

Foundations of Athletic Training

Prevention, Assessment, and Management

Marcia K. Anderson, Ph.D., LATC

Professor

Department of Movement Arts, Health Promotion, and Leisure Studies

Bridgewater State College

Bridgewater, Massachusetts

Gail P. Parr, Ph.D., ATC

Associate Professor

Department of Kinesiology

Towson University

Towson, Maryland

Susan J. Hall, Ph.D.

Professor and Chair

Department of Health and Exercise Sciences

University of Delaware

Newark, Delaware

Wolters Kluwer | Lippincott Williams & Wilkins
Health

Philadelphia • Baltimore • New York • London
Buenos Aires • Hong Kong • Sydney • Tokyo

Comprehensive Contents

Preface v
Acknowledgments xi
User's Guide xiii

SECTION I Foundations of Injury Care 1

| | |
|------------------|---|
| Chapter 1 | Injury Care and the Athletic Trainer 2 |
| | Sports Medicine 4 |
| | Athletic Training 4 |
| | National Athletic Trainers' Association 4 |
| | Board of Certification 5 |
| | Athletic Training Education 7 |
| | The ATC® Credential 7 |
| | Standards of Professional Practice 8 |
| | Registration and Licensure 8 |
| | Athletic Training Work Settings 9 |
| | Team Approach to the Delivery of Healthcare 10 |
| | Team Physician 10 |
| | Primary Care Physician 11 |
| | The Coach or Sport Supervisor 11 |
| | Sport/ Physical Activity Participant 11 |
| | Physical Therapist 11 |
| | Strength and Conditioning Specialist 12 |
| | Exercise Physiologist 12 |
| | Nutritionist 12 |
| | Biomechanist 12 |
| | Legal Considerations 12 |
| | Standard of Care 12 |
| | Clearance for Participation 13 |
| | Negligence 13 |
| | Legal Liabilities 14 |
| | Legal Defenses 16 |
| | Preventing Litigation 17 |
| Chapter 2 | Preparticipation Examination 19 |
| | Setting Up the Examination 21 |
| | Examination Format 21 |
| | Timing of the Examination 22 |
| | Frequency of the Examination 22 |
| | Medical History 22 |

The Physical Examination 23

- Vital Signs 23
- General Medical Problems 25
- Cardiovascular Examination 26
- Pulmonary Examination 27
- Musculoskeletal Examination 28
- Neurologic Examination 30
- Eye Examination 31
- Dental Examination 32
- Gastrointestinal Examination 33
- Genitourinary Examination 34
- Dermatologic Examination 34
- Examination for Heat Disorders 35
- Laboratory Tests 36

Physical Fitness Profile 36

- Anthropometry and Body Composition 37
- Maturation and Growth 37
- Flexibility 37
- Strength, Power, and Speed 39
- Agility, Balance, and Reaction Time 40
- Cardiovascular Endurance 40

Clearance for Participation 40**Chapter 3 Protective Equipment 43****Principles of Protective Equipment 44**

- Materials Used 45
- Construction of Custom Pads and Protective Devices 47
- Rules Regarding Protective Pads 47

Liability and Equipment Standards 47**Protective Equipment for the Head and Face 48**

- Football Helmets 48
- Ice Hockey Helmets 49
- Batting Helmets 50
- Other Helmets 50
- Face Guards 51
- Eye Wear 51
- Ear Wear 52
- Mouth Guards 52
- Throat and Neck Protectors 53

Protective Equipment for the Upper Body 54

- Shoulder Protection 54
- Elbow, Forearm, Wrist, and Hand Protection 55
- Thorax, Rib, and Abdominal Protection 55
- Sport Bras 56
- Lumbar/Sacral Protection 56

Protective Equipment for the Lower Body 56

- Hip and Buttock Protection 57
- Thigh Protection 57
- Knee and Patella Protection 57

Lower Leg Protection 59
Ankle and Foot Protection 59
Foot Orthotics 60

Chapter 4 Protective Taping and Wrapping 62

Principles Of Taping And Wrapping 63

Types of Tape and Wraps 64
Application of Tape 64
Removal of Tape 65
Application of Wraps 66

Common Taping and Wrapping Techniques 66

Taping and Wrapping Techniques for the Lower Extremity 66
Taping and Wrapping Techniques for the Upper Extremity 80

SECTION II Injury Assessment and Rehabilitation 85

Chapter 5 Injury Assessment 86

The Injury Evaluation Process 88

The HOPS Format 89
The SOAP Note Format 89

History of the Injury 90

Primary Complaint 93
Mechanism of Injury 93
Characteristics of the Symptoms 94
Disability Resulting from the Injury 96
Related Medical History 96

Observation and Inspection 96

Observation 96
Inspection of the Injury Site 98

Palpation 99

Physical Examination Tests 100

Functional Tests 100
Stress Tests 105
Special Tests 106
Neurologic Testing 106
Activity-Specific Functional Testing 111

