral, stabilize the proximal phalanx

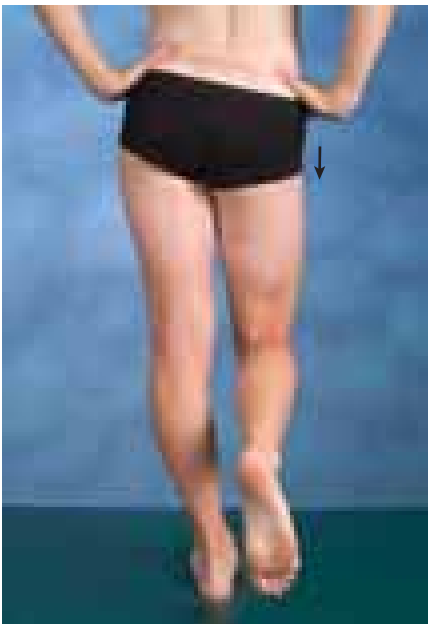
Technique: Apply a varus/valgus stress via the distal phalanx

Interpretation: + test = joint line pain or gapping/instability

Wrist Tests	Sensitivity	Specificity	Reference
Tinel's—CTS	27–79	65–98	Bruske; Faught; Goloborod'ko; Hansen; Novak; MacDermid; Tetro
Phalen's	34–93	48–93	Bruske; Faught; Hansen; Goloborod'ko; Heller; Kuhlman; MacDermid; Tetro
Reverse Phalen's	88	93	Goloborod'ko
Flicking maneuver	37	74	Hansen
Flicking + Phalen's Flicking + Tinel's Phalen's + Tinel's	49 46 41	62 68 72	Hansen
TFCC press test	100		Lester

Hip Tests

TRENDELENBURG'S TEST



Purpose: Assess for weakness of gluteus medius

Position: Standing on involved LE

Technique: Flex the contralateral LE; iliac crest on WB side should be lower than the NWB side

Interpretation: + test = dropping of the NWB limb is 2° to abductor weakness (common in epiphyseal problem, Legg-Calve-Perthes, MD)

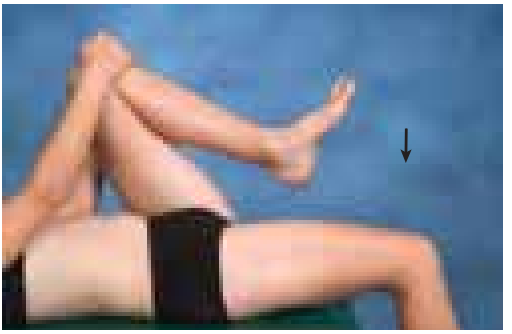
THOMAS TEST

Purpose: Assess for tight hip flexors

Position: Supine with lumbar spine stabilized & involved LE extended

Technique: Flex contralateral hip to the abdomen

Interpretation: + test = flexion of the involved hip or lumbar spine indicates tight hip flexors



ELY'S TEST

Purpose: Assess for tight rectus femoris

Position: Side-lying or prone, hip in extension

Technique: Flex knee

Interpretation: + test = limited knee flexion with hip extension or inability to maintain hip extension when knee is flexed

OBER'S TEST

Purpose: Assess for tight ITB

Position: Side-lying with involved hip up

Technique: Extend the involved hip & allow LE to drop into adduction

Interpretation: + test = LE fails to adduct

PIRIFORMIS TEST

Purpose: Assess for tight piriformis

Position: Supine or contralateral side-lying

Technique: Flex hip to 70°–80° with knee flexed & maximally adduct LE (apply a downward force to the knee)

Interpretation: + test = pain in buttock & sciatica; IR stresses superior fibers; ER stresses inferior fibers

SCOUR TEST

Purpose: Assess for labral tear

Position: Supine, flex hip to 90°

Technique: IR/ER hip with abd/adduction while applying a compressive force down the femur

Interpretation: + test = clicking, grinding or pain due to arthritis, acetabular labrum tear, avascular necrosis, or osteochondral defect

FABER TEST (PATRICK'S)

Purpose: Assess hip/SI pathology

Position: Supine, passively flex, abduct & ER the hip so that the lateral malleolus of the involved LE is on the knee of the uninvolved LE

Technique: Apply overpressure to flexed knee

Interpretation: + test = hip pain 2° to OA, osteophytes, intracapsular fx, or LBP 2° SI px; tightness without pain is a (−) test;. pain experienced assuming this position may indicate a problem with the sartorius muscle

Hip Tests	Sensitivity	Specificity	Reference
• Scour	75–79	43–50	Narvani; Suenaga
• FABER	41–77	88–100	Albert; Broadhurst; Cook

ANTERIOR LABRAL TEST

Purpose: Assess for labral tear

Position: Supine in PNF D2 flexion (hip in full flex, ER & abd)

Technique: Resist mov't into ext IR & add (D2 extension)

Interpretation: + test = reproduction of pain or click

POSTERIOR LABRAL TEST

Purpose: Assess for labral tear

Position: Supine in PNF D1 flexion (hip in full flexion, IR, add)

Technique: Resist mov't into ext, ER & abd (D1 extension)

Interpretation: + test = reproduction of pain or click

Knee Tests

Ottawa Knee Rules

X-ray series of the knee is only required if the patient presents with any of the following criteria:

- >55 years old
- Isolated tenderness of the patella
- Tenderness of the head of the fibula
- Inability to flex >90°
- Inability to bear weight (4 steps) both immediately after injury & in emergency department (regardless of limping)

LACHMAN'S TEST

Purpose: Assess for ACL laxity

Position: Supine with knee in 0°–30° of flexion (hamstrings relaxed)

Technique: Stabilize distal femur & translate proximal tibia forward on the femur

Interpretation: + test = >5 mm of displacement or a mushy, soft end-feel; beware of false (−) test due to hamstring guarding, hemarthrosis, posterior medial meniscus tear

PRONE LACHMAN'S TEST

Purpose: Assess for ACL laxity

Position: Prone with knee flexed to 30°, LE supported & hamstrings relaxed

Technique: Palpate anterior aspect of the knee while imparting a P-A force to posterior-proximal aspect of tibia

Interpretation: + test = >5 mm of displacement or a mushy, soft end-feel

Beware of false (−) test due to hamstring guarding, hemarthrosis, posterior medial meniscus tear

ANTERIOR DRAWER TEST

Purpose: Assess for ACL laxity

Position: Supine with foot stabilized on table, knee flexed to 80°–90° & hamstrings relaxed

Technique: Translate proximal tibia forward on the femur

Interpretation: + test = >5 mm of anterior displacement; snap or palpable jerk with anterior drawer indicates meniscus px

Beware—translation may appear excessive with PCL injury if tibia starts from a more posterior position

POSTERIOR DRAWER TEST

Purpose: Assess for PCL laxity

Position: Supine with knee flexed to 90° & foot on table

Technique: Translate proximal tibia posteriorly on the distal femur

Interpretation: + test = >5 mm of posterior displacement

SAG OR GODFREY'S TEST

Purpose: Assess for PCL laxity

Position: Supine 90/90, support LEs

Technique: Compare the level of the tibial tuberosities

Interpretation: + test = posterior displacement of the tibial tuberosity is greater in the involved leg

VARUS TEST

Purpose: Assess for LCL laxity

Position: Supine; knee in full extension & then repeat @ 30° flexion

Technique: Cup knee with heel of clinician's hand @ medial joint line; use fingers of other hand to palpate lateral joint line; apply a varus stress to the knee through the palm of the medial hand & the forearm/elbow of the lateral hand

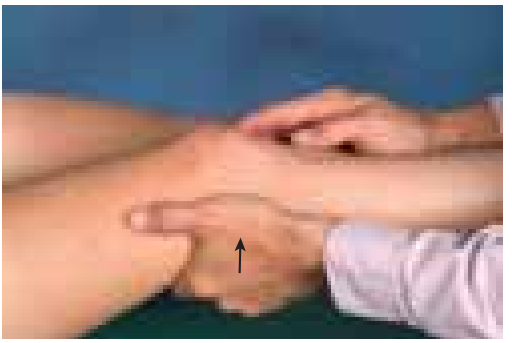
Interpretation: + test = pain or excessive gapping of the joint when compared to the contralateral side

VALGUS TEST

Purpose: Assess for MCL laxity

Position: Supine; knee in full extension & then repeat @ 30° flexion

Technique: Cup knee with heel of clinician's hand @ lateral joint line; use fingers of other hand to palpate medial joint line; apply a valgus stress to the knee through the palm of the lateral hand & the forearm/elbow of the medial hand



Interpretation: + test = pain or excessive gapping of the joint when compared to the contralateral side

APLEY TEST

Purpose: Assess meniscus (nonspecific for location of meniscal tear)

Position: Prone, knee flexed to 90°; clinician grasps foot & calcaneus

Technique: While applying a downward force through the heel, rotate the tibia internally & externally

Interpretation: + test = pain, popping, snapping, locking, crepitus

McMURRAY TEST

Purpose: Assess meniscus

Position: Supine, with 1 hand of the clinician over the patella & the other grasping the distal tibia

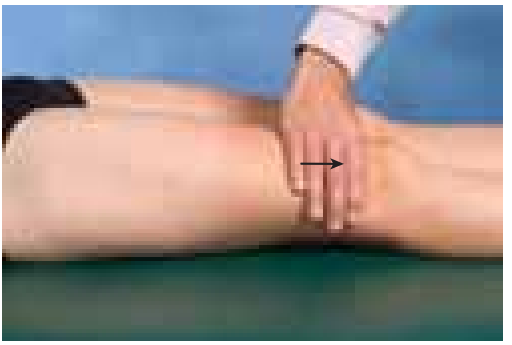
Technique: From a position of maximal flexion, extend the knee with IR of the tibia & a varus stress then return to maximal flexion & extend the knee with ER of the tibia & a valgus stress

Interpretation: + test = pain or snapping/clicking with IR incriminates the lateral meniscus & ER incriminates the medial meniscus; if pain, snapping, or clicking occur with the knee in flexion, the posterior horn of the meniscus is involved & if the pain, snapping, or clicking occurs with increasing amounts of knee extension, the anterior meniscus is involved

CLARKE'S TEST; GRIND TEST; ZOHLER'S TEST

Purpose: Assess for chondromalacia or patella malacia

Position: Supine with knee in extension, clinician compresses quads at the superior pole of the patella to resist patella mov't

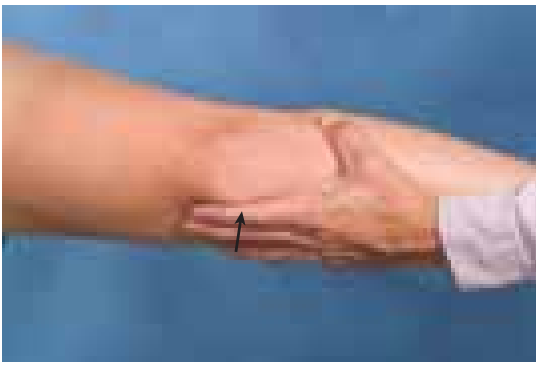


Technique: Client contracts quads against resistance

Interpretation: + test = inability to contract without pain

PATELLA APPREHENSION (FAIRBANK) TEST

Purpose: Assess for subluxing patella



Position: Supine or seated, 30° knee flexion, quads relaxed

Technique: Clinician carefully pushes patella laterally

Interpretation: + test = client feels patella about to dislocate & contracts quads to keep this from happening

PATELLA TILT TEST

Purpose: Assess for ITB tightness/patella mobility

Position: Relaxed in supine with knee in extension

Technique: Clinician attempts to lift the lateral border of patella

Interpretation: + test = inability to lift the lateral border of the patella above the horizontal

NOBLE'S TEST

Purpose: Assess ITB irritation

Position: Supine, start @ 90/90

Technique: Apply pressure over the lateral femoral condyle while extending the knee

Interpretation: + test = pain or clicking @ lateral femoral condyle @ 30° of knee flexion

OBER TEST

Purpose: Assess for tight ITB

Position: Side-lying with involved hip up

Technique: Extend the hip & allow LE to drop into adduction

Interpretation: + test = LE fails to adduct past anatomic neutral

RENNE'S TEST

Purpose: Assess ITB irritation

Position: Standing

Technique: Apply pressure over the lateral femoral condyle with AROM of the knee

Interpretation: + test = pain or clicking @ lateral femoral condyle @ 30° of knee flexion

PIVOT SHIFT TEST

Purpose: Assess A/L instability

Position: Supine

Technique: Knee is taken from full extension to flexion with a valgus stress

Interpretation: + test = sudden reduction of the anteriorly subluxed lateral tibial plateau

STUTTER TEST

Purpose: Assess for medial plica irritation

Position: Sitting with knee flexed over the edge of the table

Technique: Slowly extend knee with a finger placed lightly in contact with the center of the patella

Interpretation: + test = patella stutters as knee moves into extension

PATELLAR BOWSTRING TEST

Purpose: Assess medial plica

Position: Supine

Technique: Medially displace patella while flexing/extending knee with tibia IR

Interpretation: + test = palpable clunk

WILSON'S TEST

Purpose: Assess for osteochondritis of medial femoral condyle

Position: Supine with knee flexed to 90°

Technique: Extend the knee with IR of the tibia

Interpretation: + test = pain at 30° of flexion in IR that ↑ if the tibia is ER; should r/o meniscal px

Knee Tests	Sensitivity	Specificity	Reference
Ottawa Knee Rules			
• Adults	98–100	19–54	Stiell; Jackson; Ketelslegers; Tigges
• Children	92	49	Khine
Cruciate Ligaments			
Lachman's	63–99	90–99	Boeree/Ackroyd; Donaldson; Jackson; Jonsson; Katz; Lee; Liu/Osti; Torg
• Anterior drawer—acute	22–56	78–97	Jackson; Jonsson; Katz Sandberg
• Anterior drawer— chronic	54–95		Boeree
• Posterior drawer	86–90	99	Rubinstein; Baker
• Sag–Godfrey	79	100	Rubinstein
Collateral Ligaments			
• Varus stress	25		Harilainen
• Valgus stress	86–96		Garvin; Harilainen

Knee Tests	Sensitivity	Specificity	Reference
Meniscus			
Apley compression	13–58	80–90	Fowler; Grifka; Kurosaka
McMurray McMurray—medial McMurray—lateral	16–67 16–67 53–65	57–98 69–98 86–88	Akseki; Evans; Fowler; Grifka; Jackson; Karachalios; Kurosaka; Noble;
Patella			
Clarke's Grind	48	75	Nils
Apprehension	32–39	86	Nils; Sallay

Lower Leg & Ankle Tests

HOMAN'S SIGN

Purpose: Assess for thrombophlebitis of the lower leg

Position: Supine

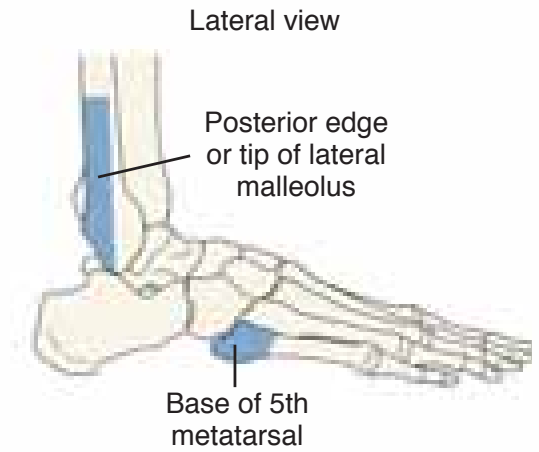
Technique: Passively dorsiflex the foot & squeeze the calf

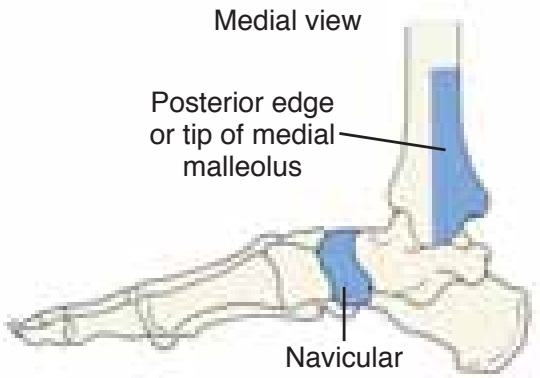
Interpretation: + test = sudden pain in the posterior leg or calf

Ottawa Ankle Rules

X-ray series of the ankle is only required if the patient presents with any of the following criteria:

- Bone tenderness at posterior edge of the distal 6 cm of the medial malleolus
- Bone tenderness at posterior edge of the distal 6 cm of the lateral malleolus
- Totally unable to bear weight both immediately after injury & (for 4 steps) in the emergency department





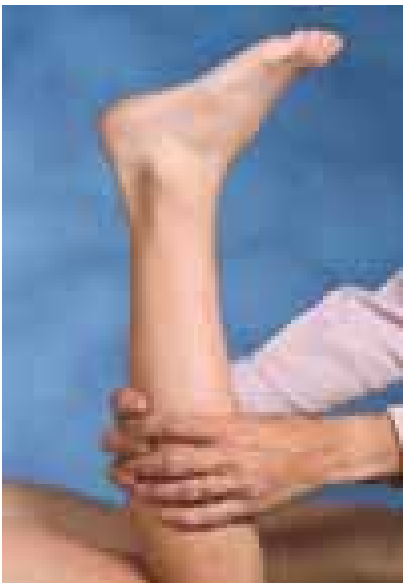
THOMPSON'S TEST

Purpose: Assess for Achilles tendon rupture

Position: Prone

Technique: Passively flex the knee to 90° & squeeze the middle 1/3 of the calf

Interpretation: Plantarflexion of the foot should occur; + test = failure to plantarflex



PERONEAL TENDON DISLOCATION

Purpose: Assess for damage to peroneal retinaculum

Position: Prone, knee flexed to 90°

Technique: Have the client actively plantarflex & dorsiflex the ankle against resistance

