Evaluation and Treatment of the Shoulder: *An Integration of the Guide to Physical Therapist Practice*

Brian J. Tovin, MMSc, PT, SCS, ATC, FAAOMPT
Clinic Director
The Sports Rehabilitation Center at Georgia Tech
Director of Rehabilitation
Georgia Tech Sports Medicine
Atlanta, Georgia

Bruce H. Greenfield, MMSc, PT, OCS
Instructor
Department of Rehabilitation Medicine
Division of Physical Therapy
Emory University School of Medicine
Atlanta, Georgia

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Dedication

This book is dedicated to my most significant others: my wife and best friend, Stacey, for making me a better person and being my b'shert; and my parents, Stefanie and Ian, for their continuous love, support, and guidance.

Brian Tovin

This book is dedicated to my wife Amy, who has provided me with unconditional love and support, and to my children, Heather, Suzanne, and Eleanor, gifts from God.

Bruce Greenfield

Foreword

As we enter the new millennium, we pause for a moment to recognize that publication of *Evaluation and Treatment of the Shoulder: An Integration of the Guide to Physical Therapist Practice* marks the 15th anniversary of the **Contemporary Perspectives in Rehabilitation** series. Throughout this time, a consistent and conscientious effort has been made to present a variety of topics to rehabilitation specialists, clinicians, and students. Our texts have received recognition for their diversity and comprehensive informational formats. In all of the volumes in the CPR series, material is critically and consistently presented using a challenging and problem-solving approach, often through the incorporation of case studies, decision trees, and comprehensive tables.

This approach was undertaken so that we could be "contemporary." Clearly, within the past decade, multiple changes in health-care policy have impacted the circumstances under which rehabilitation is provided. Opinions about these changes have varied, with most professionals showing a multitude of emotions, ranging from ambiguity to recalcitrance to anger. Yet, one undeniable fact remains—the concept of *contemporary* has changed, or at least its fabric appears manufactured from a different fiber and design. What was once labeled clinical decision making has now been transformed into evidence-based practice; and while empiricism was at one time permitted to reign as the basis for evaluation and treatment, defined guidelines that speak to documentation and evidence are now prevalent.

Against this background, the editors of this text on shoulder evaluation and treatment have brought together a unique combination of competence, skill, dedication, and friendship to carve a niche in contemporary physical therapy. This niche is embedded in the text's application of the *Guide to Physical Therapist Practice* (Physical Therapy, (11) 77, 1997) as it pertains to a musculoskeletal problem pervasive among clients ranging from young athletes to frail, older adults.

This text is more than a detailed study on evaluation, physical therapy diagnoses, treatment, and reassessment of the shoulder. Tovin and Greenfield have taken a courageous step to offer their interest in the treatment of this body segment as one of the first efforts for rethinking the way physical therapists interface and treat patients. To succeed in this task required the contributions of authors whose sense of destiny is redefining how therapists evaluate and treat parallels those of the editors. Indeed, many of the contributors to this book are well known to many orthopedic physical therapists and their students. Guccione, Davies, Binkley, McClure, Stralka, McConnell, and Snyder-Mackler can easily be classified as visionaries with the ability to sense the course that clinicians must chart to secure further growth and autonomy.

To accomplish the task, the text is divided into three major sections. The first section reviews anatomy (Greenfield) and kinesiology (Abelew) while also reviewing the fundamental constructs underlying the evolution of impairment-based diagnosis by physical therapists (Guccione) and its application to the shoulder girdle (Tovin and Greenfield). The importance of clinical examination (Davies et al.) and integration of quantified outcome measures (Binkley) complete this section. The second section addresses the preferred practice patterns. To better appreciate the thought that has made this section unique, the reader is referred to Chapter 4 of the ''Guidelines.'' Students and clinicians are presented with a discussion of the relationship between the suggested guidelines and specific shoulder joint or girdle pathologies, along with commentary that challenges their reasoning and thought processes. Lastly, Section III describes the principles of treatment. In this section, the reader is exposed to clinical reasoning in the use of manual therapy techniques (Jones and Magarey), alternative treatment modes, such as aquatic therapy (Tovin), and the role of open versus closed kinetic chain exercises as treatment for the shoulder (Livingston). Highlighting this section is Jenny McConnell's discussion of appropriate neuromuscular re-education strategies and a presentation of the rationale underlying the orderly functional progression in therapeutic exercise plans (Chmielewski and Snyder-Mackler).