The Emergency Medical Services System 111

Emergency Injury Assessment 113

On-Site History 113
On-Site Observation and Inspection 114
On-Site Palpation 116
On-Site Functional Testing 116
On-Site Stress Testing 116
On-Site Neurologic Testing 117
Vital Signs 117
Disposition 119
Equipment Considerations 119

Moving the Injured Participant 121

- Ambulatory Assistance 122
- Manual Conveyance 122
- Transporting by Spine Board 122
- Pool Extrication 122

Diagnostic Testing 124

- Laboratory Tests 124
- Radiography 124
- Computed Tomography 125
- Magnetic Resonance Imaging 125
- Radionuclide Scintigraph (Bone Scan) 126
- Ultrasonic Imaging 126
- Electromyography 126

Chapter 6 Tissue Healing and Wound Care 128**Injury Mechanisms 129**

- Force and Its Effects 130
- Torque and Its Effects 132

Soft-Tissue Injuries 133

- Anatomic Properties of Soft-Tissue 133
- Anatomic Properties of Joints 136
- Classification of Skin Injuries 138
- Classification of Muscle/Tendon Injuries 139
- Joint Injury Classifications 142

Soft-Tissue Healing 143

- Inflammatory Phase (Days 0–6) 143
- The Proliferative Phase (Days 3–21) 145
- Maturation Phase (Up to 1+ Year) 145
- The Role of Growth Factors 146

Soft-Tissue Wound Care Management 147

- Care of Open Soft-Tissue Injuries 147
- Care of Closed Soft-Tissue Injuries 149

Bone Injuries 149

- Anatomic Properties of Bone 149
- Classification of Bone Injuries 150
- Classification of Epiphyseal Injuries 152
- Bony Tissue Healing 153
- Management of Bone Injuries 153

Nerve Injuries 155

- Anatomic Properties of Nerves 155
- Classification of Nerve Injuries 156
- Nerve Healing 156
- Management of Nerve Injuries 156

Pain 157

- The Neurologic Basis of Pain 157
- Factors That Mediate Pain 157
- Referred and Radiating Pain 158

Chapter 7 Therapeutic Modalities 160

Electromagnetic Spectrum 161

Ionizing Range 162

Non-ionizing Range 162

Transfer of Energy 163

Factors Affecting Energy Transfer 163

Effect of Energy on Tissue 164

Cryotherapy 165

Cold Packs 167

Ice Massage 169

Ice Immersion 169

Vapo-Coolant Sprays 169

Thermotherapy 170

Whirlpool Tanks 171

Moist Heat Packs 172

Paraffin Bath 172

Fluidotherapy 173

Ultrasound 174

The Ultrasound Wave 174

Frequency and Attenuation 174

Types of Waves 175

Intensity 175

Clinical Uses 175

Application 176

Phonophoresis 177

Shortwave Diathermy 177

Continuous Shortwave Diathermy 178

Pulsed Shortwave Diathermy 178

Electrotherapy 179

Principles of Electricity 179

Types of Currents 179

Current Modifications 180

Electrical Stimulating Units 182

Other Treatment Modalities 185

Massage 186

Traction 187

Continuous Passive Motion 188

Medications 188

Chapter 8 Therapeutic Exercise Program 192

Psychological Aspects of the Injured Participant 194

Strategies to Assist Athletes and Physically Active Individuals

 Cope with Injury 194

Psychological Influences 195

Mental Skills Training 197

Role of the Athletic Trainer 199

Referral for Psychological Problems 199

Developing a Therapeutic Exercise Program 200

- Assess the Patient 201
- Interpret the Assessment 201
- Establish Goals 201
- Develop and Supervise the Treatment Plan 201
- Reassess the Progress of the Program 202

Phase 1: Controlling Inflammation 203

- Control of Inflammation 203
- Effects of Immobilization 204
- Effects of Remobilization 205
- Protection After Injury 206

Phase 2: Restoration of Motion 206

- Passive Range of Motion 207
- Active Assisted Range of Motion 210
- Active Range of Motion 211
- Resisted Range of Motion 211
- Proprioception 212
- Open Versus Closed Kinetic Chain Exercises 213

Phase 3: Developing Muscular Strength, Endurance, and Power 214

- Muscular Strength 215
- Muscular Endurance 216
- Muscular Power 216
- Functional Application of Exercise 217

Phase 4: Return to Sport/Physical Activity 218

- Coordination 219
- Sport/Activity-Specific Skill Conditioning 219
- Cardiovascular Endurance 219

SECTION III Conditions to the Axial Region 223

Chapter 9 Head and Facial Conditions 224**Anatomy of the Head and Facial Region 225**

- Bones of the Skull 226
- The Scalp 226
- The Brain 226
- The Eyes 226
- The Nose 228
- The Ear 229
- Nerves of the Head and Face 229
- Blood Vessels of the Head and Face 231

Prevention of Head and Facial Injuries 231**Scalp Injuries 232****Cranial Injury Mechanisms 232**