Interpretation: + test = tendon subluxing from behind the lateral malleolus

ANTERIOR DRAWER

Purpose: Assess for ATF laxity

Position: NWB position in ~ 20° of plantarflexion, stabilize the distal tibia/fibula

Technique: Grasp posterior aspect of calcaneus/talus & translate the calcaneus/talus anterior on the tibia/fibula

Interpretation: + test = pain & excessive mov't 2° to instability

TALAR TILT

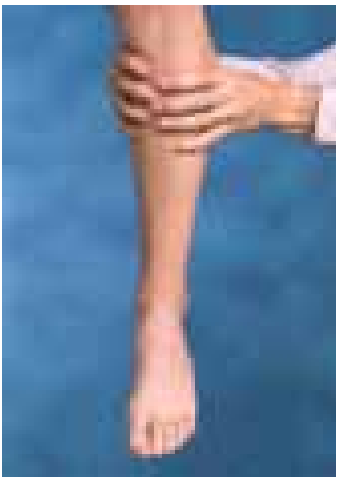
Purpose: Test for laxity of lateral ankle ligaments—ATF, CF, PTF

Position: NWB—stabilize the lower leg & palpate respective ligament

Technique: Grasp calcaneus to apply a varus stress to displace the talus from the mortise; should be performed with plantarflexion (ATF), in neutral (CF), & in dorsiflexion (PTF)

Interpretation: + test = pain or excessive gapping with respect to the contralateral limb

SQUEEZE TEST



Purpose: Assess for syndesmotic sprain

Position: Supine with knee extended

Technique: Begin at the proximal tibia/fibula & firmly compress (squeeze) the tibia/fibula together, progress distally toward the ankle until pain is elicited

Interpretation: + test = pain at the syndesmosis; the farther from the ankle the pain is elicited, the more severe the sprain

Note: Recovery time = 5 + (0.97 × cm from ankle joint that squeeze test is positive) ±3 days

ER STRESS TEST (rotate from heel)
KLEIGER'S TEST (rotate from forefoot)

Purpose: Assess for deltoid or syndesmotic sprain

Position: Sitting with lower leg stabilized but syndesmosis not compressed

Technique: Grasp the heel or medial aspect of the foot & ER in plantarflexion (deltoid lig) & then repeat with ER in dorsiflexion (syndesmosis)

Interpretation: + test = pain or gapping as compared with contralateral limb

Foot Tests

Ottawa Foot Rules

X-ray series of the foot is only required if the patient presents with any of the following criteria:

- Bone tenderness is at navicular
- Bone tenderness at the base of 5th MT
- Totally unable to bear weight both immediately after injury & (for 4 steps) in the emergency department

BUMP TEST

Purpose: Test for stress fx

Position: NWB—ankle in neutral

Technique: Apply a firm force with the thenar eminence to the heel of the foot

Interpretation: + test = pain @ site of the possible fx

MORTON'S TEST

Purpose: Assess for neuroma

Position: NWB

Technique: Grasp around the transverse metatarsal arch & squeeze the heads of the metatarsals together

Interpretation: + test = pain between 2nd/3rd or 3rd/4th digits that refers to the toes

METATARSAL LOAD

Purpose: Assess for metatarsal fracture

Position: NWB

Technique: Grasp the distal aspect of the metatarsal bone & apply a longitudinal force to load the metatarsal

Interpretation: + test = localized pain as the metatarsal joints are compressed

Ankle & Foot Tests	Sensitivity	Specificity	Reference
Ottawa Ankle Rules			
Adults	95–100	16	Broomhead; Lucchesi
Children	83–100	21–50	Clark; Plint
Ottawa Foot Rules			
Adults	93–100	12–21	Broomhead; Lucchesi
Children	100	36	Plint

Neuromuscular Pathology

Side Stitch

Common symptom in runners

- Symptom: A sharp/stabbing pain in the right upper abdominal quadrant
- Cause: Diaphragmatic muscle spasm 2° hypoxia
- Rx #1: Breathe in through the nose & expire forcefully through pursed lips
- Rx #2: Stretch the right UE over the head
- Becomes evident between 2 and 15 years of age

Source: Lillegard WA, Burcher JD & Rucker KS (1999).

Tourette's Syndrome

Defined by multiple motor & vocal tics lasting for >1 year

- Becomes evident between 2 and 15 years of age
- Most common 1st symptom is a facial tic (eye blink, nose twitch, grimace)
- Involuntary movements (tics) of the arms, limbs, or trunk
- Other symptoms such as touching, repetitive thoughts & movements, & compulsions can occur
- Verbal tics (vocalizations) usually occur with the mov'ts
- Although unusual, verbal tics may also be expressed as coprolalia (the involuntary use of obscene words) or copro-praxia (obscene gestures)

Source: http://www.tsa-usa.org/aboutts.html.

Possible Signs & Symptoms of a Brain Tumor

- H/A— ↑ intracranial pressure
- Vomiting
- Visual changes
- Mentation changes
- Seizures
- Muscle weakness
- Bladder dysfunction
- Coordination changes
- (+) Babinski
- Clonus (ankle or wrist)

Romberg's Test

Used to assess balance & coordination problems that may indicate a cerebellar pathology or an inner ear infection

- Have athlete stand in a place free from obstacles
- Instruct athlete to close his or her eyes
- Instruct athlete to abduct arms to 90° with elbows extended
- Instruct athlete to tilt head back & lift 1 leg off floor
- Positive test = unsteadiness

Tandem Walking

- Have athlete stand heel-to-toe (1 foot in front of the other)
- Instruct the athlete to walk 10' along a straight line
- Positive test = unsteady gait

Systemic Lupus Erythematosus

An autoimmune, disease of unknown etiology that results in inflammation & damage to various organs
Onset: 15–45 yo ♀ > ♂ 10–15:1
African (3x more common), Native-American, Asian > Caucasians

Signs & Symptoms

- Unexplained fever
- Swollen glands
- Constitutional symptoms
- Arthralgia—symmetrical
- Swollen joints
- Skin rash—"butterfly" pattern (cheeks)
- Chest pain upon deep breathing
- Extreme fatigue
- Photosensitivity
- Unusual hair loss
- Pale or purple fingers or toes from cold or stress (Raynaud's phenomenon)
- CNS px—seizures, h/a, neuropathy, CVA, OBS
- Mouth, nose, vaginal ulcers
- Symptoms get worse during menstruation

Complications of Lupus

- Seizures/psychosis
- Pleuritis/pericarditis
- Endocarditis/myocarditis
- Anemia
- Glomerulonephritis

Note: A severe side effect of the acne medication minocycline, is lupuslike symptoms

Source: Gulick D (2006).

Cardiovascular & Pulmonary Pathology

Signs & Symptoms of Iron-Deficiency Anemia

- Fatigue with exercise
- Muscle burning
- Nausea; pallor
- SOB; palpitations
- Hair loss
- Craving for substances with no nutritional value (starch, ice, clay)
- Spoon-shaped nails
- Fissures of the lips
- Inflammation of the tongue

Source: Anderson MK, Hall SJ & Martin M (2000).

Wells Clinical Score for Deep Vein Thrombosis

Clinical Parameter Score	Score
Active cancer (treatment ongoing/within 6 mo)	+ 1
Paralysis or recent plaster immobilization of LE	+ 1
Recently bedridden >3 days or major sx <4 wks	+ 1
Localized tenderness along distribution of deep venous system	+ 1
Entire leg swelling	+ 1
Calf swelling 3 cm >asymptomatic leg	+ 1
Pitting edema (>asymptomatic leg)	+ 1
Previous DVT documented	+ 1
Collateral superficial veins (nonvaricose)	+ 1
Alternative diagnosis (as likely or > that of DVT)	− 2
Total Score	
High probability	≥ 3
Moderate probability	1–2
Low probability	≤ 0

Additional Risks of DVT

- AIDS
- Varicose veins
- Pacemakers
- Pregnancy
- Obesity
- Acute MI
- Long airline flights
- Recent central venous catheterization
- Blood type A
- Antithrombin deficiency
- Oral contraceptives

Source: Anand SS, Wells PS & Hunt D et al. (1998); Gulick D (2006).

Integumentary Pathology

Lyme Disease

Note: This is a multisystemic inflammatory condition. The transmission of the tick spirochete takes ~ 24 hrs; blood work is used to confirm the disease, not to diagnose it.

Transplacental transmission has been documented

Clinician should r/o GBS, MS, & FMS

Early Localized Stage

- Rash with onset of erythema within 7–14 days (range is 3–30 days)
- Rash may be solid red expanding rash or a central spot with rings (Bull's-eye)
- Average diameter of rash is 5"–6"
- Rash may/may not be warm to palpation
- Rash is usually not painful or itchy
- Fever, malaise, headache
- Muscle aches, joint pain

Early Disseminated Stage

- ≥2 rashes not @ the bite site
- Migrating pain
- Headache, stiff neck
- Facial palsy
- Numbness/tingling into extremities
- Abnormal pulse
- Sore throat
- Visual changes
- 100°–102°F fever
- Severe fatigue

Late Stage

- Arthritis of 1–2 larger joints
- Neurological changes—disorientation, confusion, dizziness, mental "fog," numbness in extremities
- Visual impairment
- Cardiac irregularities

Source: American Lyme Disease Foundation, Gulick D (2006).

Gastrointestinal Pathology

Hernias

Signs & Symptoms

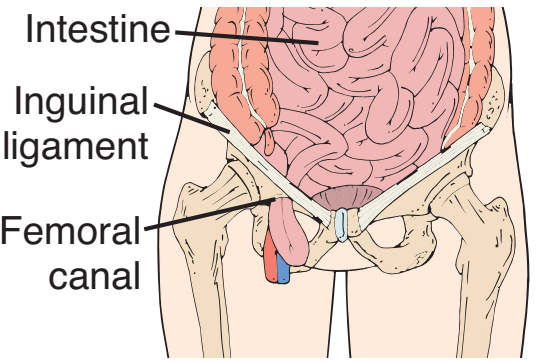
- Marble-sized lump; visible swelling
- Tenderness to palpation
- Pain is dependent on structures compressed
- Pain will ↑ with exertion, cough, & menstruation
- Pain may radiate from groin to ipsilateral thigh, flank, or lower middle abdomen

Differential Diagnosis– Pathology to Rule Out

- Psoas abscess with psoas &/or obturator test (psoas abscess is lateral to femoral artery)
- Appendicitis (McBurney's Point)
- Diverticulitis, inflammatory bowel/Crohn's disease
- UTI, kidney stones
- Prostatitis
- Endometriosis, ovarian cyst

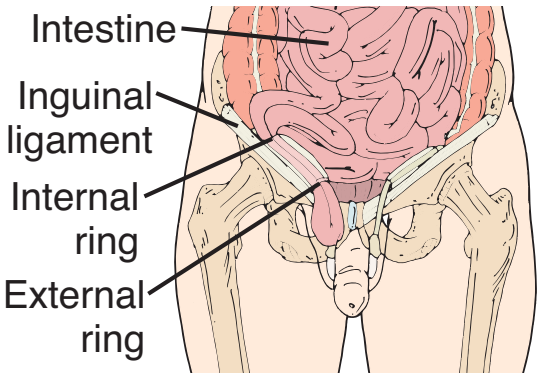
Femoral Hernia

- More common in ♀
- Location: Medial to femoral artery, lateral to pubic tubercle, inferior to inguinal ligament
- Allows viscera to protrude through femoral ring into femoral canal



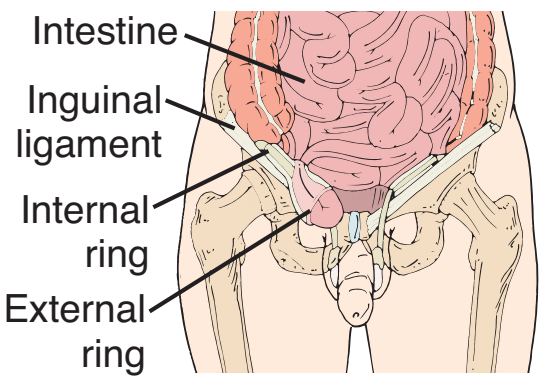
Indirect Inguinal Hernia

- Most common in young ♂
- Viscera protrudes through inguinal canal & sometimes the scrotum



Direct Inguinal Hernia

- Most common in ♂ over 40 yo
- Protrusion is due to weakness in rectus abdominis
- Location: Medial to inferior epigastric artery, lateral to rectus abdominis, usually does not protrude into testes



Treatment

- Medical evaluation by a physician
- Elastic support/truss is not always suggested
- No adhesive strapping should be used
- Surgical repair

Source: Goodman & Snyder (2000); Anderson MK, Hall SJ & Martin M (2000); Macintyre J, Johson C & Schroeder EL (2006).

Ulcers

- Hx of NSAID use or presence of *H. pylori* infection
- Dull gnawing/burning into midline T6–12 & radiating suprascapula
- Antacids provide temporary relief
- Nausea, coffee-grounds vomitus
- Bloody or black-tarry stools (melena)
- May have weeks of remission

Gastric		Duodenal
30–60 min after a meal	**Epigastric Cramping**	2–3 hrs after a meal
Left UQ	**Localized tenderness**	Right of midline

Appendicitis

Onset: Most common in adolescents and young adults

Signs & Symptoms (in order of significant likelihood ratios)	Differential Diagnosis
• Ⓡ LQ pain, (+) McBurney's point referring to Ⓡ thigh/testicle	• Position of relief: Tense abdomen with FB or lie down with both knees to chest
• Nausea, vomiting, night sweats	• ↓ Hemoglobin
• Guarding of rectus abdominis	• ↓ Hematocrit
• (+) Psoas sign	• Change in fingernail beds
• (+) Obturator sign	• Pale skin color
• Low-grade fever	• Fatigue
• (+) Rebound tenderness	• ↓ DBP

Source: American Family Physician http://www.afp.org/afp/991101ap/2027.html.

Bowel Pathology

Inflammatory Bowel (Crohn's or Ulcerative Colitis)	Irritable Bowel	Colon/Rectal Cancer
• Joint arthralgia • Skin lesions (ankles, shins) • Light sensitivity • ↓ Pain with gas/BM • Anemia due to blood loss • Weight loss • Clubbing of fingers • Fever • Rectal bleeding • (+) Psoas test	• Effects females in early adulthood • Stress related • Variable/intermittent S&S • Abdominal cramps • Nausea & vomiting • Flatulence • Change in bowel patterns • Foul breath	• Hemorrhoids • Rectal bleeding • Back pain referred to LEs • Change in bowel patterns • Nausea & vomiting • Weight loss • Fatigue & dyspnea due to iron deficiency • Red/mahogany stools

Source: Gulick D (2006).

Hepatic Pathology

Hepatitis

Generalized Signs & Symptoms:

- Nausea
- Vomiting
- Low-grade fever/chills
- Loss of appetite
- Lethargy
- Jaundice—skin & eyes
- Liver pain
- Dark urine
- Light-colored stools

Type	Incubation	Transmission	Cause
A	15–45 days	Fecal-oral (does not develop into chronic hepatitis)	Contaminated milk, water, shellfish, unsanitary conditions
B	2–3 months	Blood or body fluids Infants = carriers (can become chronic)	Contaminated needles, transfusion
C	15–90 days	Blood or body fluids (can become chronic)	Transfusion
D	25–75 days	Blood or body fluids	Occurs in presence of Hep B, IV drug use
E	20–80 days	Fecal-oral	Contaminated milk, water, shellfish
F	Unknown	Blood or body fluids	Transfusion, IV drug use

Source: Gulick D (2006).

Epstein-Barr Virus (Mononucleosis)

Characterized by:

- ↑ WBC & lymphocytes
- (+) Reaction to "Mono Spot" test (10% false negatives)
- (+) Paul-Bunnell heterophile antibody test

Symptoms During Prodromal Period (3–5 days):

• Malaise	• Headache
• Fatigue	• Anorexia
• Myalgia	• Nausea

Followed by:

• Moderate fever	• Tender & enlarged posterior cervical lymph nodes
• Chills	
• Severe exudative pharyngitis	• Splenomegaly

Outcomes:

- Acute symptoms resolve in 15 days; treatment is symptomatic; acetaminophen (650 mg every 4 hrs)
- Return to activity as tolerated in 5–7 days
- No contact sports if spleen is enlarged
- Full recovery takes 8–12 weeks

Source: Lillegard WA, Burcher JD & Rucker KS (1999).

Endocrine Pathology

Signs & Symptoms of Diabetes

- ↑ Urination
- ↑ Thirst
- ↑ Hunger
- Fatigue, lethargy
- Weight loss
- Paresthesia (feet & hands)

Abnormal Blood Glucose

Hypoglycemia

- Blood glucose <50–60 mg/dL
- Skin is pale, cool, diaphoretic
- Disoriented or agitated
- Headache
- Blurred vision
- Slurred speech
- Tachycardic/palpitations
- Weak/shaky/LOC
- Lip/tongue numbness

Hyperglycemia

- Blood glucose >180 mg/dL
- Skin is dry & flushed
- Fruity breath odor
- Blurred vision
- Dizziness
- Weakness
- Nausea
- Vomiting
- Cramping
- Increased urination
- LOC/seizure

Source: Gulick D (2006).

Urogenital Pathology

Cystitis-Pyelonephritis (UTI)

- Pain with urination
- Leukocytes & bacteria in urine (white casts)
- Cloudy urine
- Back pain
- Fever, chills
- Nausea
- Loss of appetite
- Pain with percussion over kidneys

Source: Gulick D (2006).

Kidney Stones

Risk Factors

- Males 4x . females
- Caucasians 3x > Blacks
- 20–40 years old
- High-protein, low-fiber diet
- Dehydration
- Poor mobility
- Family hx

Signs & Symptoms

- Pain @ costovertebral angle
- Intermittent, excruciating pain into ipsilateral genitals
- Ureter spasms radiate into medial thigh
- Pacing "like a tiger"
- Chills, nausea, vomiting
- Frequent urge to urinate
- Burning sensation with urination
- Bloody, cloudy, smelly urine

Source: http://hcdz.bupa.co.uk/fact.sheets/html/kidney_stones.html, Gulick D (2006).