I have served as Editor-in-Chief for all of the volumes in the CPR series, but many factors make this book particularly endearing to me. Both Brian Tovin and Bruce Greenfield are past students of mine. Perhaps I have contributed a small portion to their academic accomplishments. Most of their contributors are friends or colleagues whose work I have respected for many years. As a total team, they have embarked on a venture that may some day be viewed as a model that symbolized a change in how (and why) physical therapy services are provided.

As students and therapists read this book, they should be reminded of the prudent words of the great American humorist, Mark Twain, ''A man cannot be comfortable without his own approval.'' The time has come for us to alter our comfort level by not only approving the guidelines, but more importantly, by applying them. This book affords all of us that special opportunity. At the risk of sounding somewhat dramatic, perhaps we might consider the following:

> The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise to the occasion. As our case is new, so we must think anew and act anew. We must disenthrall ourselves.

This thought is as true for the physical therapist pondering changing practice patterns as it was for Abraham Lincoln more than 140 years ago as he pondered the fate of a nation.

Steven L. Wolf, PhD, FAPTA
Series Editor

Preface

In November 1997, the American Physical Therapy Association published the *Guide to Physical Therapist Practice.* "The Guide," as it came to be known, provided the physical therapy and medical community with a comprehensive document that outlined the nature and scope of physical therapy practice. The Guide is divided into two parts: part one discusses patient/client management and explains the tests and measures that are used in patient management; part two discusses patterns of practice for selected diagnostic categories. The patterns of practice describe the components of patient management that a panel of expert clinicians deemed reasonable for a diagnostic group and include examination techniques, evaluation, diagnosis, prognosis, and intervention. The items in each diagnostic group share common impairments and functional losses that distinguish them from other groups. Diagnostic groups encompass the major body systems and include musculoskeletal, neuromuscular, cardiopulmonary, and integumentary. Up to this point, there is limited documentation that the guidelines included in the patterns of practice are superior to others. The challenge to the profession is to apply the guidelines to the treatment of patients and determine their effectiveness by gauging outcomes.

Evaluation and Treatment of the Shoulder: An Integration of the Guide to Physical Therapist Practice provides physical therapists, as well as occupational therapists, athletic trainers, and others, with a resource that integrates the musculoskeletal practice patterns in the Guide with the rehabilitation of the shoulder. This text introduces orthopedic conditions based on clustering impairments and in so doing embraces the Guide's philosophy that physical therapists and other rehabilitation specialists diagnose the consequences of disease, pathology, injury, or surgery on the musculoskeletal system. These consequences include related impairments, functional losses, and disabilities that have been and continue to be the purview of physical therapy practice.

The purpose of *Evaluation and Treatment of the Shoulder* is twofold: to serve as a model that presents shoulder conditions from an impairment-based perspective so that the Guide's preferred practice patterns outlining treatment strategies can be used and assessed for their feasibility and effectiveness. Second, the text is an excellent basic resource for the entry-level clinician for all aspects of shoulder rehabilitation. Whether or not practicing clinicians embrace the guidelines contained in the Guide, this text provides them with an excellent updated resource on the care and management of selected shoulder conditions.

Evaluation and Treatment of the Shoulder is divided into three parts. Part I discusses shoulder anatomy and kinesiology, reviews the historical basis of impairment-based

practice, and extrapolates and operationally defines the impairment-based categories of the shoulder from the Guide that serve as the organizing construct for the rest of the text. Part I concludes with a review of the examination of the shoulder and functional outcome measures.