Skull Fractures 233

Signs and Symptoms 234

Management 235

Focal Cerebral Conditions 235

Epidural Hematoma 236

Subdural Hematoma 236

Cerebral Contusion 237

Diffuse Cerebral Conditions 238

Concussions 238

Posttraumatic Headaches 241

Postconcussion Syndrome 241

Second-Impact Syndrome 242

Assessment of Cranial Conditions 242

Vital Signs 243

History and Mental Status Testing 243

Observation and Inspection 244

Palpation 244

Neurologic Tests 245

External Provocative Tests 248

Determination of Findings 248

Facial Conditions 250

Facial Soft-Tissue Conditions 250

Temporomandibular Joint Conditions 250

Facial Fractures 251

Nasal Conditions 252

Epistaxis 253

Deviated Septum 253

Nasal Fractures 254

Oral and Dental Conditions 255

Periodontal Disease 255

Dental Caries (Tooth Decay) 256

Mouth Lacerations 256

Loose Teeth 256

Fractured Tooth 257

Dislocated Tooth 257

Ear Conditions 258

External Ear Conditions 258

Internal Ear Conditions 258

Eye Conditions 260

Periorbital Ecchymosis 260

Foreign Bodies 261

Sty 261

Conjunctivitis (Pinkeye) 262

Corneal Abrasion 262

Corneal Laceration 262

Subconjunctival Hemorrhage 262

Hemorrhage into the Anterior Chamber 263

Detached Retina 263

Orbital “Blowout” Fracture 263
 Displaced Contact Lens 264

Chapter 10 Cervical and Thoracic Spinal Conditions 267

Anatomy of the Cervical and Thoracic Spine 269

Cervical and Thoracic Spinal Column and Vertebrae 269
 Intervertebral Discs 272
 Ligaments of the Spine 273
 Muscles of the Cervical and Thoracic Regions of the Spine and Trunk 274
 Spinal Cord and Spinal Nerves 274
 The Cervical Plexus 275
 The Brachial Plexus 275

Kinematics and Major Muscle Actions of the Cervical and Thoracic Spine 277

Flexion, Extension, and Hyperextension 277
 Lateral Flexion and Rotation 278

Kinetics of the Spine 278

Effect of Loading 278
 Effect of Impact 278

Anatomical Variations Predisposing Individuals to Spinal Conditions 279

Kyphosis 279
 Scoliosis 279

Prevention of Spinal Conditions 280

Protective Equipment 280
 Physical Conditioning 280
 Proper Skill Technique 280

Cervical Spine Conditions 281

Torticollis 281
 Cervical Sprains 281
 Cervical Strains 282
 Cervical Spinal Stenosis 282
 Spear Tackler’s Spine 283
 Cervical Disc Injuries 283
 Cervical Fractures and Dislocations 284

Brachial Plexus Conditions 285

Acute Burners 286
 Chronic Burners 287
 Suprascapular Nerve Injury 287

Thoracic Spine Conditions 288

Thoracic Contusions, Strains, and Sprains 288
 Thoracic Spinal Fractures and Apophysitis 288

Assessment of Spinal Conditions 289

History 290

Observation and Inspection 291

Posture 291
 Scan Exam 291

Gait Assessment 292
Injury Site Inspection 292
Gross Neuromuscular Assessment 292

Palpation 292

Anterior Aspect 293
Posterior Aspect 293
Lateral Aspect 294

Physical Examination Tests 294

Functional Tests 294
Stress and Functional Tests 296
Neurologic Tests 300
Activity-Specific Functional Testing 301

Rehabilitation 302

Relief of Pain and Muscle Tension 302
Restoration of Motion 302
Restoration of Proprioception and Balance 302
Muscular Strength, Endurance, and Power 302
Cardiovascular Fitness 303

Chapter 11 Lumbar Spinal Conditions 306

Anatomy of the Lumbar Spine 308

Lower Spinal Column 308
Ligaments of the Lumbar Spine and Trunk 309
Muscles of the Lumbar Spine and Trunk 309
Spinal Cord and Spinal Nerves 309

Kinematics and Major Muscle Actions of the Lumbar Spine 310

Flexion, Extension, and Hyperextension 310
Lateral Flexion and Rotation 312

Kinetics of the Lumbar Spine 312

Effect of Body Position 312
Effect of Movement Speed 312

**Anatomical Variations Predisposing Individuals
to Spinal Conditions 313**

Lordosis 313
Swayback 314
Flat Back Syndrome 314
Pars Interarticularis Fractures 314

Prevention of Spinal Conditions 316

Protective Equipment 316
Physical Conditioning 316
Proper Skill Technique 316

Conditions of the Lumbar Spine 317

Lumbar Contusions, Strains, and Sprains 317
Low Back Pain in Runners 317
Myofascial Pain 318
Facet Joint Pathology 319

| | |
|---|------------|
| Sciatica | 320 |
| Conditions of the Lumbar Disc | 321 |
| Lumbar Fractures and Dislocations | 322 |
| Sacrum and Coccyx Conditions | 323 |
| Sacroiliac Joint Sprain | 323 |
| Coccygeal Conditions | 323 |
| Assessment of Spinal Conditions | 324 |
| History | 324 |
| Observation and Inspection | 325 |
| Posture | 325 |
| Gait Assessment | 326 |
| Inspection of the Injury Site | 326 |
| Gross Neuromuscular Assessment | 326 |
| Palpation | 326 |
| Anterior Aspect | 327 |
| Posterior Aspect | 327 |
| Physical Examination Tests | 328 |
| Functional Tests | 328 |
| Stress and Functional Tests | 331 |
| Neurologic Tests | 340 |
| Rehabilitation | 342 |
| Relief of Pain and Muscle Tension | 342 |
| Restoration of Motion | 342 |
| Restoration of Proprioception and Balance | 343 |
| Muscular Strength, Endurance, and Power | 343 |
| Cardiovascular Fitness | 343 |