Ectopic Pregnancy

Risk Factors

- History of pelvic inflammatory disease
- Endometriosis
- History of pelvic surgery
- Previous history of ectopic pregnancy

Signs & Symptoms

- Lower abdominal pain
- Pelvic or LB pain
- Pain referring into the shoulder girdle
- Rebound tenderness

Note: Fallopian tube will typically rupture by the 12th week of pregnancy

Source: Gulick D (2006).

Testicular Torsion

- Most common 8–30 yo
- Severe distress
- Nausea, vomiting
- Tachycardia
- Testis is large/tender with pain radiating to inguinal area
- Testicle is high in scrotum

Source: Gulick D (2006).

Sexually Transmitted Diseases (STDs)

Genital Herpes

- Tingling, itching, genital pain
- Eruption of small pustules & vesicles
- Lesion rupture @ ~ 5 day to wet ulcers
- Dysuria & urine retention
- Fever, h/a, malaise, muscle ache, lymph adenopathy

Candidiasis = Yeast Infection, Thrush

- Results from antibiotic therapy, ↑ hormone levels (pregnancy, oral contraceptives), DM
- See Integumentary pg. 74

Gonorrhea

- Transmitted via sexual intercourse or from mom to infant at birth (3–5 day incubation period)
- Urethral pain, dysuria
- Discharge
- Dyspareunia
- Vaginal bleeding (unusual or after intercourse)
- Fever
- Abdominal pain

Syphilis

Transmission is sexual via secretions, kissing, or skin abrasions, or from mom to infant in utero

- 1°—chancre @ site of exposure; incubates 1 wk to 3 months; highly contagious; button-like papule (painless)
- 2°—rash (palms & soles), constitutional symptoms, nausea, loss of appetite, fever, sore throat, stomatitis, inflamed eyes, red-brown 2–3 cm lesions on genitals (foul, contagious discharge)
- 3°—destructive lesions to CV & neural systems

Source: Gulick D (2006).

HIV and AIDS

Transmission: Blood products, CSF, semen, vaginal secretions mom to child

Early HIV Signs

- Fever, night sweats
- Chronic diarrhea
- Oral infections
- Vaginal candidiasis
- Cough
- SOB
- Skin/nail changes

Advanced HIV Signs

- Kaposi's sarcoma—multiple purple skin blotches
- Persistent cough
- Fever, night sweats
- Easy bruising
- Thrush
- Muscle weakness
- Comorbidities: TB, pneumonia, lymphoma, herpes, toxoplasmosis

Source: Goodman C & Snyder T (2000), Gulick D (2006).

Neuropsychiatric Disorders

Signs & Symptoms of Depression

- Sadness; frequent/unexplained crying
- Feelings of guilt, helplessness, or hopelessness
- Suicide ideations
- Problems sleeping
- Fatigue or decreased energy; apathy
- Loss of appetite; weight loss/gain
- Difficulty concentrating, remembering, & making decisions
- Bipolar disorder (manic-depression)—peak onset is late teens with equal males/females with a strong genetic component. It may be a neurotransmitter abnormality

Source: Gulick D (2006).

Signs & Symptoms of Panic Disorder

- Pounding tachycardia
- Chest pain
- Dizziness, nausea
- Difficulty breathing, SOB
- Bilateral numbness
- Tingling in face
- Sweats or chills
- Hand wringing
- Perceptual distortions
- Sense of terror
- Extreme fear of losing control
- Fear of dying
- Feeling of choking/smothering
- Vertigo

Source: Gulick D (2006).

Obsessive-Compulsive Disorders

Medical brain disorder that causes problems in information processing. Typically manifests from preschool to age 40.

Types of Obsessions	Associated Compulsions
Contamination fears (germs, dirt, etc.)	Washing
Imagining having harmed self/others	Repeating
Imagining losing control/aggressive	Checking urges
Intrusive sexual thoughts/urges	Touching
Excessive religious/moral doubt	Counting
Forbidden thoughts	Order/arranging
A need to have things "just so"	Hoarding/saving
A need to tell, ask, confess	Praying

Source: http://www.ocfoundation.org/; Gulick D (2006).

The Mood Disorder Questionnaire (MDQ)

Question:	Yes	No
1. Has there ever been a period of time when you were not your usual self and . . .		
• you felt so good or so hyper that other people thought you were not your normal self or you were so hyper that you got into trouble?		
• you were so irritable that you shouted at people or started fights or arguments?		
• you felt much more self-confident than usual?		
• you got much less sleep than usual and found that you didn't really miss it?		
• you were more talkative or spoke much faster than usual?		
• thoughts raced through your head or you couldn't slow your mind down?		
• you were so easily distracted by things around you that you had trouble concentrating or staying on track?		
• you had much more energy than usual?		
• you were much more active or did many more things than usual?		
• you were much more social or outgoing than usual, for example, you telephoned friends in the middle of the night?		
• you were much more interested in sex than usual?		

Continued

The Mood Disorder Questionnaire (MDQ)—*(Cont'd)*

Question:	Yes	No
• you did things that were unusual for you or that other people might have thought were excessive, foolish, or risky?		
• spending money got you or your family in trouble?		
2. If you checked YES to more than 1 of the above, have several of these ever happened during the same period of time?		
3. How much of a problem did any of these cause you—like being able to work; having family, money, or legal troubles; getting into arguments or fights? **None Minor Moderate Severe problem**		
4. Have any of your blood relatives (i.e., children, siblings, parents, grandparents, aunts, uncles) had manic-depressive illness or bipolar disorder?		
5. Has a health professional ever told you that you have manic-depressive illness or bipolar disorder?		

Scoring Algorithm:

All **3** of the following criteria **must** be met for a **Positive Screen:**

- Question 1–7 of 13 "Yes" responses
- Question 2—"Yes" response
- Question 3—"Moderate" or "Severe" response

Source: Hirschfeld RM (2000); Gulick D (2006).

Other Pathology

Otitis Externa (ear infection)

- Ear discomfort (ranges from itching to severe pain)
- Discomfort may ↑ with chewing
- Discharge from the ear
- Feeling of "fullness" of the ear
- Hearing loss

Source: Sander R (2001).

Bacterial Meningitis = Medical Emergency

Adult

- H/A, fever, chills
- Photophobia
- Vomiting, nausea
- URI symptoms
- Seizures in 20%–30% of cases
- Confusion
- (+) Kernig's sign = hip flexed to 90°, pain reproduced with knee extension
- (+) Brudzinski sign = supine neck flexion reproduces pain
- Stiff neck
- Sleepiness

Source: Boissonnault WG (2005); Gulick D (2006).

Headaches

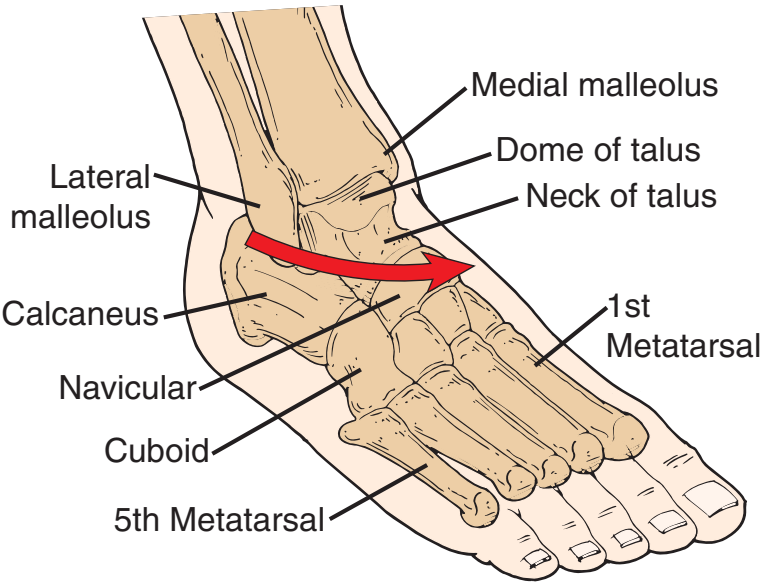
Type of Pain	Possible Etiology
Acute	Trauma, infection, impending CVA
Chronic	Eye strain, ETOH, inadequate ventilation
Severe & intense	Meningitis, aneurysm, brain tumor
Throbbing/pulsating	Migraine, fever, hypertension, aortic insufficiency
Constant	Muscle contraction/guarding
AM pain	Sinusitis (with discharge), ETOH, hypertension, sleeping position
Afternoon pain	Eye strain, muscle tension
Night	Intracranial disease, nephritis
Forehead	Sinusitis, nephritis
Temporal	Eye or ear px, migraine
Occipital	Herniated disk, eye strain, hypertension
Parietal	Meningitis, constipation, tumor
Face	Sinusitis, trigeminal neuralgia, dental px, tumor
Stabbing pain	With ear fullness, tinnitus, vertigo = otitis media
Severe pain	With fever, + Kernig's sign = meningitis
Severe, sudden pain	With ↑ BP = subarachnoid hemorrhage
Intermittent pain	With fluctuating consciousness = subdural hematoma

Source: Gulick D (2006).

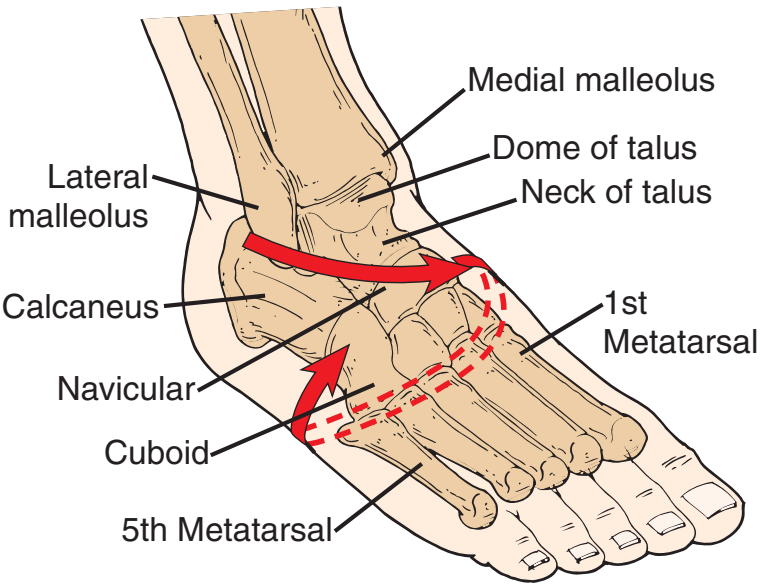
Assessment of Edema

Method to Assess Ankle Edema

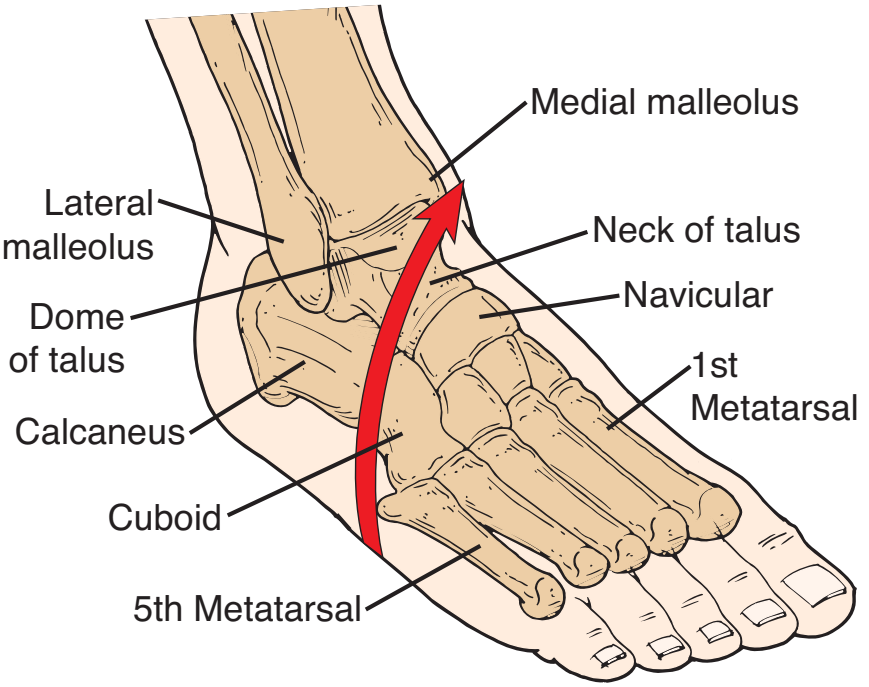
1. Start distal to the lateral malleolus; go medial, just distal to navicular tuberosity



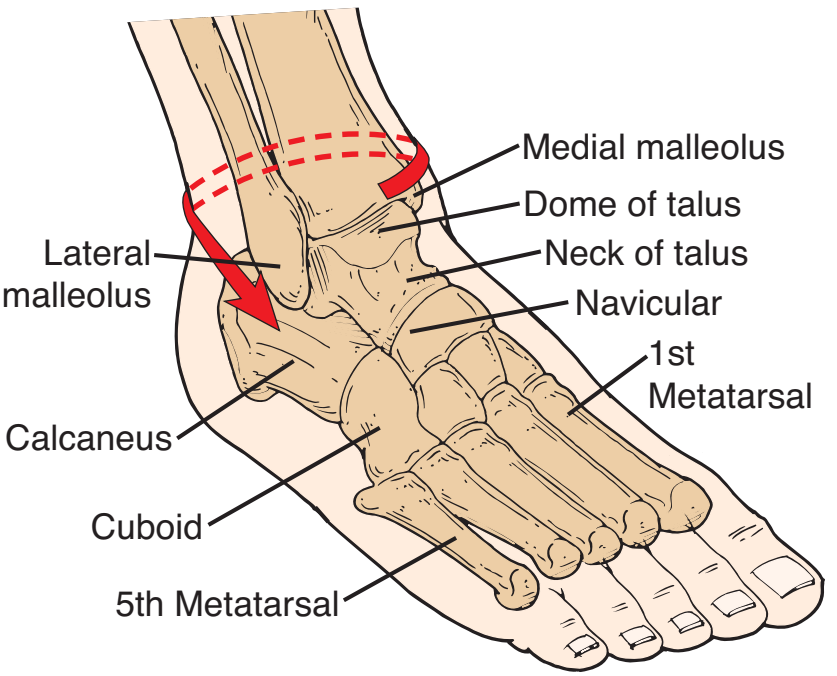
2. Under the arch to the proximal aspect of the head of the 5th metatarsal



3. Across the anterior tibialis tendon to the distal aspect of the medial malleolus

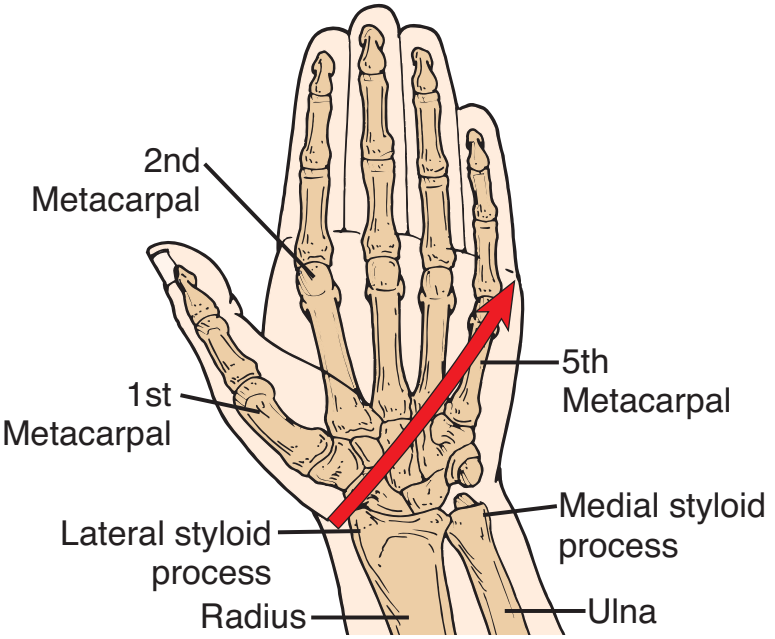


4. Over the Achilles tendon back to the lateral malleolus

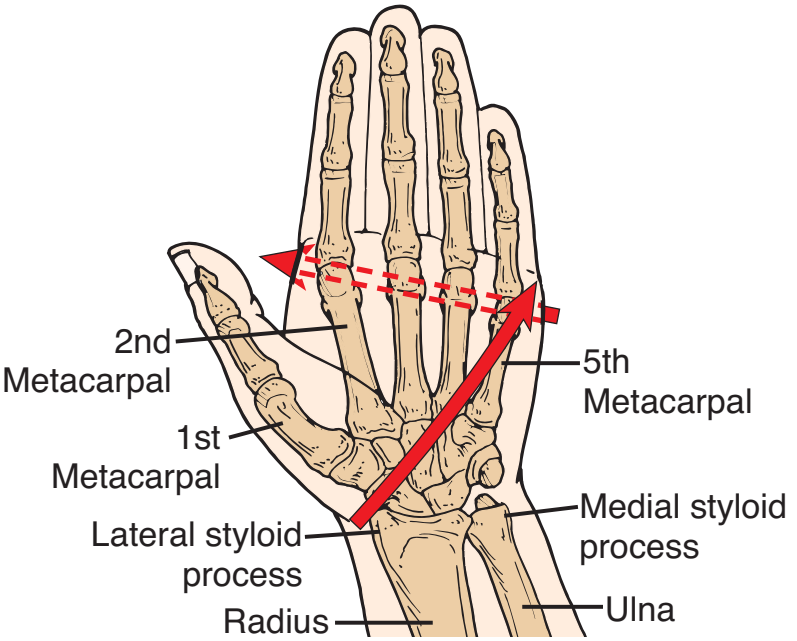


Method to Assess Hand Edema (Palmar Surface)