Part II presents the main body of the text—selected shoulder conditions. In keeping with a philosophy that we believe to be unique to this text, conditions are introduced based on their primary impairments, rather than on the traditional medical diagnoses. The medical diagnoses are presented as secondary concerns that guide the pace and nature of treatment, rather than direct the primary approach to evaluating and ameliorating impairments and functional losses. An example is Chapter 7, ''Musculoskeletal Pattern D: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated with Capsular Restriction.'' The rehabilitation of a painful and stiff shoulder that is the result of primary adhesive capsulitis or secondary to post-surgical shoulder immobilization is consistently based on identifying, assessing, and correcting the impairments that affect function. What varies is the pace of treatment dictated by soft tissue healing and the individual's functional goals.

Finally, Part III reviews principles of rehabilitation for the shoulder. Historically, the treatment strategies and techniques for shoulder conditions have varied both in their scope and effectiveness. The challenge was to sift through the large number of treatments, tossing the irrelevant ones and exposing the ''nuggets.'' In meeting this challenge, we were guided by our commitment and that of the **Contemporary Perspectives of Rehabilitation** series to present, whenever possible, evidence-based outcome treatments. Chapters on manual therapy strategies, neuromuscular education techniques, aquatic therapy, functional progression exercises, and closed kinetic chain exercises, all contain information rich in detail but scrupulous in scientific rigor.

Contributors were selected for their expertise, academic credentials, and professional integrity. The selection criteria are reflected in the quality of the text and the attention paid to pedagogy. Every chapter includes pedagogy designed to enhance the content. Chapter outlines give readers a quick overview of the content. Chapter introductions explain all relevant principles and operational definitions. Specific case studies within the chapters allow the reader to learn how the information is integrated into patient care.

In using this text, we anticipate that readers will apply the process method and the content to formulate treatments for their patients. We feel confident we are offering cutting-edge material aimed at influencing the future practice of physical therapy and rehabilitation in general. Since this venture is directed toward the profession's growth, we invite the reader's feedback to see if our predictions are accurate. Future editions will reflect that feedback and the dynamic changes in health care policy to effect even better and more relevant treatment assessments and approaches.

Brian Tovin
Bruce Greenfield

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A professional career is not only guided by the amount of knowledge, perseverance, and motivation of that individual, but equally by the surrounding cast of people who have helped to shape, direct, and influence that individual along the way. I would like to thank those individuals who have done all of these things for me and helped contribute, both directly and indirectly, to the development of this text. To Pam Levangie for taking a chance on me by admitting me to physical therapy school at Boston University. To Lynn Snyder-Mackler, who guided me on the right track early in my career and taught me to strive for excellence. She continues to be a source of inspiration and motivation in my career. To Steve Wolf, who has patiently taught me the finer points of research, writing, and editing. Both Lynn and Steve have been friends and mentors, serving as my ''professional parents'' and teaching me that balancing academics and clinical practice is possible. To Geoff Maitland and Keith Kleven for teaching me that being an expert clinician not only requires advanced clinical skills, but compassion for the patient as well. They taught me that no patient cares how much you know until they know how much you care. To Mark Jones and Steve Kraus for motivating me to continually challenge myself and for helping me refine my clinical reasoning process and manual therapy skills. To Jay Shoop, who has given me the opportunity to have my ''dream'' job and who has taught me that ''old school'' is sometimes better than ''new school.'' To my brothers Cory and Todd Tovin, and sisters-in-law Melissa and Renee Tovin, who have taught me that a family of physical therapists does not necessarily make for boring dinner conversation. To my colleagues Catherine Duncan, David Pasion, and Gina Boomershine for all that they do for our clinics. To Grace Jones for being the backbone of our office. I owe a great deal of gratitude to Dr. Angelo Galante, Dr. John Xerogeanes, and Dr. ''Chip'' Pendleton for their friendship and confidence in me. I would also like to thank Joelle Szendel for assisting with typing and Kelly Ramsdell, Adria Gravely, and Adam Snyder for serving as models. To Jean-Francois Vilain, Sharon Lee, and the staff at F.A. Davis for making this challenging task an unforgettable experience. Finally, to Bruce Greenfield, without whose assistance, support, patience, and friendship this book would never have happened.

Brian J. Tovin

As human beings, we have good and bad traits that result from the confluence of a number of factors, not the least of which is the influence of individuals during our personal and professional development. Hopefully, the good traits outweigh the bad, and we are able to accomplish things that make life meaningful.