Chapter 12 Throat, Thorax, and Visceral Conditions 348

| | |
|---------------------------------------|------------|
| Anatomy of the Throat | 350 |
| Pharynx, Larynx, and Esophagus | 350 |
| Trachea | 351 |
| Blood Vessels of the Throat | 351 |
| Anatomy of the Thorax | 351 |
| Thoracic Cage and Pleura | 352 |
| Muscles of the Thorax | 352 |
| Anatomy of the Visceral Region | 353 |
| Pelvic Girdle and Abdominal Cavity | 353 |
| Visceral Organs | 354 |
| Blood Vessels of the Trunk | 356 |
| Muscles of the Pelvic Girdle | 356 |
| Anatomy of the Genitalia | 356 |
| Female Reproductive System | 357 |
| Male Reproductive System | 357 |

Prevention of Injuries to the Throat, Thorax, and Viscera 358

Protective Equipment 358

Physical Conditioning 358

Throat Conditions 358

Neck Lacerations 358

Contusions and Fractures 359

Thoracic Conditions 360

Stitch in the Side 360

Breast Conditions 361

Strain of the Pectoralis Major Muscle 362

Costochondral Injury 362

Sternal Fractures 363

Rib Fractures 363

Internal Complications 365

Hyperventilation 365

Pulmonary Contusion 365

Pneumothorax 366

Hemothorax 367

Tension Pneumothorax 368

Traumatic Asphyxia 368

Heart Injuries 368

Sudden Death in Athletes 369

Athletic Heart Syndrome 369

Abdominal Wall Conditions 369

Skin Wounds 370

Skin Contusions 370

Muscle Strains 370

Solar Plexus Contusion ("Wind Knocked Out") 370

Hernias 371

Intra-Abdominal Conditions 372

Splenic Rupture 372

Liver Contusion and Rupture 374

Appendicitis 374

Renal and Genitourinary Conditions 374

Injuries and Conditions of the Genitalia 378

Male Genital Injuries 378

Female Genital Injuries 379

Assessment of Throat, Thorax, and Visceral Conditions 379

History 380

Observation and Inspection 381

Inspection 382

Auscultation and Percussion 382

Palpation 386

Physical Examination Tests 387

Vital Signs 387

Urinalysis 387

Neurologic Test 388

SECTION IV Upper Extremity 391

Chapter 13 Shoulder Conditions 392**Anatomy of the Shoulder 394**

- Sternoclavicular Joint 395
- Acromioclavicular Joint 396
- Coracoclavicular Joint 396
- Glenohumeral Joint 397
- Scapulothoracic Joint 397
- Muscles of the Shoulder 398
- Bursae 398
- Nerves of the Shoulder 399
- Blood Vessels of the Shoulder 400

**Kinematics and Major Muscle Actions
of the Shoulder Complex 400**

- Throwing 401
- Coordination of Shoulder Movements 402
- Glenohumeral Flexion 403
- Glenohumeral Extension 403
- Glenohumeral Abduction 403
- Glenohumeral Adduction 403
- Lateral and Medial Rotation of the Humerus 403

Kinetics of the Shoulder 404**Prevention of Shoulder Conditions 404**

- Protective Equipment 404
- Physical Conditioning 404
- Proper Skill Technique 406

Sprains to the Shoulder Complex 406

- Sternoclavicular Joint Sprain 407
- Acromioclavicular Joint Sprain 407
- Glenohumeral Joint Sprain 410
- Glenohumeral Instability 410
- Glenohumeral Dislocations and Subluxations 411
- Glenoid Labrum Tears 413

Overuse Conditions 414

- Rotator Cuff and Impingement Injuries 415
- Bursitis 418
- Bicipital Tendinitis 418
- Biceps Tendon Rupture 419
- Thoracic Outlet Compression Syndrome 419

Fractures 421

- Clavicular Fractures 421
- Scapular Fractures 422
- Epiphyseal and Avulsion Fractures 422
- Humeral Fractures 423