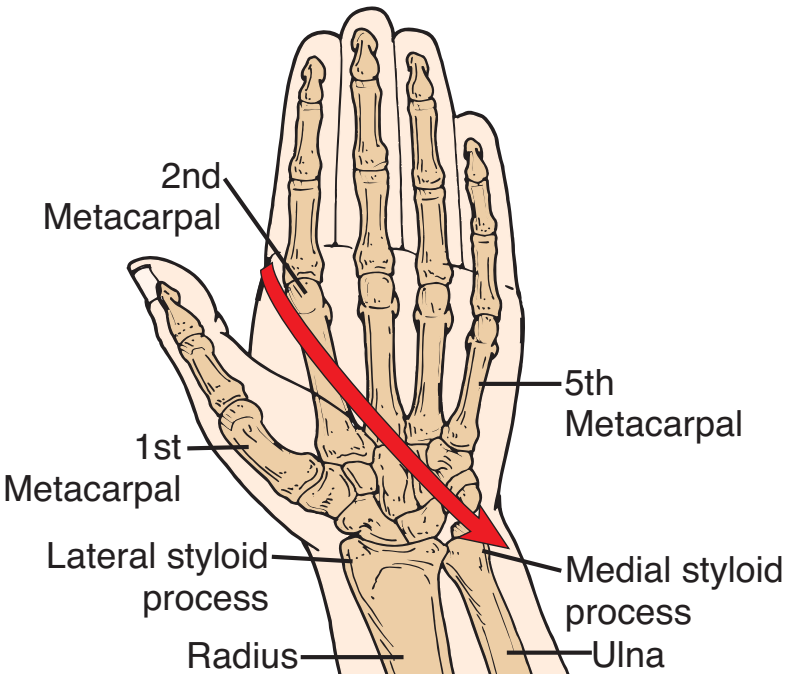
1. Start distal to the lateral styloid process; go medial across the palm of the hand to the 5th MCP joint



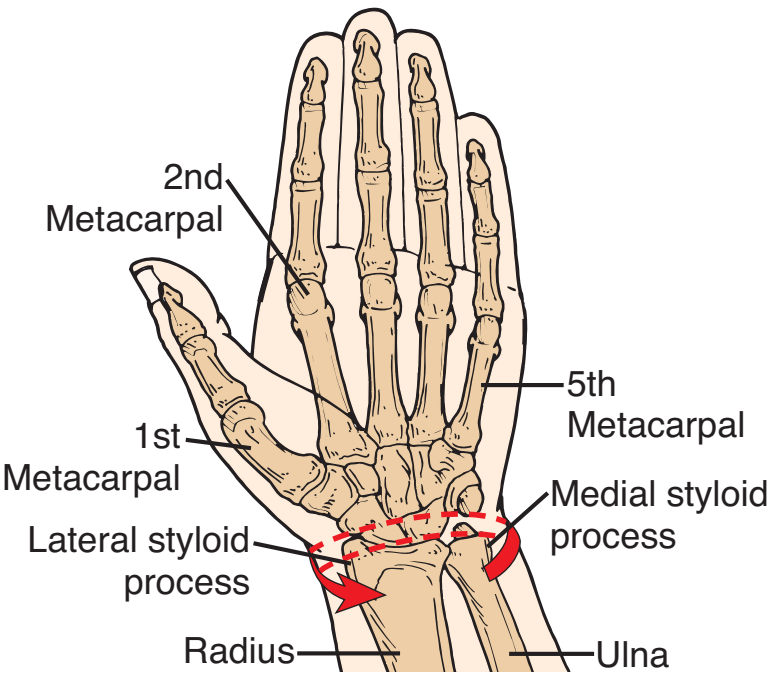
2. Over the knuckles to the 2nd MCP joint



3. Across the palm to the medial styloid process

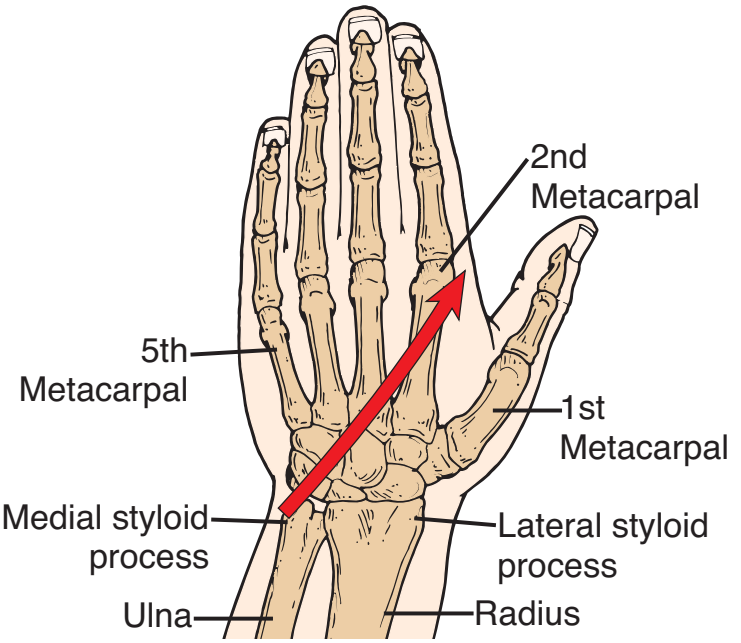


4. Around the back of the wrist to the lateral styloid process

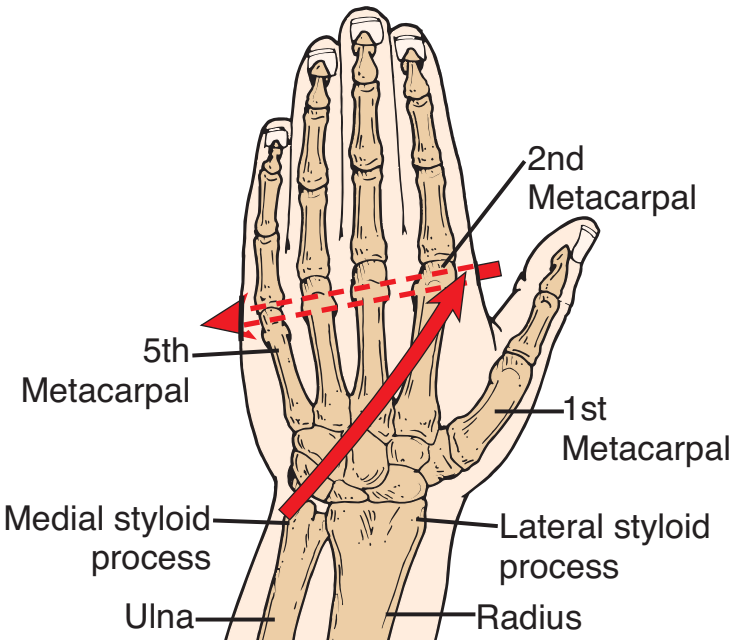


Method to Assess Hand Edema (Dorsal Surface)

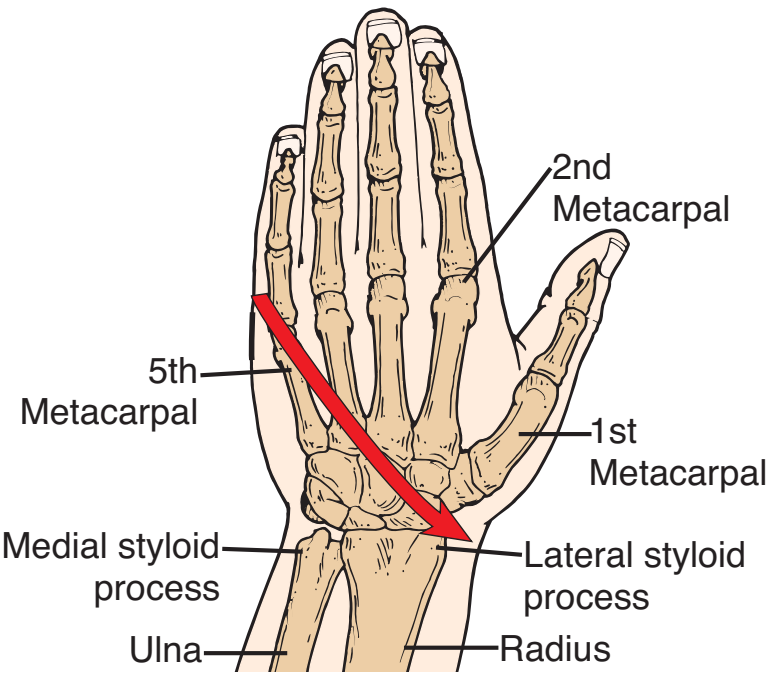
1. Start distal to the medial styloid process; go lateral across the back of the hand to the 2nd MCP joint



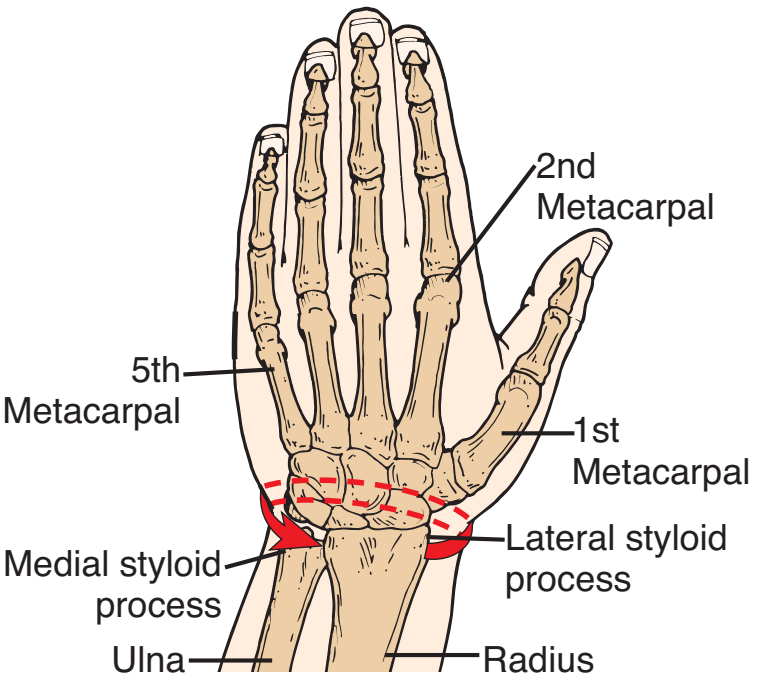
2. Over the palmar aspect of the MCP joints to the 5th MCP joint



3. Across the back of the hand to the lateral styloid process



4. Around the front of the wrist to the medial styloid process



Modalities

Effects of Short-Term Application of Heat & Cold

	Heat	Cold
Skin capillaries	Dilated	Constricted
Skin texture	Smooth	Rough
Skin color	Pink, then red	White, then red
Skeletal muscle	Relaxed	Shiver
Cell tissue size	Expanded	Little change
Tissue metabolism	↑	↓
Pulse rate	↓	↑
Stroke volume	↓	↑
Blood pressure	↓	↑
Pain sensation	↓	↓

Contraindications to Heat & Cold

Heat	Cold
■ Acute inflammation ■ Acute bleeding ■ Fever ■ Malignancy (relative) ■ Thermoregulation px (relative) ■ Absent sensation (relative)	■ Cold hypersensitivity ■ Cryoglobulinemia ■ Arterial insufficiency ■ Thermoregulation px (relative) ■ Absent sensation (relative)

Ultrasound

Clear all of the following contraindications prior to treatment

- Malignancy (relative)
- TB
- Pregnancy
- Epiphyseal plates (relative)
- Hemophilia
- Over genitals, brain, eyes, pacemaker, carotid sinus, thrombi
- Absent sensation (relative)

Ultrasound Parameters:	
Frequency	• 1 MHz target tissue depth is 3–5 cm deep • 3 MHz target tissue depth is 2–3 cm deep
Mode	• Continuous to achieve thermal effects • Pulsed to achieve mechanical effects
Beam Nonuniformity Ratio (BNR)	• < 5:1
Intensity = seek athlete's feedback to determine if warmth is perceived for thermal effects vs. mechanical effects	• At 1 w/cm2, 1 MHz US heats muscle at 0.2°C per minute & 3 MHz US heats muscle at 0.6°C per minute • Vigorous heating requires >4°C tissue temperature
Treatment area	• 2–3x effective radiating area (ERA)
Applicator mov't	• Circular pattern 3–4 cm/sec
Duration of heating effect, i.e., stretching window	• Tissue temperature remains elevated for 4–5 minutes • Tissue temperature returns to baseline within 15–18 minutes

Source: Draper DO (1998); Draper DO & Ricard MD (1995); Rose S, Draper DO, Schulthies SS & Durtant E (1996).

Thermal effects	Nonthermal effects
■ ↑ Tissue temperature ■ ↑ Collagen extensibility ■ ↑ Blood flow ■ ↑ Enzymatic activity ■ ↓ Muscle guarding ■ ↑ Nerve conduction velocity ■ ↑ Pain threshold	■ Degranulation of mast cells ■ Histamine release ■ ↑ Phagocytic activity ■ Micromassage ■ Wound contraction

Phonophoresis	Anti-inflammatory Compounds
■ ≤1°C tissue heating ■ May use pulsed or low intensity ■ 3 MHz (superficial tissue only) ■ 10 minute treatment duration	■ Ketoprofen ■ Dexamethasone ■ Hydrocortisone

Electrical Stimulation

Clear all of the following contraindications prior to treatment

- Over heart or carotid sinus
- In the area of a thrombi
- Pregnancy (except delivery)
- TB
- Cancer (relative)
- Absent sensation (relative)

Parameters for DC Edema Management (Fluid Shift)

- Preintervention: Volumetric or girth measurements
- Can be performed in conjunction with CP, ice bath, intermittent compression
- Intensity to tolerance
- Continuous current flow
- Rx time = 20–30 minutes

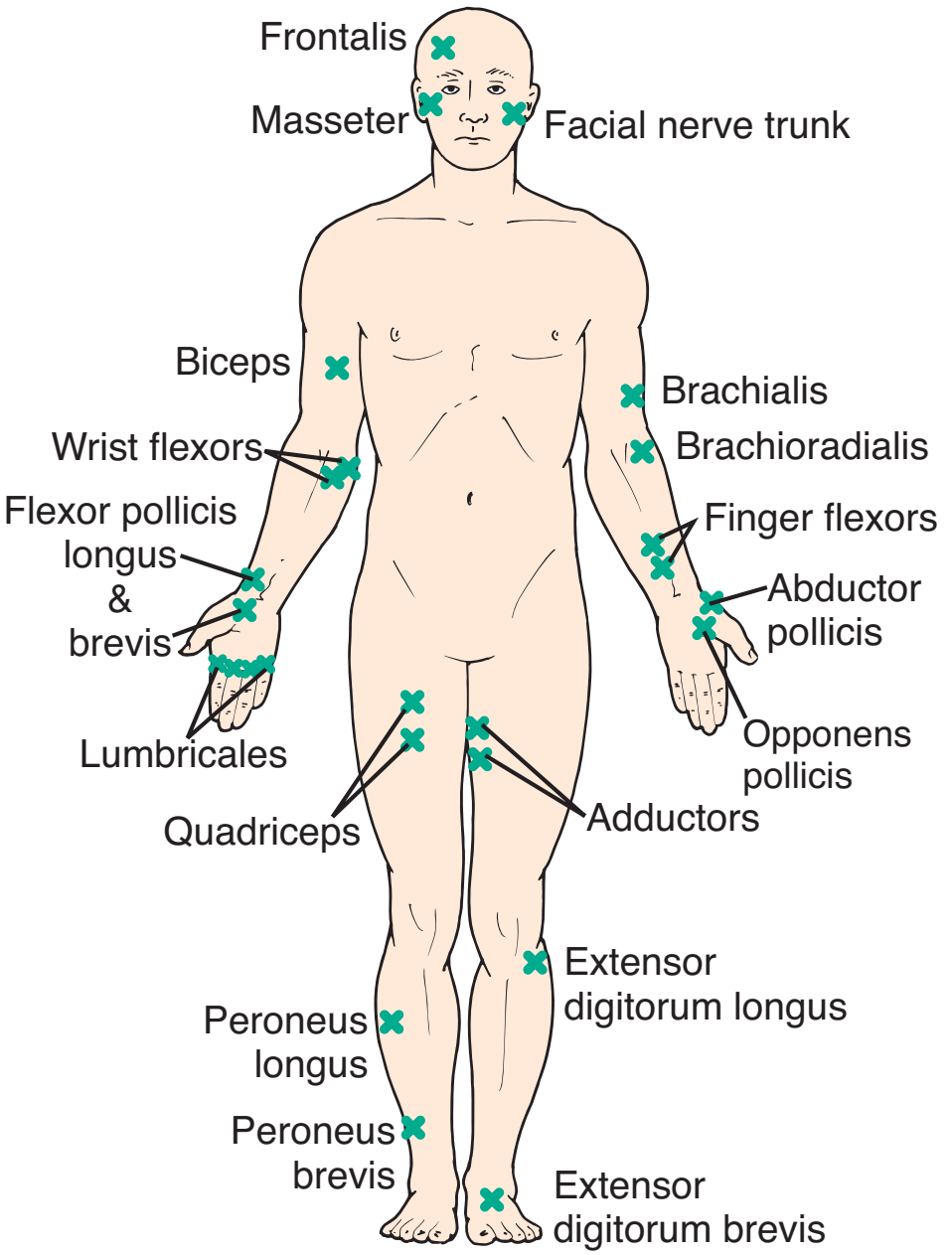
(+) Current: acute Intervention	(−) Current: chronic intervention
• Clumping of blood cells • Vasoconstriction (prevents edema from occurring	• Reversal of clumping • Vasodilation • Fluid shifting to facilitate the removal of edema already present