The following individuals have helped to identify and nurture the attitudes, values, and habits that constitute the good in me. My greatest debt of gratitude is owed to my late mother, Eleanore Greenfield, my father, Seymour Greenfield, and my sister, Meryl Jacobs. I would like to thank my in-laws, Edward and Florence Schuman, and my brother-in-law, Andrew Jacobs, for their love and support. I would like to thank my colleagues and friends on the faculty of the Division of Physical Therapy at Emory University for their unfailing support and friendship. In particular, I would like to express my gratitude to Dr. Pamela Catlin, who allowed me to "carve out" my own professional time to work on this book. I would like to thank Steve Wolf, a friend, colleague, and role model who impressed upon me the value of rigorous scholarship. I would like to thank Marie Johanson for her friendship and support. I would also like to thank some of my colleagues who still toil in the clinic and to me are the true heroes of the profession of physical therapy: Michael Wooden, Tim McMahon, Robert Donatelli, Mark Albert, Steve Kraus, Zita Gonzales, and Greg Bennett. These people did it right in the beginning, and they continue to do it right.

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Bruce Greenfield

Contributors

Thomas Abelew, PhD
Assistant Professor
Department of Rehabilitation Medicine
Division of Physical Therapy
Emory University School of Medicine
Atlanta, Georgia

Jill Binkley, PT, MClSc, FCAMT, FAAOMPT
Assistant Professor
School of Physiotherapy
McMaster University
Hamilton, Ontario, Canada

Lori Thein Brody, MS, PT, SCS, ATC
Senior Clinical Specialist
University of Wisconsin Clinics Research Park
Sports Medicine and Spine Center
Madison, WI
Program Director
Rocky Mountain University of Physical Therapy
Provo, Utah

Kevin Cappel, MS, PT, SCS, ATC, CSCS
Director of Sports Medicine
Gunderson Lutheran Sports Medicine
Winona, Minnesota

Terese L. Chmielewski, MA, PT, SCS
Doctoral Student, Biomechanics and Movement Sciences Program
Department of Physical Therapy
University of Delaware
Newark, Delaware

Michael A. Clark, MS, PT, CSCS
Sports Physical Therapy and Performance Specialist
Physiotherapy Associates Tempe Sport Clinic
Director of Sports Science
Athletic Institute
Franklin, Pennsylvania

George J. Davies Med, PT, SCS, ATC, CSCS
Professor, Graduate Physical Therapy Program
University of Wisconsin-Lacrosse
Director, Clinical and Research Services
Gunderson Lutheran Sports Medicine
Lacrosse, Wisconsin

Todd S. Ellenbecker, MS, PT, SCS, CSCS
Clinic Director
Physiotherapy Associates
Scottsdale Sports Clinic
Scottsdale, Arizona

Bruce H. Greenfield, MMSc, PT, OCS
Instructor
Department of Rehabilitation Medicine
Division of Physical Therapy
Emory University School of Medicine
Atlanta, Georgia

Andrew A. Guccione, PhD, PT, FAPTA
Senior Vice President
Division of Practice and Research
American Physical Therapy Association
Alexandria, Virginia

Penny L. Head, PT, SCS, ATC
Director of Physical Therapy
The Campbell Clinic
Memphis, Tennessee

Mark A. Jones, BS, PT, MAppSc
Senior Lecturer, Centre for Allied Health Research
Coordinator, Postgraduate Programs in Manipulative Physiotherapy
School of Physiotherapy, Division of Health Sciences
University of South Australia
Adelaide, South Australia

Beven P. Livingston, MS, PT, ATC
Graduate Student, PhD Program in Neuroscience
Emory University
Atlanta, Georgia

Mary M. Magarey, PhD, Grad Dip Man Ther
Senior Lecturer, Centre for Allied Health Research
Coordinator, Postgraduate Programs in Sports Physiotherapy
School of Physiotherapy, Division of Health Sciences
University of South Australia
Adelaide, South Australia

Phil McClure, PhD, PT, OCS
Associate Professor
Department of Physical Therapy
Beaver College
Glenside, Pennsylvania