Assessment of Shoulder Conditions 424**History 424**

Observation and Inspection 424

Palpation 425

Anterior 426

Lateral 426

Posterior 426

Physical Examination Tests 426

Functional Tests 426

Stress Tests 429

Special Tests 433

Neurologic Tests 438

Activity-Specific Functional Tests 439

Rehabilitation 440

Restoration of Motion 440

Restoration of Proprioception and Balance 441

Muscular Strength, Endurance, and Power 441

Cardiovascular Fitness 441

Chapter 14 Upper Arm, Elbow, and Forearm Conditions 445

Anatomy of the Elbow 447

Humeroulnar Joint 447

Humeroradial Joint 448

Proximal Radioulnar Joint 448

Carrying Angle 448

Ligaments of the Elbow 449

Bursae of the Elbow 449

Muscles of the Elbow 450

Nerves of the Elbow 450

Blood Vessels of the Elbow 451

Kinematics and Major Muscle Actions of the Elbow 452

Flexion and Extension 452

Pronation and Supination 452

Kinetics of the Elbow 453

Prevention of Elbow Conditions 453

Protective Equipment 453

Physical Conditioning 453

Proper Skill Technique 454

Contusions 454

Olecranon Bursitis 456

Acute and Chronic Bursitis 456

Septic and Nonseptic Bursitis 456

Sprains 457

Collateral Ligament Sprain 457

Anterior Capsulitis 457

Dislocations 458

Strains 460

Flexor and Extensor Strains 460

| | |
|--|------------|
| Rupture of the Biceps Brachii | 461 |
| Rupture of the Triceps Brachii | 461 |
| Compartment Syndrome | 462 |
| Overuse Conditions | 462 |
| Medial Epicondylitis | 462 |
| Common Extensor Tendinitis (Lateral Epicondylitis) | 463 |
| Neural Entrapment Injuries | 464 |
| Fractures | 466 |
| Epiphyseal and Avulsion Fractures | 466 |
| Stress Fractures | 466 |
| Osteochondritis Dissecans | 466 |
| Displaced and Undisplaced Fractures | 467 |
| Fracture Management | 468 |
| Assessment of Elbow Conditions | 469 |
| History | 469 |
| Observation and Inspection | 469 |
| Palpation | 470 |
| Anterior Palpation | 470 |
| Lateral Palpation | 471 |
| Posterior Palpation | 471 |
| Medial Palpation | 471 |
| Physical Examination Tests | 471 |
| Functional Tests | 471 |
| Stress Tests | 473 |
| Special Tests | 474 |
| Neurologic Tests | 476 |
| Activity-Specific Functional Tests | 477 |
| Rehabilitation | 477 |
| Restoration of Motion | 477 |
| Restoration of Proprioception and Balance | 478 |
| Muscular Strength, Endurance, and Power | 478 |
| Cardiovascular Fitness | 478 |

| | | |
|-------------------|--|------------|
| Chapter 15 | Wrist and Hand Conditions | 481 |
| | Anatomy of the Wrist and Hand | 483 |
| | Wrist Articulations | 483 |
| | Hand Articulations | 484 |
| | Muscles of the Wrist and Hand | 484 |
| | Nerves of the Wrist and Hand | 487 |
| | Blood Vessels of the Wrist and Hand | 487 |
| | Kinematics and Major Muscle Actions of the Wrist and Hand | 488 |
| | Flexion | 488 |
| | Extension and Hyperextension | 488 |
| | Radial and Ulnar Deviation | 489 |
| | Carpometacarpal Joint Motion | 489 |
| | Metacarpophalangeal Joint Motion | 489 |
| | Interphalangeal Joint Motion | 489 |

| | |
|--|------------|
| Kinetics of the Wrist and Hand | 489 |
| Prevention of Wrist and Hand Conditions | 490 |
| Protective Equipment | 490 |
| Physical Conditioning | 490 |
| Proper Skill Technique | 490 |
| Contusions and Skin Wounds | 491 |
| Sprains | 491 |
| Wrist Sprains | 492 |
| Gamekeeper's Thumb | 492 |
| Interphalangeal Collateral Ligament Sprains | 492 |
| Dislocations | 493 |
| Strains | 495 |
| Jersey Finger (Profundus Tendon Rupture) | 495 |
| Mallet Finger | 496 |
| Boutonniere Deformity | 496 |
| Tendinopathies | 497 |
| Ganglion Cysts | 499 |
| Fingertip Injuries | 500 |
| Subungual Hematomas | 500 |
| Paronychia | 501 |
| Nerve Entrapment Syndromes | 501 |
| Median Nerve Entrapment | 501 |
| Ulnar Nerve Entrapment | 503 |
| Radial Nerve Entrapment | 504 |
| Fractures of the Wrist and Hand | 505 |
| Distal Radial and Ulnar Fractures | 505 |
| Carpal Fractures | 507 |
| Metacarpal Fractures | 508 |
| Phalangeal Fractures | 511 |
| Assessment of Wrist and Hand Conditions | 511 |
| History | 512 |
| Observation and Inspection | 512 |
| Palpation | 512 |
| Dorsal Aspect | 513 |
| Palmar Aspect | 513 |
| Physical Examination Tests | 513 |
| Functional Tests | 514 |
| Stress Tests | 515 |
| Special Tests | 516 |
| Neurologic Tests | 518 |
| Activity-Specific Functional Tests | 519 |
| Rehabilitation | 519 |
| Restoration of Motion | 519 |
| Restoration of Proprioception and Balance | 520 |
| Muscular Strength, Endurance, and Power | 520 |
| Cardiovascular Fitness | 520 |