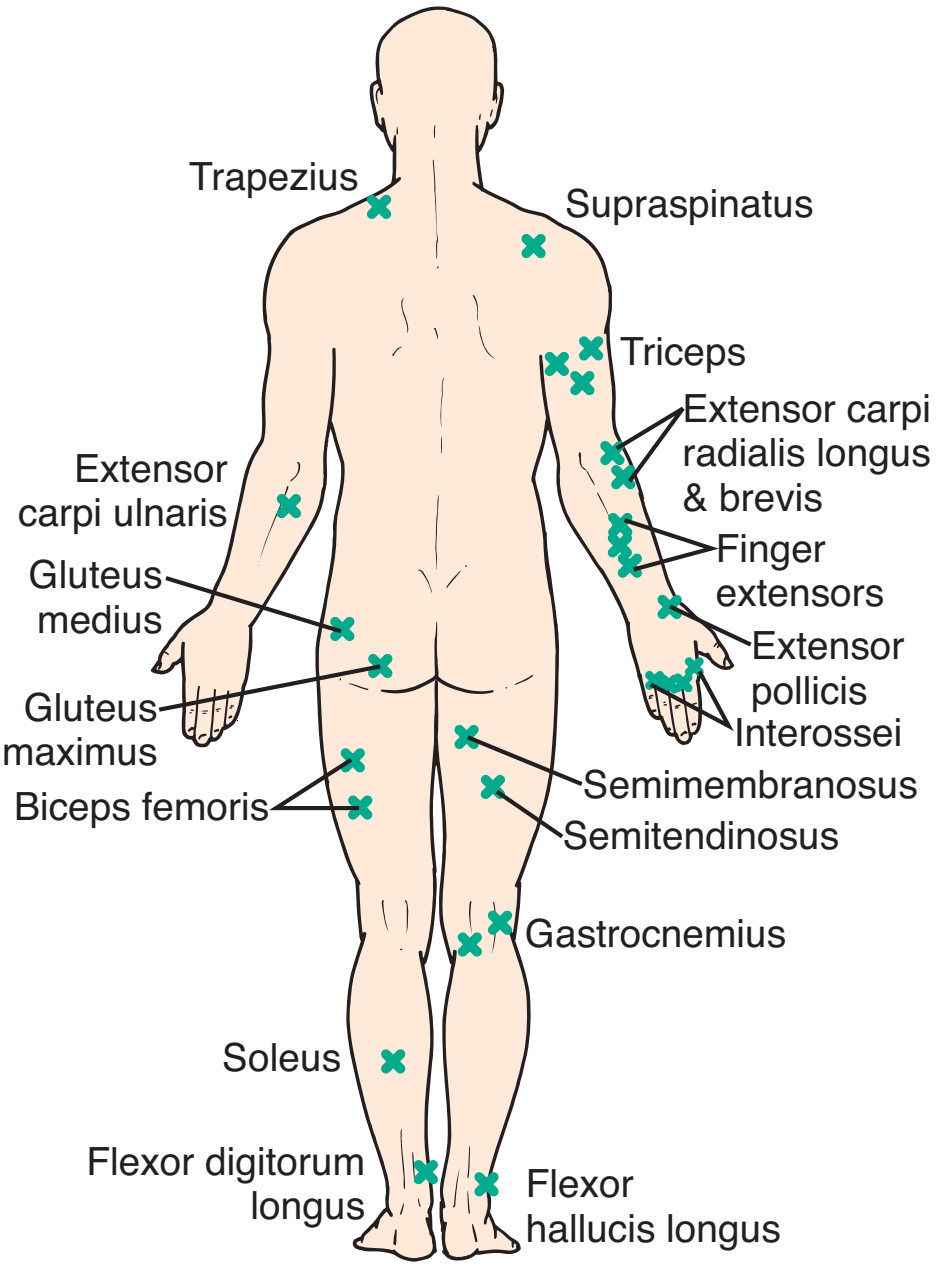
Parameters for AC Edema Management (Muscle Pumping)

- Preintervention: Volumetric or girth measurements
- Can be performed in conjunction with CP, ice bath, intermittent compression

AC electrode placement	• Place 1 electrode/channel on agonist muscle • Place 1 electrode/channel on antagonist muscle

Rate	20–50 pps
Intensity	Strong muscle contraction
Pulse duration	Maximal
Duty cycle	1:2; 4 sec on & 4 sec off; alternating between electrodes/ channels (1–2 sec ramp)
Rx time	20–30 minutes
Parameters for Muscle Reeducation (Innervated)	
AC	Biphasic wave
Electrodes	On muscle motor point(s)
Rate	• 30–40 pps of UE • 40–50 pps for LE
Intensity	Strong muscle contraction
Pulse duration	Maximal
Duty cycle	• 1:3–6 = 3–5 sec on & 10–30 sec off • 1-2 sec ramp
Rx time	10–20 maximal contractions
Parameters for Muscle Reeducation (Denervated)	
DC	Monophasic wave
Electrodes	Just distal to muscle motor point; may use uninvolved extremity to pilot the electrical stimulation
Rate	• 30–40 pps of UE • 40–50 pps for LE
Intensity	Strong muscle contraction
Pulse duration	Maximal
Duty cycle	• 1:3–6 = 3–5 sec on & 10–30 sec off • 1–2 sec ramp
Rx time	10–20 maximal contractions

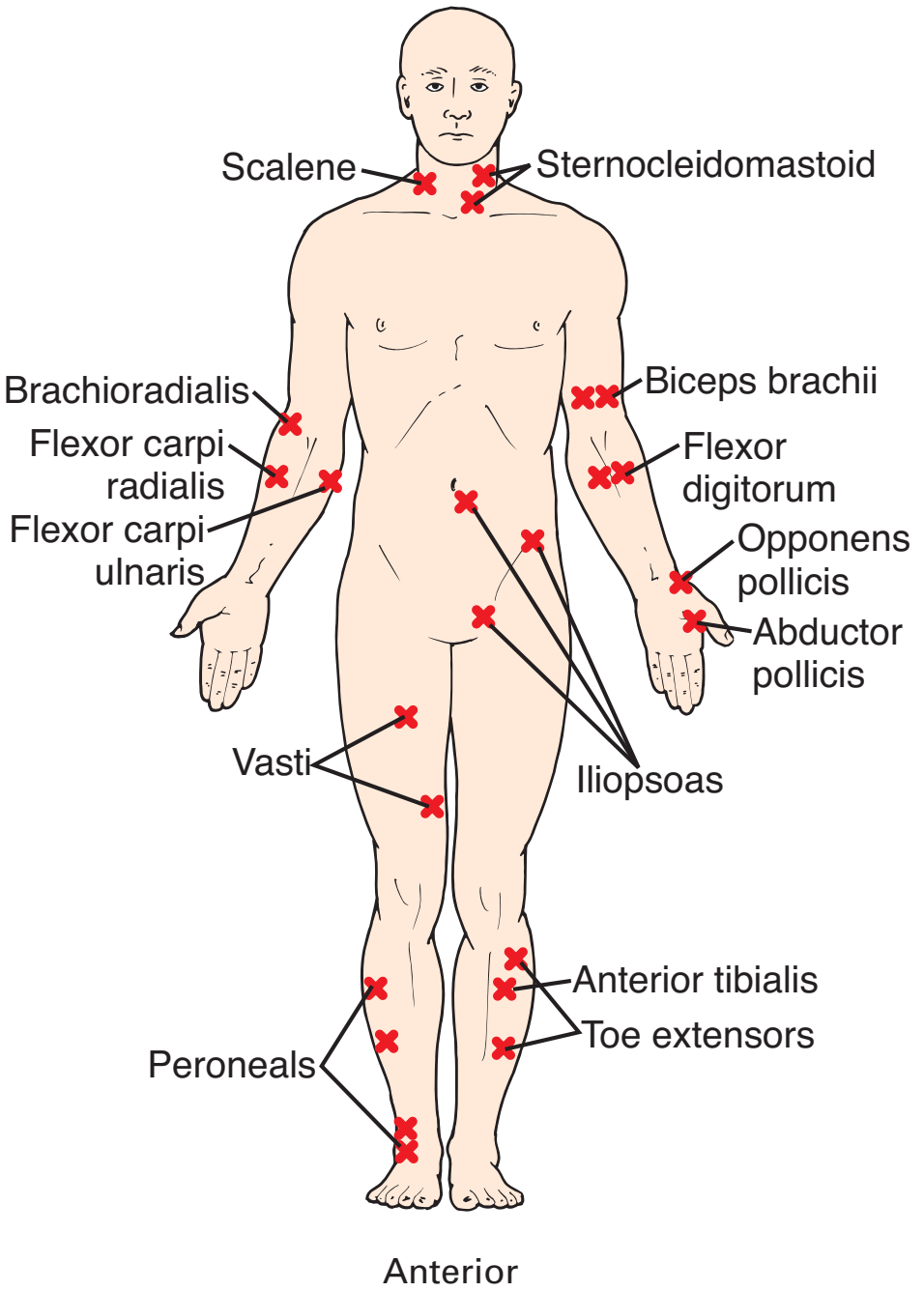

Frontalis
Masseter
Facial nerve trunk
Biceps
Brachialis
Wrist flexors
Brachioradialis
Flexor pollicis longus & brevis
Finger flexors
Abductor pollicis
Lumbricales
Opponens pollicis
Quadriceps
Adductors
Extensor digitorum longus
Peroneus longus
Peroneus brevis
Extensor digitorum brevis
Anterior

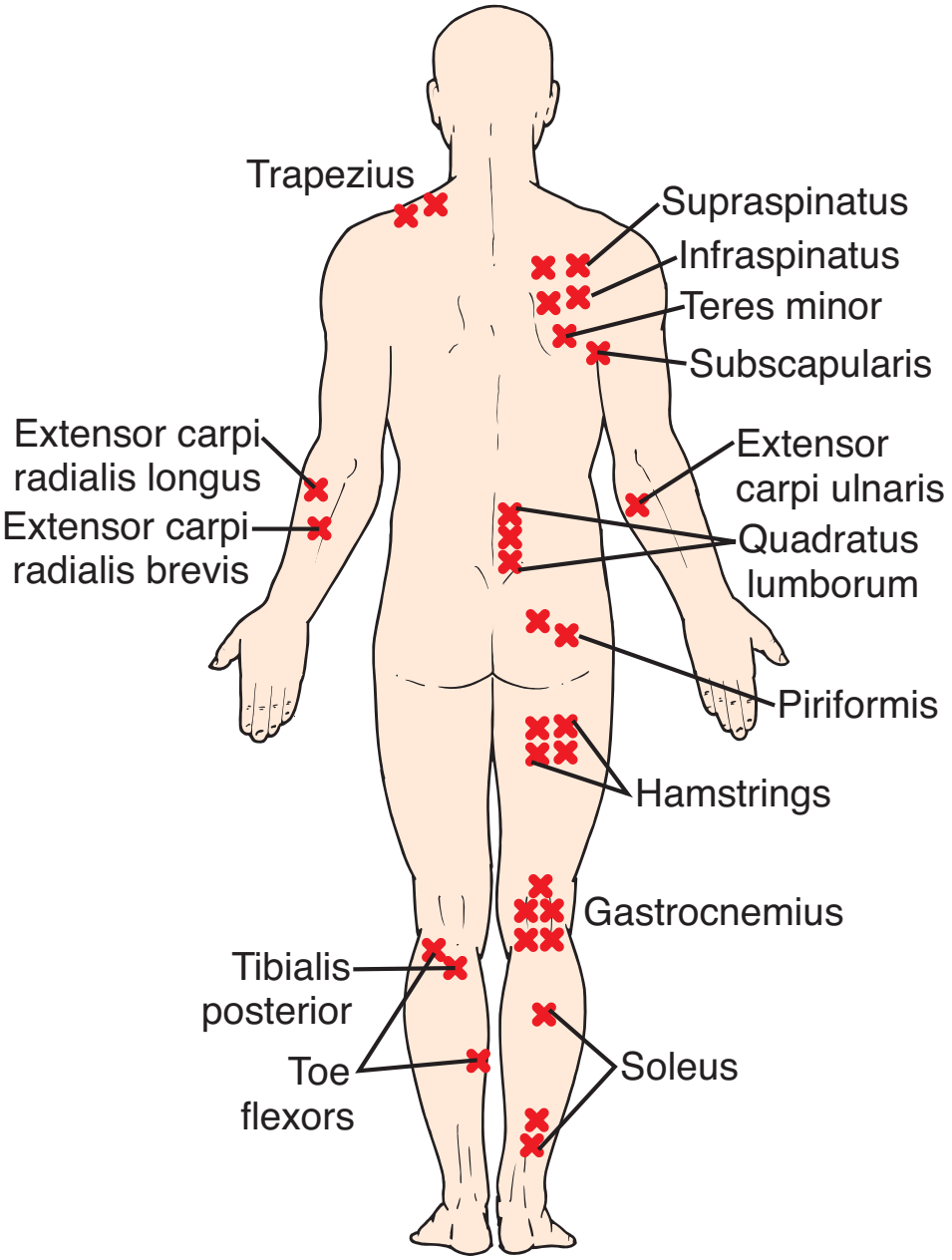

Trapezius
Supraspinatus
Triceps
Extensor carpi radialis longus & brevis
Extensor carpi ulnaris
Finger extensors
Gluteus medius
Extensor pollicis
Interossei
Gluteus maximus
Semimembranosus
Biceps femoris
Semitendinosus
Gastrocnemius
Soleus
Flexor digitorum longus
Flexor hallucis longus

Posterior

Pain Management–AC Continuous

	Gate Control Theory (Conventional)	Central Biasing Theory (Brief Intense)	Opiate Control Theory (Low Rate)
Theory	Stimulation of the A-beta sensory fibers to block the A-delta & C-fibers; as long as the sensory fibers are firing, the gate to the pain is "closed"	Intense stimulation of the C-fibers to produce hyperstimulation analgesia	Stimulation of the A-delta & C-fibers lead to the release of enkephalins & beta-endorphins to decrease pain
Electrode placement	Directly over painful region	Directly over painful site	Nonspecific because of the systemic response
Rate	100–120 pps	100–120 pps	1–3 pps
Intensity	To sensory tolerance but no muscle contraction	Maximal tolerated	Maximal tolerated; Noxious
Rx duration	Minimum of 15–20 minutes	30–60 seconds	60 minutes 15–30 minutes
Time to onset of relief	10–20 minutes for the release of enkephalins	Immediate to within a couple minutes	2–6 hrs (B-endorphin half-life = 4 hrs)
Duration of relief	~ 30 minutes after the removal of the stim unit	5–10x the duration of treatment	


Scalene
Sternocleidomastoid
Brachioradialis
Flexor carpi radialis
Flexor carpi ulnaris
Biceps brachii
Flexor digitorum
Opponens pollicis
Abductor pollicis
Vasti
Iliopsoas
Anterior tibialis
Toe extensors
Peroneals
Anterior


Trapezius
Supraspinatus
Infraspinatus
Teres minor
Subscapularis
Extensor carpi radialis longus
Extensor carpi radialis brevis
Extensor carpi ulnaris
Quadratus lumborum
Piriformis
Hamstrings
Gastrocnemius
Tibialis posterior
Toe flexors
Soleus

Posterior

Wound Healing

Use of direct current (DC) to produce polar effects for wound healing

Parameters with Infection Present	Parameters with Infection NOT Present
• The (−) pole results in an alkaline reaction that inhibits the growth of bacteria & ↑ blood flow. However, the liquification of tissue protein could interfere with the laying down of new collagen. Thus, the (−) pole should only be used until the infection resolves • Monophasic, pulsed, twin-peaked (HVGS) • Pulse rate = 50 pps • Intensity = maximal sensory but subthreshold for muscle contraction • Rx time = 30–60 min; 2–3x/day	• The (+) pole promotes the migration of cells toward the center of the wound, ↑ cell proliferation, & ↓ healing time • Monophasic, pulsed, twin-peaked (HVGS) • Pulse rate = 80 pps • Intensity = maximal sensory but subthreshold for muscle contraction • Rx time = 30–60 min; 2–3x/day

Rx response:

- Serous drainage = underdosed; ↑ intensity next treatment
- Bloody drainage = overdosed; ↓ intensity next treatment
- Serous with a tint of blood = OK; maintain intensity next treatment

Ion, Source, & Pole of Delivery Identified by Pathology		
Inflammation		
Betamethasone	0.4% (4 mg/mL)	Negative
Dexamethasone	0.2%–0.8% (2–8 mg/mL)	Negative
Prednisolone	1%–5% (10–50 mg/mL)	Negative
Wounds		
Gentamycin (gram neg)	5%–10% (50–100mg/mL)	Positive
Zinc	2% (20 mg/mL)	Positive
Penicillin	5%–10% (50–100 mg/mL)	Negative
Calcium Deposits (Heel Spurs, Calcific Tendonitis)		
Acetate (acetic acid)	2%–4% (20–40 mg/mL)	Negative
Scar Tissue & Adhesions		
Chlorine (NaCl)	2% (20 mg/mL)	Negative
Iodine	2%–4% (20–40 mg/mL)	Negative
Potassium iodide	10% solution (200 mg/mL)	Negative
Sodium chloride	2% (20 mg/mL)	Negative
Edema Reduction		
Hyaluronidase	1%–2% (10-20 mg/mL)	Positive
Muscle Spasms		
Baclofen	0.5% (5mg/mL)	Negative
Calcium (CaCl)	1%–2% (10–20 mg/mL)	Positive
Magnesium	1%–2% (10–20 mg/mL)	Positive
Pain		
Lidocaine	4-5% (40-50 mg/ml)	Positive

(Continued)

Ion, Source, & Pole of Delivery Identified by Pathology—*Cont'd*		
Hyperhidrosis		
Atropine sulfate	0.001%–0.01% (0.01–1 mg/mL)	Positive
Glycopyrronium bromide	0.1% (1 mg/mL)	Positive
Gout		
Lithium	2%–4% (20–40 mg/mL)	Positive
Fungus Infections (i.e., Athlete's Foot)		
Copper sulfate	2%–4% (20–40 mg/mL)	Positive

Traction

Clear all of the following contraindications prior to treatment

Absolute contraindications

- Spinal infection
- Spinal cancer
- Tumors
- RA

Relative contraindications

- Osteophytes
- Osteoporosis
- Joint hypermobility
- Traction anxiety
- Pregnancy
- TMJ dysfunction (no chin strap)

Traction Indications

- Distraction of articular surfaces
- Reduce interdiscal pressure
- Neurological signs & symptoms
  - ↓ Sensation
  - ↓ Reflexes
  - ↓ Motor function
- Nerve root impingement
- Muscle guarding
- Facet joint impingement
- Improve the circulation of the epidural spaces
- Spine hypomobility

Traction Parameters

- Angle of pull for given target tissue
  - L5–S1 = 45°–60° of hip flexion
  - L4–L5 = 60°–75° of hip flexion
  - L3–L4 = 75°–90° of hip flexion
  - Atlas & axis = neutral pull
  - ↑ Angle of cervical flexion targets lower cervical vertebra
- Force
  - Cervical: Weight of head is 12–15 lb; vertebral separation occurs between 25 & 45 lb
  - Lumbar: > 50% of body weight
- Duration of Rx = 5–25 minutes

Source: Colachis S & Strohm M (1965).

Traction Red Flags

- ↑ Extremity pain
- ↓ Sensation
- ↑ Anxiety
- Change in vital signs

Intermittent Compression

Clear all of the following contraindications prior to treatment

- Infection
- Thrombi
- Cancer
- Unstable fracture
- Arterial insufficiency
- Cellulitis

Intermittent Compression Indications

- Prevention of DVTs
- Reduction of lymphedema
- Management of arterial occlusive disease
- Management of acute edema

Intermittent Compression Parameters

- Pressure: > capillary refill pressure (30 mm Hg) & < DBP
- On: Off ratio: 3–4:1
- Rapid inflation is recommended over slow inflation

Source: Nikolovoka S, Arsovski A, Damevska K, Gocev G & Pavlova L (2005).

Whirlpool Temperatures

Classification	°F	°C
Very hot	104–110	40–43.5
Hot	99–104	37–40
Warm	96–99	35.5–37
Neutral	92–96	33.5–35.5
Tepid	80–92	27–33.5
Cool	65–80	17–27
Cold	56–65	13–17
Very cold	35–56	1–13

Upper Extremity

Upper Extremity Sling Application

Step 1: Slide sling over injured UE

Step 2: Wrap Velcro® strap around back & over contralateral shoulder

Step 3: Secure strap through D-ring

Optional technique: Apply a horizontal swathe to increase stabilization

Upper Extremity SAM Splint Application

Step 1: Shape the SAM splint into the general contour of the body part to be splinted

Step 2: Position the SAM splint on the injured body part & contour as able

Step 3: Secure the SAM splint with an Ace wrap or Velcro® straps

Optional technique: SAM splint can be doubled over on itself to increase the strength of the splint

Upper Extremity Compression Wrap

Step 1: Position UE as desired; begin distally & apply wrap in a spiral pattern from distal to proximal

Step 2: Overlap each layer by ½ the width of wrap

Step 3: Secure the wrap proximally with tape, clips, or Velcro®

Shoulder Spica Wrap

Step 1: Anchor wrap on mid-humerus & circle proximally toward shoulder

Step 2: Cross diagonally across chest, under contralateral axilla, around back to shoulder

Step 3: Encircle the upper arm & back across the chest; continue to alternate between arm & chest; end on upper arm

Step 4: Optional technique: Use 2″ elastic tape to complete 1–2 cycles over the Ace wrap

Strapping for Glenohumeral Subluxation

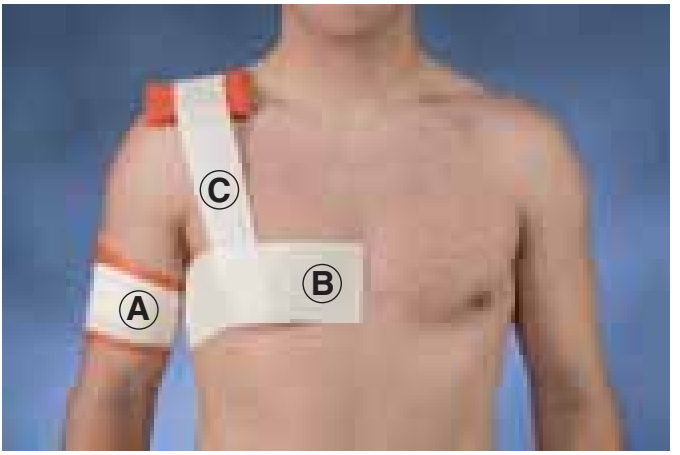
Step 1: Apply an elastic anchor strip to mid-humerus & several elastic horizontal strips around chest (be sure to cover nipple with gauze or felt)

Step 2: Apply a figure-8 with 3″ elastic tape around arm & thorax, twisting tape as it passes under axilla

Step 3: Wrap twisted elastic tape in axillary region with tape to secure check rein

A-C Support

Step 1: Apply an anchor strip to mid-humerus & several horizontal strips to chest with nipple covered with gauze or felt



Step 2: Apply a rigid foam pad over A/C joint & compress with several strips of elastic tape from anterior chest, anchor to posterior chest anchor; elastic strips can be reinforced with white tape prn

Step 3: Apply several strips in a fanlike pattern from A/C joint to mid-humeral anchor; re-anchor

Elbow Hyperextension Strapping

Step 1: Apply 2 anchors around mid-humerus & mid-forearm

Step 2: Apply 2 diagonal straps from lateral humerus to medial forearm & medial humerus to lateral forearm

Step 3: Apply several fanning strips on anterior surface from humerus to forearm; note that strips extend beyond anchors so they can be folded back for additional stability

Step 4: Reinforce anchors & close off as desired

Lateral Epicondylitis Strap

Commercial Strap

Step 1: Measure girth of elbow @ joint line to size strap appropriately

Step 2: Position strap 1 finger-width distal to lateral epicondyle

Step 3: Tighten strap as much as possible without compromising circulation

Taping Technique

Step 1: Cut a 1″–2″ square ¼″-thick felt pad

Step 2: Place pad 1 finger-width distal to lateral epicondyle & secure with underwrap

Step 3: Apply 1″ elastic tape over underwrap as tightly as possible without compromising circulation

Wrist Strapping

Step 1: Abduct fingers in extension & position wrist as desired

Step 2: Apply several circular strips in a continuous, overlapping pattern moving from distal to proximal

Wrist & Hand Strapping

Step 1: Position fingers in maximal abduction & apply an anchor around proximal wrist

Step 2: Fold the tape & cut a hole to accommodate the finger; slip finger through tape hole

Step 3: Pull tape proximally toward anchor & repeat as needed for one, or multiple, fingers

Step 4: Reinforce anchor

Boxer's Wrap

Step 1: With wrist in neutral & fingers abducted, apply an anchor around proximal wrist

Step 2: Begin @ anchor & proceed distally to web space of 2nd & 3rd rays, wrap around index finger (laterally) & back to anchor; repeat for each finger; confirm that the athlete can make a fist after each strap

Optional Technique: Apply 2–3 thumb spicas

Step 3: Close off around wrist

Thumb Spica

Step 1: Position thumb in neutral & apply an anchor around proximal wrist

Step 2: Apply a spiral strap from the anchor around the thumb (encompassing the MCP joint) & back to the anchor

Step 3: Optional technique – Cut a "V" notch out of a strip of elastic tape & criss-cross over the MCP joint

Step 4: Reinforce anchor

Thumb Hyperextension Strapping

Step 1: Position thumb MCP & IP in flexion & apply an anchor around proximal wrist

Step 2: Apply a series of longitudinal straps on the palmar side of the thumb; note that the straps extend beyond the end of the thumb & the anchor strips

Step 3: Secure longitudinal strap at thumb tip & between IP/MCP; flip strap back & reapply circular strap around thumb tip; reinforce anchor

Step 4: Optional technique: Check rein between thumb MCP/IP & index finger MCP/PIP

Finger Buddy Taping

Step 1: Position fingers as desired

Step 2: Encircle fingers with ½"-tape between the MCP & PIP

Step 3: Encircle fingers with ½"-tape between the PIP & DIP

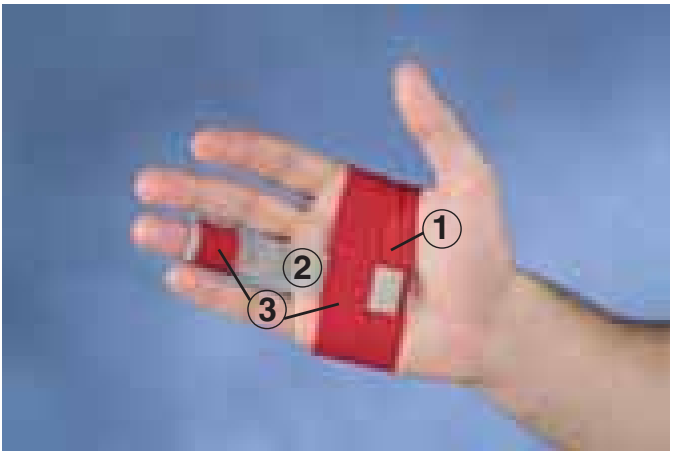
Step 4: Optional technique: Apply check rein to each strap for reinforcement

Finger Hyperextension Strapping

Step 1: Position finger in flexion & apply an anchor around palm of hand & distal phalange

Step 2: Apply a series of ½" longitudinal straps on palmar side of finger; note that straps extend beyond end of finger & anchor strips

Step 3: Re-anchor, flip the longitudinal strip back, & anchor again



Lower Extremity

Hip Spica Wrap

Step 1: Apply strip of rolled adhesive tape to serve as an anchor

Step 2: Begin @ distal aspect of femur by anchoring Ace wrap to skin; apply wrap in a spiral pattern from distal to proximal; overlap each layer by ½ the width of the wrap

Step 3: At top of thigh, wrap around hips & back down thigh

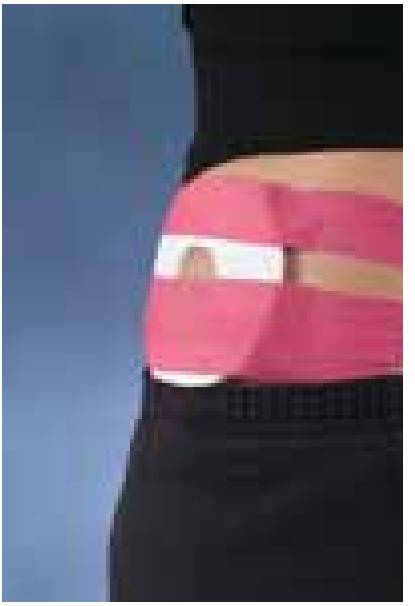
Step 4: Secure the wrap proximally with tape, clips, or Velcro®

Hip Pointer Padding

Step 1: Position a donut pad over ASIS

Step 2: Secure pad with athletic tape & wrap with an Ace wrap around abdominal region

Optional technique: Incorporate a hip spica wrap to secure pad



Thigh Compression Wrap

Step 1: Begin @ distal aspect of femur by anchoring Ace wrap to skin; apply wrap in a spiral pattern from distal to proximal; overlap each layer by ½ the width of wrap

Step 2: Secure wrap proximally with tape, clips, or Velcro®

Knee Compression Wrap

Step 1: Position knee in slight flexion; begin @ middle of tibia by anchoring Ace wrap to skin & applying wrap in a spiral pattern from distal to proximal

Step 2: Overlap each layer by ½ the width of the wrap

Step 3: Secure the wrap proximally with tape, clips, or Velcro®

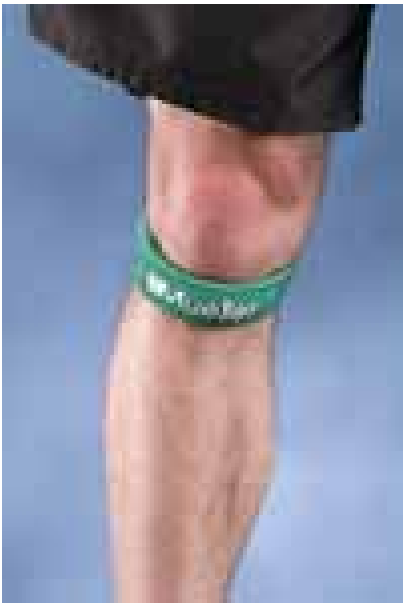
Patella Stabilization

Step 1: Cut & position a felt horseshoe horizontally on lateral side of patella

Step 2: Using 3" elastic tape, start in the popliteal fossa & split tape around patella—1 strip medial→lateral & 1 strip lateral→medial

Patellar Tendon Strap

Commercial Strap



Step 1: Measure girth of knee @ joint line to size strap appropriately

Step 2: Position strap 1 finger-width distal to inferior pole of the patella

Step 3: Tighten strap as much as possible without compromising circulation

Taping Technique

Step 1: Cut a 1″–2″ square ½″-thick felt pad

Step 2: Place pad over patellar tendon & secure with underwrap

Step 3: Apply 1″ elastic tape over underwrap as tightly as possible without compromising circulation

McConnell Taping

Step 1: Apply 2 horizontal strips of adhesive Cover-Roll tape across the anterior aspect of the patella

Step 2a: To glide the patella medially, attach a strip of Leukotape to lateral edge of patella & pull to medial aspect of knee

Step 2b: To rotate the patella medially, attach a strip of Leukotape to inferior pole of patella & pull superior & medial

Step 2c: To rotate the patella laterally, attach a strip of Leukotape to inferior pole of patella & pull superior & lateral

Glide medial

Rotate medial

Rotate lateral

Knee Hyperextension Strapping

Step 1: Apply 1 anchor @ middle of thigh & 1 anchor @ middle of tibia; apply a heel & lace pad to popliteal fossa

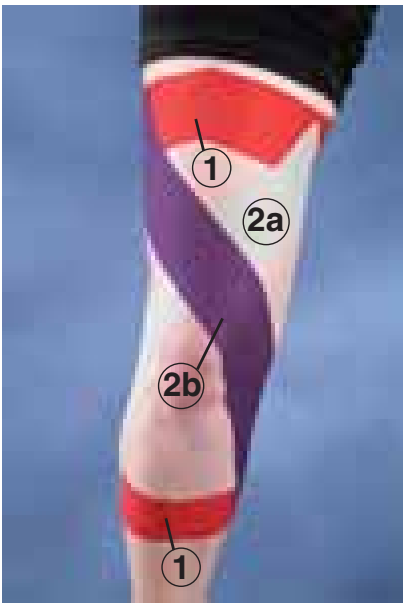
Step 2: Apply 2–3 vertical straps down posterior aspect of the leg; remember to overshoot the anchors to allow them to be folded back on themselves

Step 3: Apply a spiral strap from medial thigh, around to popliteal fossa to lateral tibia; repeat beginning from lateral thigh, around to popliteal fossa to medial tibia

Step 4: Anchor & close-off prn

Knee Strapping for Collateral Support

Step 1: Apply 1 anchor @ middle of thigh & 1 anchor @ middle of tibia; apply a heel & lace pad to popliteal fossa



Step 2: Apply a diagonal strip from lateral tibial anchor to medial thigh anchor (approximate lateral & superior edges of patella); apply another diagonal strip from medial tibial anchor to lateral thigh anchor (approximate medial & superior edges of patella); repeat each strip by overlapping previous strip by half the width laterally

Step 3: Apply a diagonal strip from lateral tibial anchor to medial thigh anchor (approximate inferior & medial edges of patella); apply another diagonal strip from medial tibial anchor to lateral thigh anchor (approximate inferior & lateral edges of patella); repeat each strip by overlapping previous strips by half the width laterally

Step 4: Apply vertical strips along the path of the MCL & LCL

Step 5: Anchor & close-off prn

Ankle Strapping

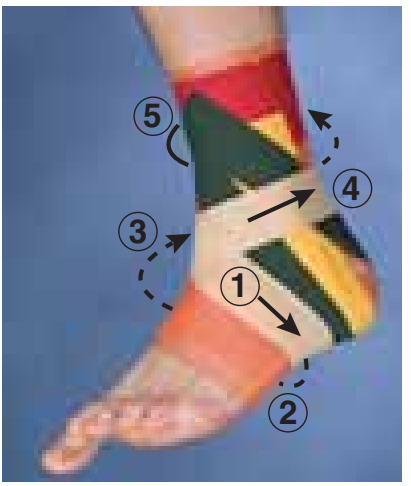
Step 1: Position ankle in neutral for ATF, CF, & deltoid sprains & in 10° of plantarflexion for syndesmotic sprain; apply heel & lace pads

Step 2: Apply 2–3 anchors @ lower ⅓ of tibia; apply 2–3 stirrups pulling medial to lateral for ATF & CF sprains, pulling lateral to medial for deltoid sprains, pulling bilaterally for syndesmotic sprains

Optional technique: Using 2"–3" elastic tape or a strip of moleskin, apply a bifurcated "Y" stirrup for additional support

Step 3: Apply 2–3 medial & lateral heel locks, as needed

Step 4: Apply 1–2 figure-8 straps & close-off



Ankle Compression Wrap

Step 1: Position ankle in neutral

Step 2: Optional technique: Incorporate a felt horseshoe contoured to lateral malleolus to compress the edematous region

Step 3: Begin applying overlapping (½ the width of the wrap) spirals from distal to proximal

Step 4: Optional technique: lincorporate heel locks as described in ankle strapping to support ankle