SECTION V Lower Extremity 523

Chapter 16 Pelvic, Hip, and Thigh Conditions 524**Anatomy of the Pelvis, Hip, and Thigh 526**

- The Pelvis 526
- Bony Structure of the Thigh 528
- The Hip Joint 529
- Hip Joint Capsule 529
- Ligaments of the Hip Joint 529
- Femoral Triangle 530
- Bursae 530
- Q-Angle 530
- Muscles of the Hip Joint 531
- Nerves of the Pelvis, Hip, and Thigh 531
- Blood Vessels of the Pelvis, Hip, and Thigh 535

Kinematics and Major Muscle Actions of the Hip 535

- Pelvic Positioning 535
- Flexion 535
- Extension 536
- Abduction 536
- Adduction 536
- Medial and Lateral Rotation of the Femur 536

Kinetics of the Hip 537

- Forces at the Hip During Standing 537
- Forces at the Hip During Gait 537

Prevention of Pelvic, Hip and Thigh Conditions 537

- Protective Equipment 537
- Physical Conditioning 537
- Shoe Selection 537

Contusions 539

- Hip Pointer 539
- Quadriceps Contusion 540
- Myositis Ossificans 541
- Acute Compartment Syndrome 542

Bursitis 543

- Greater Trochanteric Bursitis 543
- Iliopsoas Bursitis 544
- Ischial Bursitis 544
- Management of Bursitis 544
- Snapping Hip Syndrome 544

Sprains and Dislocations 545**Strains 546**

- Quadriceps Strain 547
- Hamstrings Strains 547
- Adductor (Groin) Strain 548
- Gluteal Muscles 549
- Piriformis Syndrome 549

Management of Strains 549

Vascular and Neural Disorders 550

Legg-Calvé-Perthes Disease 550

Venous Disorders 551

Toxic Synovitis 551

Obturator Nerve Entrapment 552

Hip Fractures 552

Avulsion Fractures 552

Slipped Capital Femoral Epiphysis 553

Stress Fractures 554

Osteitis Pubis 554

Displaced and Nondisplaced Pelvic Fractures 554

Sacral and Coccygeal Fractures 555

Femoral Fractures 555

Assessment of Pelvic, Hip, and Thigh Conditions 557

History 557

Observation and Inspection 558

Palpation 559

Anterior Palpation 559

Posterior Palpation 559

Physical Examination Tests 559

Functional Tests 560

Stress Tests 562

Special Tests 563

Neurologic Tests 569

Activity-Specific Functional Tests 570

Rehabilitation 570

Restoration of Motion 570

Restoration of Proprioception and Balance 570

Muscular Strength, Endurance, and Power 571

Cardiovascular Fitness 571

Chapter 17 Knee Conditions 573

Anatomy of the Knee 575

Bony Structure of the Knee 575

Tibiofemoral Joint 575

Menisci 575

Joint Capsule and Bursae 578

Ligaments of the Knee 579

Other Structures Stabilizing the Knee 580

Patellofemoral Joint 580

Muscles Crossing the Knee 583

Nerves of the Knee 583

Blood Vessels of the Knee 583

Kinematics and Major Muscle Actions of the Knee 584

Flexion and Extension 584

Rotation and Passive Abduction and Adduction 584

| | |
|---|------------|
| Knee Motion During Gait | 584 |
| Patellofemoral Joint Motion | 584 |
| Kinetics of the Knee | 585 |
| Forces at the Tibiofemoral Joints | 585 |
| Forces at the Patellofemoral Joint | 585 |
| Prevention of Knee Conditions | 586 |
| Physical Conditioning | 586 |
| Rule Changes | 588 |
| Shoe Design | 588 |
| Contusions | 588 |
| Fat Pad Contusion | 588 |
| Peroneal Nerve Contusion | 588 |
| Bursitis | 589 |
| Ligamentous Conditions | 590 |
| Unidirectional Instabilities | 591 |
| Multidirectional Instabilities | 595 |
| Knee Dislocations | 596 |
| Management of Ligament Conditions | 597 |
| Meniscal Conditions | 597 |
| Patellar and Related Conditions | 599 |
| Patellofemoral Stress Syndrome | 602 |
| Chondromalacia Patellae | 602 |
| Patellar Instability and Dislocations | 603 |
| Patella Plica Syndrome | 604 |
| Patellar Tendinitis (Jumper's Knee) | 605 |
| Osgood-Schlatter's Disease | 605 |
| Sinding-Larsen-Johansson Disease | 607 |
| Extensor Tendon Rupture | 607 |
| Iliotibial Band Friction Syndrome | 608 |
| Fractures and Associated Conditions | 610 |
| Avulsion Fractures | 610 |
| Epiphyseal and Apophyseal Fractures | 610 |
| Stress Fractures | 611 |
| Chondral and Osteochondral Fractures | 611 |
| Osteochondritis Dissecans | 612 |
| Patellar Fractures | 613 |
| Assessing Knee Conditions | 613 |
| History | 614 |
| Observation and Inspection | 614 |
| Palpation | 616 |
| Anterior Palpation | 617 |
| Posterior Palpation with Knee Slightly Flexed | 617 |
| Palpation for Swelling | 617 |
| Physical Examination Tests | 618 |
| Functional Tests | 618 |
| Stress Tests | 620 |