Step 5: Secure the wrap with tape, clips, or Velcro®

Peroneal Tendon Support

Step 1: Apply an anchor around lower ⅓ of tibia

Step 2: Cut an "L-shaped" felt pad to wrap around posterior & inferior aspect of lateral malleolus

Step 3: Secure the "L" pad with a lateral heel lock & close-off prn

Achilles Tendon Strapping

Step 1: With athlete in prone position & ankle in plantarflexion, apply a heel & lace pad to Achilles tendon

Step 2: Apply an anchor @ mid-tibia & an anchor @ metatarsal arch

Step 3: Using 3″ elastic tape, apply a vertical strip from distal anchor to proximal anchor; split proximal end of tape & spiral tape around tibia; repeat 1–2x

Step 4: Apply 1–2 heel locks to stabilize the rearfoot in a plantarflexed position

Step 5: Re-anchor & close-off prn

Option: Include a 2 cm heel lift in shoe to reduce stress on Achilles tendon

Plantarflexion Restriction (Dorsal Bridge)

Step 1: Position the ankle in dorsiflexion; apply heel & lace pad; apply anchors around metatarsal arch & lower ⅓ of tibia

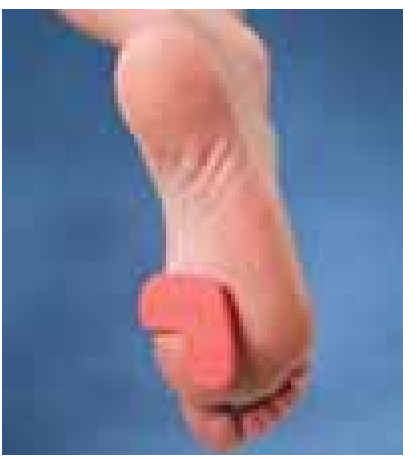
Step 2: Cut a 3" elastic strip several inches longer than the distance between anchors

Step 3: Be sure to overshoot anchors in order to fold tape back on itself; & anchor

Sesamoid "J" Pad

Step 1: Cut & size felt or foam "J-shaped" pad to athlete's foot

Step 2: Wrap with prewrap & secure pad with elastic tape



Longitudinal Arch Strapping

Step 1: Apply an anchor around metatarsal heads

Step 2: Apply a series of loops from anchor, around heel, & back to anchor; each loop should overlap previous loop by ½ the width of the tape & support medial longitudinal arch

Step 3: Close-off foot with overlapping anchors (tape or elastic)

Turf Toe Strapping

Step 1: Cut a piece of moleskin 2" wide and about ⅔ the length of athlete's foot with a "T-shaped" projection @ the end

Step 2: Position the great toe in flexion & wrap the "T-shaped" portion of the moleskin around great toe & anchor in place

Step 3: Adhere moleskin to plantar surface of foot

Toe Spica

Step 1: Apply an anchor around metatarsal heads

Step 2:

- To maintain toe flexion (left photo)—start on anchor on plantar surface, loop great toe, & return to plantar anchor
- To maintain toe extension (right photo)—start on anchor on dorsal surface, loop great toe, & return to dorsal anchor
- To maintain toe in abduction (not shown)—start on anchor on plantar surface of foot, proceed medially around great toe, around to dorsal surface, between 1st & 2nd toes, to dorsal aspect of anchor

Step 3: Repeat as many loops as needed & re-anchor

Hallux Valgus Strapping

Step 1: Apply 1 anchor around mid-foot & 1 anchor around great toe

Step 2: Apply several longitudinal straps from medial great toe to lateral mid-foot anchors; (wrap straps past medial aspect of anchor & around heel to lateral side of anchor); be sure to overshoot anchors for step 3

Step 3: Secure anchors & fold longitudinal strips back on themselves; anchor again & close-off prn

Hallux Valgus Splinting

Step 1: Abduct great toe

Step 2: Insert rubber toe wedge between 1st & 2nd toes to align 1st ray

Metatarsal Arch Pad

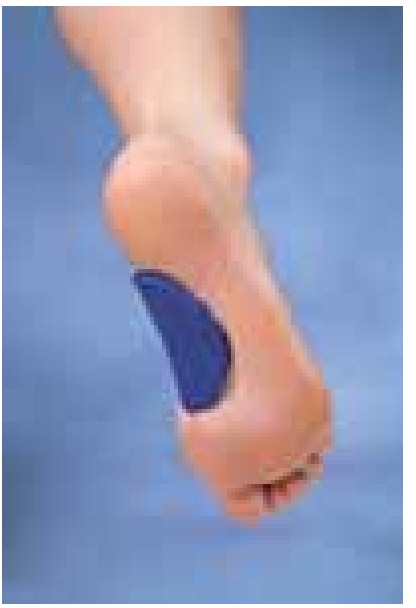
Step 1: Cut & size felt, foam, or rubber "tear-drop" shaped pad to athlete's foot

Step 2: Wrap with prewrap & secure pad with elastic tape

Medial Longitudinal Arch Pad

Step 1: Cut & size felt, foam, or rubber "D" pad to athlete's foot

Step 2: Wrap with prewrap & secure pad with elastic tape

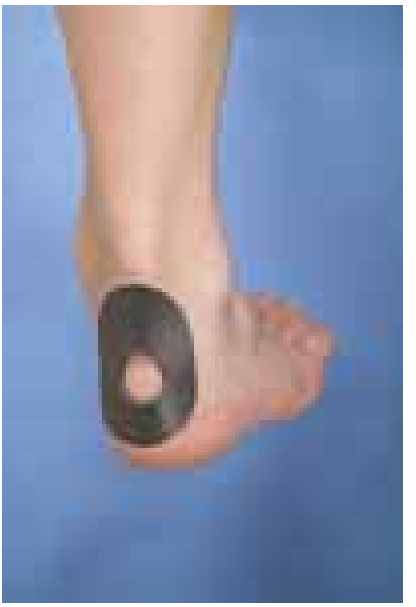


Donut Pad

Step 1: Measure the size of the blister, bunion, or bursa & cut a piece of adhesive foam that is 1" larger in diameter

Step 2: Cut out center of foam to be slightly larger than size of blister, bunion, or bursa

Step 3: Add another layer to the foam if additional thickness is desired, cover blister with Telfa®; secure with elastic tape



References

- AAFA, 1-800-7-ASTHMA
- Akseki D, Ozcan O, Boya H & Pinar H. A new weight-bearing meniscal test and a comparison with McMurray's test and joint line tenderness. *Arthroscopy*, 20(9):951–958, 2004.
- Albeck M. A critical assessment of clinical diagnosis of disc herniation in patients with monoradicular sciatica. *Acta Neurochiropractic*, 138:40–44, 1996.
- Albert H, Godskesen M & Westergaard J. Evaluation of clinical tests used in classification procedures in pregnancy-related pelvic joint pain. *European Spine Journal,* 9(2):161–166, 2000.
- Almquist J. Spine injury management, retreived from http://www.healthsouth.com/medinfo/home/app/frame?2=article.jsp,0,sh_football_spineinjury
- American Academy of Neurology. Practice parameter: The management of concussion in sports. Report of the Quality Standards Subcommittee. *Neurology*, 48:581–585, 1997.
- American College of Sports Medicine. Position stand: Exercise and fluid replacement. *Medicine and Science in Sports and Exercise*, 28:i, 1996.
- American Heart Association. Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, 2005.
- American Heart Association. Summary of BLS ABCD maneuvers for infants, children, and adults. *Currents,* Winter 2005–2006:15.
- American Lyme Disease Foundation. *http//www/aldf.com*
- Anand SS, Wells PS & Hunt D et al. Does this patient have deep vein thrombosis? *JAMA,* 279(14):1094–1099, 1998.
- Anderson MK, Fundamentals of Sports Injury Management (2nd ed.). Williams & Wilkins, 1997.
- Anderson MK, Hall SJ & Martin M. Sports Injury Management (2nd ed). Philadelphia: Lippincott Williams & Wilkins, 2002.

- Arnheim DD. Modern Principles of Athletic Training, 7th ed. St. Louis: Mosby, 1989.
- Austin K, Gwynn-Brett K & Marchall S. Illustrated Guide to Taping Techniques, Baltimore: Mosby-Wolfe, 1994.
- Baker CL Jr, Norwood LA & Hughston JC. Acute combined posterior cruciate and posterolateral instability of the knee. *American Journal of Sports Medicine,* 12(3):204–208, 1984.
- Barankin B & Freiman A. Derm Notes. Philadelphia: FA Davis, 2006.
- Barr WB & McCrea M. Sensitivity and specificity of standardized neurocognitive testing immediately following sports concussion. *Journal of the International Neuropsychological Society*, 7:693–702, 2001.
- Beam JW. Orthopedic Taping, Wrapping, Bracing & Padding. Philadelphia: FA Davis, 2006.
- Benner W. Specificity of the speed's test: Arthroscopic technique for evaluating the biceps tendon at the level of the bicipital groove. *Arthroplasty,* 14(8):789–796, 1998.
- Binkley HM, Beckett J, Casa DJ, Kleiner DM & Plummer PE. National Athletic Trainers' Association position statement: exertional heat illnesses. *Journal of Athletic Training,* 37(3):329–343, 2002.
- Blower PW & Griffin AJ. Clinical sacroiliac tests in ankylosing spondylitis and other causes of low back pain. *Annals of Rheumatic Disorders,* 43:192–195, 1984.
- Boeree NR & Ackroyd CE. Assessment of the meniscus and cruciate ligaments: an audit of clinical practice. *Injury,* 22(4):291–294, 1991.
- Boissannault WG. Primary Care for the Physical Therapist. Philadelphia: Elsevier Saunders, 2005.
- Boissannault WG & Bass C. Pathological origins of trunk and neck pain: Part I–Pelvic and abdominal visceral disorders. *Journal of Orthopaedic and Sports Physical Therapy,* 12(5):192–207, 1990.

- Boissannault WG & Bass C. Pathological origins of trunk and neck pain: Part II–Disorders of the cardiovascular and pulmonary systems. *Journal of Orthopaedic and Sports Physical Therapy*, 12(5):208–215, 1990.
- Boissannault WG & Bass C. Pathological origins of trunk and neck pain: Part III–Diseases of the musculoskeletal system. *Journal of Orthopaedic and Sports Physical Therapy*, 12(5):216–221, 1990.
- Broadhurst NA & Bond MJ. Pain provocation tests for the assessment of sacroiliac joint dysfunction. *Journal of Spinal Disorders,* 11(4):341–345, 1998.
- Broomhead A & Stuart P. Validation of the Ottawa ankle rules in Australia. *Emergency Medicine*, 15(2):126–132, 2003.
- Bruske J, Bednarski M, Grzelec H & Zyluk A. The usefulness of the Phalen test and the Hoffman-Tinel sign in the diagnosis of carpal tunnel syndrome. *Acta Orthopaedica Belgica,* 68(2):141–145, 2002.
- Burkhart S, Morgan CB & Kibler B. Shoulder injuries in overhead athletes: The dead arm revisited. *Clinics in Sports Medicine,* 19(1):125–158, 2000.
- Calis M, Akgen K, Birtane M, Calis H & Tuzun F. Diagnostic values of clinical diagnostic tests in subacromial impingement syndrome. *Annals of the Rheumatic Diseases,* 59:44–47, 2000.
- Cantu RC. Posttraumic retrograde and anterograde amnesia: Pathophysiology and implications in grading and safe return to play. *Journal of Athletic Training,* 36:244–248, 2001.
- Cibulka MT & Koldehoff R. Clinical usefulness of a cluster of sacroiliac joint tests in patients with and without low back pain. *Journal of Orthopaedic and Sports Physical Therapy,* 29(2):83–92, 1999.
- Clark KD & Tanner S. Evaluation of the Ottawa ankle rules in children. *Pediatric Emergency Care,* 19(2):73–78, 2003.
- Colachis S & Strohm M. A study of tractive forces and angle of pull on vertebral interspaces in cervical spine. *Archives of Physical Medicine,* 46:820–830, 1965.

- Committee on Sports Medicine: *Pediatrics,* 81:738, 1988.
- Cook CE. Orthopedic Manual Therapy. Upper Saddle River, NJ: Prentice Hall, 2007.
- Dissmann PD & Han KH. The tuning fork test—a useful tool for improving specificity in "Ottawa positive" patients after ankle inversion injury. *Emergency Medicine Journal,* 23(10):788–790, 2006.
- Donaldson WF III, Warren RF & Wickiewicz T. A comparison of acute anterior cruciate ligament examinations. Initial versus examination under anesthesia. *American Journal of Sports Medicine,* 13:5–10, 1985.
- Draper DO. Guidelines to enhance therapeutic ultrasound treatment outcomes. *Athletic Therapy Today,* Nov:7–11, 1998.
- Draper DO & Ricard MD. Rate of temperature decay in human muscle following 3 MHz ultrasound. The stretching window revealed. *Journal of Athletic Training,* 30:304–307, 1995.
- Dreyfuss P, Michaelsen M, Pauza K, McLarry J & Bogduk N. The value of medical history and physical examination in diagnosing sacroiliac joint pain. *Spine,* 21(22):2594–2602, 1996.
- Dworkin SF, Huggins KH, LeResche L, Von Korff M, Howard J, Truelove E & Sommers E. Epidemiology of signs and symptoms in temporomandibular disorders: Clinical signs in cases and controls. *Journal of the American Dental Association,* 120(3):273–281, 1990.
- Evans PJ. Prospective evaluation of the McMurray test. *American Journal of Sports Medicine,* 22:567–568, 1994.
- Evans PJ, Bell GD & Frank C. Prospective evaluation of the McMurray test. *American Journal of Sports Medicine,* 21(4):604–608, 1993.
- Faught BE. Efficacy of clinical tests in the diagnosis of carpal tunnel. Doctoral dissertation, 2001.
- Fowler PJ & Lubliner JA. The predictive value of five clinical signs in the evaluation of meniscal pathology. *Arthroscopy,* 5:184–186, 1989.

- Garvin GJ, Munk PL & Vellet AD. Tears of the medial collateral ligament: Magnetic resonance imaging finding and associated injuries. *Canadian Association of Radiology Journal*, 44:199–204, 1993.
- Gerber C, Krushell RJ. Isolated rupture of the tendon of the subscapularis muscle. *Journal of Bone and Joint Surgery,* 73-B:389–394, 1991.
- Gillard J, Perez-Cousin M, Hachulla E, Remy J, Hurtevent J-F, Vinckier L, Thevenon A & Duquesnoy B. Diagnosing thoracic outlet syndrome: Contribution of provocative tests, ultrasonography, electrophysiology, and helical computer tomography in 48 patients. *Joint Bone Spine*, 68:416–424, 2001.
- Goloborod'ko SA. Provocative test for carpal tunnel syndrome. *Journal of Hand Therapy,* 17:344–348, 2004.
- Goodman C, Snyder T. Differential Diagnosis in Physical Therapy 3rd ed. Philadelphia: WB Saunders Co, 2000.
- Grifka J, Richter J & Gumtau M. Clinical and sonographic meniscus diagnosis. *Orthopedics,* 23:102–111, 1994.
- Guanche CA & Jones DC. Clinical testing for tears of the glenoid labrum. *Arthroscopy,* 19(5):517–523, 2003.
- Gulick DT. Ortho Notes. Philadelphia: FA Davis, 2005.
- Gulick DT. Screening Notes. Philadelphia: FA Davis, 2006.
- Guskiewicz KM, Bruce SL, Cantu RC, Ferrara MS, Kelly JP, McCrea M, Putukian M & Valovich McLeod TC. NATA Position Statement: Management of Sport-Related Concussion. *Journal of Athletic Training*, 39(3):280–297, 2004.
- Guzman J, Burgos-Vargas R, Duarte-Salazar C & Gomez-Mora P. Reliability of the articular examination in children with juvenile rheumatoid arthritis. *Journal of Rheumatology,* 22(12):2331–2236, 1995.
- Hansen PA, Micklesen P & Robinson LR. Clinical utility of the flick maneuver in diagnosing carpal tunnel syndrome. *American Journal of Physical Medicine and Rehabilitation*, 83:363–367, 2004.

- Harilainen A. Evaluation of knee instability in acute ligamentous injuries. *Annal of Chiropractic Gynaecology,* 76:269–273, 1987.
- Heck J & Rosa R. Evaluating mild head injuries. *Sports Medicine Update,* 15(2):46–52, 2001.
- Heller L, Ring H, Costeff H & Solzi P. Evaluation of Tinel's and Phalen's signs in diagnosis of the carpal tunnel syndrome. *European Neurology,* 25(1):40–42, 1986.
- Hertel R, Ballmer FT, Lambert SM & Gerber CH. Lag signs in the diagnosis of rotator cuff rupture. *Journal of Shoulder and Elbow Surgery,* 5(4):307–313, 1996.
- Holtby MB, et al. Accuracy of the Speed's and Yergason tests in detecting biceps pathology and slap lesions: comparison with arthroscopic findings. Arthroscopy, 20(3):231–236, 2004.
- Holtby MB & Razmjou H. Validity of the supraspinatus test as a single clinical test in diagnosing patients with rotator cuff pathology. *Journal of Orthopaedics and Sports Physical Therapy,* 34:194–200, 2004.
- Inter-Association Task Force for appropriate care of the spine. Consensus Statement. http://www.acsm.org/AM/Template.cfm?Section=Search&section=Original_Articles&template=/CM/ContentDisplay.cfm&ContentFileID=329
- Itoi E, Kido T, Sano A, Urayama M & Sata K. Which is more useful, the "full can test" or the "empty can test" in detecting the torn supraspinatus tendon? *American Journal of Sports Medicine,* 27:65–68, 1999.
- Jackson AS & Pollock ML. Generalized equations for predicting body density of men. *British Journal of Nutrition,* Jan; 91(1): 161–168, 2004.
- Jackson JL, O'Malley PG & Kroenke K. Evaluation of acute knee pain in primary care. *Annals of Internal Medicine. 2003,* 139:575–588, 2003.
- Joint Task Force on Practice Parameters, American Academy of Allergy, Asthma, & Immunology, American College of Allergy, Asthma, & Immunology, & the Joint Council of Allergy, Asthma, & Immunology. The diagnosis & management of anaphylaxis.

Journal of Allergy and Clinical Immunology, 101(6):S465–S528, 1998.

- Jonsson T, Althoff B, Peterson L & Renstrom P. Clinical diagnosis of ruptures of the anterior cruciate ligament: A comparative study of the Lachman test and the anterior drawer sign. *American Journal of Sports Medicine,* 10:100–102, 1982.
- Karachalios T, Hantes M, Zibis AH, Zachos V, Karantanas AH & Malizos KN. Diagnostic accuracy of a new clinical test for early detection of meniscal tears. *Journal of Bone and Joint Surgery,* 87(5):955–962, 2005.
- Katz JW & Fingeroth RJ. The diagnostic accuracy of ruptures of the anterior cruciate ligament comparing the Lachman test, the anterior drawer sign, and the pivot shift test in acute and chronic knee injuries. *American Journal of Sports Medicine,* 14(1):88–91, 1986.
- Kelly JP. Loss of consciousness: Pathophysiology and implications in grading and safe return to play. *Journal of the National Athletic Trainers' Association,* 36(3):249–252, 2001
- Kennedy R. Mosby's Sports Therapy Taping Guide, Mosby, St. Louis, 1995.
- Ketelslegers E, Collard X, Vande Berg B, Danse E, El-Gariani A, Poilvache P & Maldague B. Validation of the Ottawa knee rules in an emergency teaching center. *European Radiology,* 12(5):1218–1220, 2002.
- Khine H, Dorfman DH & Avner JR. Applicability of Ottawa knee rules for knee injuries in children. *Pediatric Emergency Care,* 17(6):401–404, 2001.
- Kim S-H, Ha K-I, Ahn J-H, Kim S-H & Choi H-J. Biceps load test II: A clinical test for SLAP lesions of the shoulder. *Arthroscopy,* 17(2):160–164, 2001.
- Kim S-H, Park J-S, Jeong W-Km & Shin S-K. The Kim test. *American Journal of Sports Medicine,* 33(8):1188–1192, 2005.
- King NS, Crawford S, Wenden FJ, Moss NEG & Wade DT. The Rivermead post concussion symptoms questionnaire: A measure of symptoms commonly experienced after head injury and its reliability. *Journal of Neurology,* 242(9):587–592, 1995.

- Knuttson B. Comparative value of electromyographic, and clinical-neurological examinations in diagnosis of lumbar root compression syndrome. *Acta Orthopaedica Scandinavia,* Suppl 49:19–49, 1961.
- Kosteljanetz M, Espersen O, Halaburt H & Miletic T. Predictive values of clinical and surgical findings in patients with lumbago-sciatica: A prospective study. *Acta Neurochirurgica,* 73:67–76, 1984.
- Kuhlman KA & Hennessey WJ. Sensitivity and specificity of carpal tunnel syndrome signs. *American Journal of Physical Medicine and Rehabilitation,* 76(6):451–457, 1997.
- Kurosaka M, Yagi M, Yoshiya S, Muratsu H & Mizuno K. Efficiency of the axially loaded pivot shift test for the diagnosis of a meniscal tear. *International Orthopedics,* 23:271–274, 1999.
- Laslett M, Aprill CN, McDonald B & Young SB. Diagnosis of sacroiliac joint pain: Validity of individual provocation tests and composites of tests. *Manual Therapy,* 10:207–218, 2005.
- Laslett M, Young SB, Aprill CN & McDonald B. Diagnosing painful sacroiliac joints: A validity study of a McKenzie evaluation and sacroiliac provocation tests. *Australian Journal of Physiotherapy,* 49:89–97, 2003.
- Lee JK, Yao L, Phelps CT, Wirth CR, Czajka J & Lozman J. Anterior cruciate ligament tears: MR imaging compared with arthroscopy and clinical tests. *Radiology,* 166:861–864, 1988.
- Leroux et al. Diagnostic value of clinical tests for shoulder impingement syndrome. *Revue du Rhumatisme,* 62(6):423–428, 1995.
- Lester B, Halbrecht J, Levy IM & Gaudinez R. "Press test" for office diagnosis of triangular fibrocartilage complex tears of the wrist. *Annals of Plastic Surgery,* 35(1):41–45, 1995.
- Levangie PK. Four clinical tests of sacroiliac joint dysfunction: The association of test results with innominate torsion among patients with and without low back pain. *Physical Therapy,* 79(11):1043–1057, 1999.
- Lillegard WA, Burcher JD & Rucker KS. Handbook of Sports Medicine, 2nd ed. Butterworth & Heinemann, Boston, 1999.

- Liu SH, Osti L, Henry M & Bocchi L. The diagnosis of acute complete tears of the anterior cruciate ligament. Comparison of MRI, arthrometry and clinical examination. *Journal of Bone and Joint Surgery,* 77(4):586–588, 1995.
- Liu SH, Henry MH, Nuccion SL. A prospective evaluation of a new physical examination in predicting glenoid labral tears. American Journal of Sports Medicine. 1996;24(6):721–725.
- Lo IKY, Nonweiler B, Woolfrey M, Litchfield R & Kirkley A. An evaluation of the apprehension, relocation, and surprise tests for anterior shoulder instability. *American Journal of Sports Medicine,* 32(3):655–661, 2004.
- Lucchesi GM, Jackson RE, Peacock WF, Cerasani C & Swor RA. Sensitivity of the Ottawa rules. *Annals of Emergency Medicine,* 26(1);1–5, 1995.
- MacDermid JC & Wessel J. Clinical diagnosis of carpal tunnel syndrome: A systemic review. *Journal of Hand Therapy,* 17(2):309–319, 2004.
- MacDonald PB, Clark P & Sutherland K. An analysis of the diagnostic accuracy of the Hawkins and Neer subacromial impingement tests. *Journal of Shoulder and Elbow Surgery,* 9(4):299–301, 2000.
- Macintyre J, Johson C & Schroeder EL. Groin pain in athletes. *Current Sports Medicine Reports,* 5:293–299, 2006.
- Malanga GA, Andrus S, Nadler SF & McLean J. Physical examination of the knee: A review of the original test description and scientific validity of common orthopedic tests. *Archives of Physical Medicine and Rehabilitation,* 84:592–603, 2003.
- McCrea M. Standardized mental status testing on the sideline after sport-related concussion. *Journal of the National Athletic Trainers' Association,* 36(3):274–279, 2001.
- McFarland EG, Kim TK & Savino RM. Clinical assessment of three common tests for superior labral anterior-posterior lesions. *American Journal of Sports Medicine,* 30(6):810–815, 2002.
- Miller MG, Weiler JM, Baker R, Collins J, & D'Alonzo G. NATA Position Statement: Management of Asthma in Athletes, *Journal of Athletic Training,* 40(3):224–245, 2005.

- Mimori K, Muneta T, Nakagawa T & Shinomiya K. A new pain provocation test for superior labral tears of the shoulder. *American Journal of Sports Medicine,* 27:137–142, 1999.
- Nakagawa S, Yoneda M, Hayashida K, Obata M, Fukushima S & Miyazaki Y. Forced shoulder abduction and elbow flexion test: A new simple clinical test to detect superior labral injury in the throwing shoulder. *Arthroscopy,* 21(11):1290–1295, 2005.
- Narvani A, Tsiridis E, Kendall S, Chaudhuri R & Thomas P. A preliminary report on prevalence of acetabular labrum tears in sport patients with groin pain. *Knee Surgery, Traumatology, and Arthroscopy,* 11:403–408, 2003.
- New Jersey Department of Education Athletic Pre-Participation Physical Examination (2005)
- Nikolovoka S, Arsovski A, Damevska K, Gocev G & Pavlova L. Evaluation of two different intermittent pneumatic compression cycle settings in the healing of venous ulcers: A randomized trial. *Medical Science Monitor,* 11(7):CR337–343, 2005.
- Nils J, van Geel C, van der Auwera C & van de Velde B. Diagnostic value of five clinical tests in patellofemoral pain syndrome. *Manual Therapy,* 11(1): 69–77, 2006.
- Noble J & Erat K. In defense of the meniscus: A prospective study of 200 meniscectomy patients. *Journal of Bone and Joint Surgery,* 62-B:7–11, 1980.
- Novak CB, Lee GW, Mackinnon SE & Lay L. Provocation testing for cubital tunnel syndrome. *Journal of Hand Surgery,* 19A:817–820, 1994.
- Nunn I & Gregg AJ. Peak expiratory flow in normals. *British Medical Journal,* 3(5874):282–284, 1973.
- O'Brien SJ, Pagnani MJ, Fealy S, McGlynn SR & Wilson JB. The active compression test: A new and effective test for diagnosing labral tears and acromioclavicular joint abnormality. *American Journal of Sports Medicine,* 26(5):610–613, 1998.
- Oliaro S, Anderson S & Hooker D. Management of cerebral concussion in sports: The athletic trainer's perspective. *Journal of the National Athletic Trainers' Association,* 36(3):257–262, 2001.

- Parentis MA, Mohr KJ & ElAttrache NS. Disorders of the superior labrum: Review and treatment guidelines. *Clinical Orthopaedics,* 400:77–87, 2002.
- Park HB, Yokota A, Gill HS, Rassi GE & McFarland EG. Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome. *Journal of Bone and Joint Surgery,* 87-A(7):1446–1455, 2005.
- Perrin DH. Athletic Taping & Bracing. Champaign, IL: Human Kinetics, 1995.
- Plint AC, Bulloch B, Osmond MH, Stiell I, Dunlap H, Reed M, Tenenbein M & Klassen TP. Validation of the Ottawa ankle rules in children with ankle injuries. *Academic Emergency Medicine,* 6(10):1005–1009, 1999.
- Putman LA. Alternative methods for football helmet face mask removal. *Journal of Athletic Training,* 27(2):170–171, 1992.
- Rayan GM & Jensen C. Thoracic outlet syndrome: provocative examination maneuvers in a typical population. *Journal of Shoulder and Elbow Surgery,* 4:113–117, 1995.
- Richter J, David A, Pape HG, Ostermann PA & Muhr G. (abstract) Diagnosis of acute rupture of the anterior cruciate ligament. Value of ultrasonic in addition to clinical examination. *Unfallchirurg,* 99(2):124–129, 1996.
- Robert MA et al. Development and validation of a screening instrument for bipolar spectrum disorder: The mood disorder questionnaire. *American Journal of Psychiatry,* 157(11):1873–1875, 2000.
- Rodriguez JO, Lavina AM & Agarwal A. Prevention and treatment of common eye injuries in sports. *American Family Physician,* 67(7):1481–1488, 2003.
- Rose S, Draper DO, Schulthies SS & Durrant E. The stretching window part two: Rate of thermal decay in deep muscle following 1 MHz ultrasound. *Journal of Athletic Training,* 31:139–143, 1996.
- Rubin E & Farber JL. Pathology (2nd Ed); Philadelphia: JB Lippincott Co, 1994.

- Rubinstein RA Jr, Shelbourne KD, McCarroll JR, VanMeter CD & Rettig AC. The accuracy of the clinical examination in the setting of posterior cruciate ligament injuries. *American Journal of Sports Medicine,* 22:550–557, 1994.
- Russell A, Maksymovich W & LeClerq S. Clinical examination of the sacroiliac joints. A prospective study. *Arthritis and Rheumatism,* 24:1575–1577, 1981.
- Sallay PI, Poggi J, Speer KP & Garrett WE. Acute dislocation of the patella. A correlation pathoanatomic study. *American Journal of Sports Medicine,* 24:52–60, 1996.
- Sandberg R, Balkfors B, Henricson A & Westlin N. Stability tests in knee ligament injuries. *Archives of Orthopaedic Trauma Surgery,* 106(1):5–7, 1986.
- Sander R. Otitis externa: A practical guide to teatment and prevention. *American Family Physician,* 63:927–936, 941–942, 2001.
- Scholten RJ, Deville WL, Opstelten W, Bijl D, Van der Plas CG & Bouter LM. The accuracy of physical diagnostic tests for assessing meniscal lesions of the knee. *Journal of Family Practice,* 50(11):938–944, 2001.
- Smith AM & Milliner EK. Injured athletes and the risk of suicide. *Journal of Athletic Training,* 29(4):337–341, 1994.
- Sports Medicine Secrets NJ Dept of Education Athletic Pre-Participation Physical Examination (2005).
- Stankovic R, Johnell O, Maly P & Willner S. Use of lumbar extension, slump test, physical and neurological examination in the evaluation of patients with suspected herniated nucleus pulposus. A prospective clinical study. *Manual Therapy,* 4(1):25–32, 1999.
- Starkey C & Ryan J. Orthopedic & Athletic Injury Evaluation Handbook. Philadelphia: FA Davis, 2003.
- Stiell IG, Greenberg GH, Well GA, McDowell I, Cwinn AA, Smith NA et al. Prospective validation of a decision rule for the use of radiography in acute knee injuries. *JAMA,* 275:611–615, 1996.

- Stratford PW & Binkley J. A review of the McMurray test: Definition, interpretation, and clinical usefulness. *Journal of Orthopedic and Sports Physical Therapy,* 22(3):116–120, 1995.
- Suenaga E, Noguchi Y, Jingushi S, Shuto T, Nakashima Y, Miyanishi K & Iwamoto Y. Relationship between the maximum flexion-internal rotation test and the torn acetabular labrum of a dysplastic hip. *Journal of Orthopaedic Science,* 7:26–32, 2002.
- Sundgot-Borgen J. Weight and eating disorders in elite athletes. *Scandinavian Journal of Medicine & Science in Sports,* 12(5):259–260, 2002.
- Swartz EE, Nowak J, Shirley C & Decoster LC. A comparison of head movement during back boarding by motorized spine-board and log-roll techniques. *Journal of Athletic Training,* 40(3):162–168, 2005.
- Szabo RM & Slater RR. Diagnostic testing in carpal tunnel syndrome. *Journal of Hand Surgery,* 25(1):184, 2000.
- Tennet DT, Beach WR & Meyers JF. Clinical sports medicine update. A review of the special tests associated with shoulder examination. *American Journal of Sports Medicine,* 31:154–160, 2003.
- Tetro AM, Evanoff BA, Hollstien SB & Gelberman RH. A new provocation test for carpal tunnel syndrome. Assessment of wrist flexion and nerve compression. *Journal of Bone and Joint Surgery,* 80(3):493–498, 1998.
- Tigges S, Pitts S, Mukundan S Jr, Morrison D, Olson M & Shahriara A. External validation of the Ottawa knee rules in an urban trauma center in the United States. *American Journal of Roentgenology,* 172(4):1069–1071, 1999.
- Tong HC, Haig AJ & Yamakawa K. Spurling test and cervical radiculopathy. *Spine,* 27(2):156–159, 2002.
- Torg JS, Conrad W & Kalen V. Clinical diagnosis of anterior cruciate ligament instability in the athlete. *American Journal of Sports Medicine,* 4:84–93, 1976.
- Ure BM, Tiling T, Kirchner R & Rixen D. Reliability of clinical examination of the shoulder in comparison with arthroscopy. *Unfallchirurg,* 96:382–386, 1993.

- Valovich TC, Perrin DH & Gansneder BM. Repeat administration elicits a practice effect with the balance error scoring system but not with the standardized assessment of concussion in high school Athletes. *Journal of the National Athletic Trainer's Association,* 38(1):51–56, 2003.
- Van der Wurff P, Meyne W & Hagmeijer RHM. Clinical tests of the sacroiliac joint. *Manual Therapy,* 5(2):89–96, 2005.
- Vegso IJ & Torg JS. Field evaluation & management of intracranial injuries. Athletic injuries to the head, neck, & face. St. Louis: Mosby-Year Book:226–227, 1991.
- Viikari-Juntura A, Porras M & Laasonen EM. Validity of clinical tests in the diagnosis of root compression in cervical diseases. *Spine,* 14:253–257, 1989.
- Wainner RS, Fritz JM, Irrgang JJ, Boninger ML, Delitto A & Allison S. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. *Spine,* 28(1):52–62, 2003.
- Wainner RS, Boninger ML, Balu G, Burdett R & Helkowski W. Durkan gauge and carpal compression test: accuracy and diagnostic test properties. *Journal of Orthopaedic and Sports Physical Therapy,* 30(11):676–682, 2000.
- Walsh KM, Bennett B, Cooper MA, Holle RL, Kithil R, & Lopez RE. NATA Position Statement: Lightning Safety for Athletics and Recreation. *Journal of Athletic Training,* 35(4):471–477, 2000.
- Walsworth M, Mills III J & Michener L. Diagnosing suprascapular neuropathy in patients with shoulder dysfunction: A report of 5 cases. *Journal of the American Physical Therapy Association,* 84:359–372, 2004.
- Witt C. Detecting developmental dysplasia of the hip. *Advances in Neonatal Care,* 3(2):65–75, 2003.

- http://hcdz.bupa.co.uk/fact.sheets/html/kidney_stones.html
- http://health.allrefer.com/health/skull-fracture-symptoms.html
- http://www.acsm.org
- http://www.afp.org/afp/991101ap/2027.html
- http://www.askdrsears.com/html/8/T083200.asp
- http://www.emedicine.com/neuro/topic581.htm
- http://www.epipen.com
- http://www.footballfoundation.com/news.php?id=366
- http://www.healthline.com
- http://www.nlm.nih.gov/medlineplus/ency/article/000793.htm
- http://www.ocfoundation.org
- http://www.poison-ivy.org/rash/rash-1.htm
- http://www.spine.org/articles/stingers.cfm
- http://www.tsa-usa.org/aboutts.html
- http://www.uwosh.edu/phys_ed/athtrain/program

Index

Notes