Special Tests 627
Neurologic Tests 630
Activity-Specific Functional Tests 631

Rehabilitation of Knee Injuries 632

Restoration of Motion 632
Restoration of Proprioception and Balance 632
Muscular Strength, Endurance, and Power 633
Cardiovascular Fitness 635

Chapter 18 Lower Leg, Ankle, and Foot Conditions 638

Anatomy of the Lower Leg, Ankle, and Foot 640

Forefoot 640
Midfoot 641
Hindfoot 642
Tibiofibular Joints 643
Plantar Arches 644
Muscles of the Lower Leg and Foot 646
Nerves of the Lower Leg, Ankle, and Foot 647
Blood Vessels of the Lower Leg, Ankle, and Foot 648

Kinematics of the Lower Leg, Ankle, and Foot 650

The Gait Cycle 650
Toe Flexion and Extension 651
Dorsiflexion and Plantar Flexion 651
Inversion and Eversion 651
Pronation and Supination 652

Kinetics of the Lower Leg, Ankle, and Foot 652

Forces Commonly Sustained by the Lower Leg, Ankle, and Foot 652
Foot Deformation During Gait 653

Prevention of Lower Leg, Ankle, and Foot Conditions 653

Protective Equipment 653
Physical Conditioning 653
Footwear 654

Toe and Foot Conditions 654

Toe Deformities 654
Turf Toe 657
Reverse Turf Toe (Soccer Toe) 657
Ingrown Toenail 658
Metatarsalgia 658
Bunions 659
Retrocalcaneal Bursitis 659

Contusions 660

Foot Contusions 660
Lower Leg Contusions 660
Acute Compartment Syndrome 661

Foot and Ankle Sprains 661

Toe and Foot Sprains and Dislocations 662
Mechanisms of Injury for Ankle Sprains 662
Inversion Ankle Sprains 662
Eversion Ankle Sprains 664

Syndesmosis Sprain 665
 Subtalar Sprain 666
 Subtalar Dislocation 666

Tendinopathies of the Foot and Lower Leg 667

Strains and Tendinitis 667
 Achilles Tendon Rupture 671

Overuse Conditions 672

Plantar Fasciitis 672
 Medial Tibial Stress Syndrome (MTSS) 673
 Exertional Compartment Syndrome 674

Vascular and Neural Disorders 675

Venous Disorders 675
 Neurologic Conditions 675

Fractures 677

Freiberg's Disease 677
 Sever's Disease 678
 Stress Fractures 678
 Avulsion Fractures 680
 Osteochondral Fracture of the Talus 680
 Displaced Fractures and Fracture Dislocations 682

Assessment of the Lower Leg, Ankle, and Foot Conditions 685

History 685

Observation and Inspection 686

Palpation 687

Anterior and Medial Palpation 687
 Anterior and Lateral Palpation 688
 Posterior Palpation 688

Physical Examination Tests 688

Functional Tests 688
 Stress Tests 689
 Special Tests 691
 Neurologic Tests 692
 Activity-Specific Functional Tests 692

Rehabilitation 693

Restoration of Motion 693
 Restoration of Proprioception and Balance 693
 Muscular Strength, Endurance, and Power 693
 Cardiovascular Fitness 694

SECTION VI Systemic Conditions 699

Chapter 19 Cardiovascular Disorders 700

Anatomy of the Circulatory System 702

Blood and Lymph Disorders 704

Anemia 704
 Hemophilia 707

Reye's Syndrome 708

Lymphangitis 709

Syncope 710

Shock 711

Blood Pressure Disorders 713

Hypertension 713

Hypotension 717

Sudden Cardiac Death 718

Epidemiology 718

Cardiac Causes of Sudden Cardiac Death 718

Noncardiac Causes of Sudden Death 722

Cardiovascular Preparticipation Screening 723

Chapter 20 Neurologic Conditions 728

Headaches 729

Migraine Headache 730

Cluster Headache 731

Tension-Type Headache 731

Analgesic Rebound Headache 732

Drug-Induced Headache 732

Exertional Headache 732

Posttraumatic Headache 732

Treatment of Headaches 732

Seizure Disorders and Epilepsy 733

Causes of Epilepsy 733

Types of Seizures 734

Immediate Management of Seizures 735

Medications and Epilepsy 736

Physical Activity Guidelines 737

Other Central Nervous System Disorders 737

Meningitis 738

Encephalitis 739

Complex Regional Pain Syndrome 740

Chapter 21 Respiratory Tract Conditions 744

Upper Respiratory Tract Infections 746

Common Cold 746

Sinusitis 748

Pharyngitis (Sore Throat) 748

Laryngitis 749

Tonsillitis 749

Allergic Rhinitis (Hay Fever) 750

General Respiratory Conditions 751

Bronchitis 751

Bronchial Asthma 751

Exercise-induced Bronchospasm 752

Influenza 753

Pneumonia 754

Chapter 22 Gastrointestinal Conditions 757

Upper Gastrointestinal Disorders 758

Dysphagia 759
 Gastroesophageal Reflux 760
 Dyspepsia (Indigestion) 760
 Gastric (Peptic) Ulcer 760
 Gastritis 761
 Gastroenteritis 761

Lower Gastrointestinal Disorders 762

Irritable Bowel Syndrome 762
 Crohn's Disease 762
 Ulcerative Colitis 763
 Diarrhea 763
 Constipation 764
 Hemorrhoids (Piles) 765

Other Gastrointestinal Problems 766

Anxiety and Stress Reaction 766
 Vomiting 766
 Food Poisoning 767

Chapter 23 Endocrine Conditions 769

Thyroid Disorders 771

Hyperthyroidism 771
 Hypothyroidism 773

Pancreatitis 774

Acute Pancreatitis 774
 Chronic Pancreatitis 774

Diabetes Mellitus 775

The Physiologic Basis of Diabetes 775
 Types of Diabetes 777
 Complications of Diabetes Mellitus 779
 Nutrition and Exercise Recommendations 782

SECTION VII Special Considerations 785

Chapter 24 Environmental Conditions 786

Heat-Related Conditions 788

Internal Heat Regulation 788
 Measuring the Heat-Stress Index 790
 Factors That Modify Heat Tolerance 791
 Identifying Individuals at Risk 795
 Heat Illnesses 795
 Other Heat Conditions 798

Cold-Related Conditions 799

Preventing Cold-Related Injuries 800

Cold Conditions 801

Other Environmental Conditions 804

Altitude Disorders 804

Air Pollution and Exercise 806

Exercising in Thunderstorms 807

Chapter 25 Common Infectious Diseases 811

Common Childhood Diseases 813

Bacterial Childhood Diseases 813

Viral Childhood Diseases 815

Infectious Mononucleosis 819

Viral Meningitis 819

Sexually Transmitted Diseases 820

Hepatitis 820

Acquired Immunodeficiency Syndrome 822

Chapter 26 Conditions of the Female Athlete, Disabled Athlete, and Senior Athlete 825

Special Concerns of the Female Athlete 827

The Uterine (Menstrual) Cycle 827

Gynecologic Irregularities 828

Birth Control and Participation in Sport and Physical Activity 832

Pregnancy and Sport Participation 833

Eating Disorders 834

Osteoporosis 837

The Female Athlete Triad 837

Athletes with Disabilities 838

Wheelchair Athletes 838

Athletes with Amputations 840

Cerebral Palsy 841

Visual Impairment 841

The Senior Athlete 841

Upper Extremity and Spinal Considerations 841

Lower Extremity Considerations 842

Chapter 27 Pharmacology 845

Pharmacokinetics 847

Drug Administration 848

Drug Absorption 849

Drug Distribution 850

Drug Metabolism 851

Drug Excretion 851

Factors That Contribute to the Therapeutic Effect of a Drug 851

Blood Plasma Levels 852

Therapeutic Range 852
Dosing Intervals and Plasma Concentrations 852
Maximal Efficacy 853
Half-life 853
Potency 853

Drug Interactions 853

Adverse Drug Reactions 854

Drug Names 855

Guidelines for the Use of Therapeutic Medications 856

Using Over-the-Counter Medications 856
Poison Control Plan 857
Traveling with Medications 857
Storing Medications 858
Physician's Desk Reference 858

Common Medications Used to Treat Sport-Related Injuries 859

Analgesics and Antipyretics 859
Nonsteroidal Anti-Inflammatory Drugs 859
Corticosteroids 861
Local Anesthetics 861
Muscle Relaxants 863
Topical Antibiotics 863
Antiseptics and Disinfectants 863
Antifungal Agents 863

Performance-Enhancing Substances (Ergogenic Aids) 864

Caffeine 864
Tobacco 865
Alcohol 865
Marijuana 866
Diuretics 866
Anabolic-Androgenic Steroids 867
Human Growth Hormone 868
Amphetamines 868
Ephedra 868
Blood Doping and Erythropoietin 869
Creatine 869

Drug Testing 870

Chapter 28 Dermatology 873

Types of Skin Lesions 875

Skin Infections 875

Bacterial Skin Conditions 877
Fungal Skin Conditions 883
Viral Skin Conditions 887

Other Skin Reactions 890

Chafing of the Skin 890
Athlete's Nodules 891
Acne Mechanica 891

| | |
|--------------------|-----|
| Striae Distensae | 891 |
| Sunburn | 892 |
| Pernio (Chilblain) | 893 |
| Miliaria Rubra | 893 |
| Dry (Xerotic) Skin | 894 |
| Eczema | 894 |
| Psoriasis | 895 |
| Hyperhidrosis | 896 |
| Bites and Stings | 897 |
| Contact Dermatitis | 902 |
| Urticaria | 903 |
| Glossary | 907 |
| Index | 924 |