Jenny McConnell, BAppSci (Phty), Grad Dip Man Ther, MBiomedE
Director, McConnell & Clements Physiotherapy
New South Wales, Australia

Karen J. Mohr, PT, SCS
Research Director
Kerlan-Jobe Orthopaedic Clinic
Hermosa Beach, California

Diane Radovich Schwab, MSPT
Champion Rehabilitation
San Diego, California

Lynn Snyder-Mackler, ScD, PT, ATC, SCS
Associate Professor
Department of Physical Therapy
University of Delaware
Newark, Delaware

Susan W. Stralka, MS, PT
Director, Outpatient Rehabilitation Services
Director, The Orthopaedic and Sports Medicine Institute
Baptist Memorial Healthcare
Memphis, Tennessee

Brian J. Tovin, MMSc, PT, SCS, ATC, FAAOMPT
Clinic Director
The Sports Rehabilitation Center at Georgia Tech
Director of Rehabilitation
Georgia Tech Sports Medicine
Atlanta, Georgia

Reviewers

Charles D. Ciccone, PhD, PT
Professor
Department of Physical Therapy
Ithaca College
Ithaca, New York

Gary Lentell, MS, PT
Professor
Department of Physical Therapy
California State University, Fresno
Fresno, California

Mark R. Wiegand, PhD, PT
Associate Professor
Department of Physical Therapy
Program
University of Louisville Health Sciences
Center
Louisville, Kentucky

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Impairment-Based Diagnosis for the Shoulder Girdle

Brian J. Tovin, MMSc, PT, SCS, ATC, FAAOMPT
Bruce H. Greenfield, MMSc, PT, OCS

INTRODUCTION

Physical therapy is a dynamic profession with an established theoretical base and widespread clinical applications in the preservation, development, and restoration of optimal function.[1] As clinicians, physical therapists engage in an examination process that includes taking the history, conducting a systems review, and administering tests and measures. The overall goal of this examination process is to identify potential and existing impairments, functional limitations, and disability,[2] thus enabling the clinician to formulate a diagnosis, prognosis, and an intervention.[3] These terms will be defined later in this chapter. Physical therapy examination based on the medical model focuses on differential diagnosis of disease and tissue pathology. However, the medical model has been criticized for not providing physical therapists adequate guidelines to identify impairments for treatment and to optimize function.[2–6] Recently, the American Physical Therapy Association (APTA) has advocated the use practice guidelines to direct evaluation and treatment.[1]

This chapter serves to: (1) review the evolution of diagnosis by physical therapists from the traditional medical model, (2) discuss the process of disablement as it pertains to physical therapy practice patterns, and (3) present an impairment-based classification scheme for the shoulder, incorporating preferred practice patterns of the APTA.[1]

HISTORICAL DEVELOPMENT OF THE IMPAIRMENT-BASED TREATMENT OF THE SHOULDER

Early Work

Much of the work on differential diagnosis of the shoulder was introduced by Codman[7] in the 1930s. His approach focused on the effect of pathology on shoulder

function. His system of diagnosis associated clinical signs and symptoms with tissue pathology to help physicians gain a broader perspective in tissue pathology and treatment. Codman indicated that physicians should make a clinical diagnosis based on clustering signs and symptoms. He stated, ''. . . pathologic entities and clinical entities are not the same. Clinical problems are the practical working diagnoses on which rational treatment may be based.''[7] Many of the clinical entities that he related to complete rupture of the supraspinatus tendon would be classified as present day impairments under the International Classification of Impairments, Disabilities and Handicaps (ICIDH) or Nagi systems[8,9] (see Chap. 3). These findings include loss of active muscle power and faulty scapulohumeral rhythm with compensatory, early scapular elevation and outward rotation. The list that follows includes signs and symptoms indicative of complete rupture of the supraspinatus tendon and is adapted from Codman, with impairments identified in bold.

1. Occupation: labor
2. Age: more than 40 years old
3. No shoulder symptoms prior to injury
4. Adequate injury: usually a fall
5. **Immediate sharp, brief pain**
6. Severe pain on following night
7. **Loss of power in elevation of arm**
8. Negative x-ray
9. Little, if any, restriction when stooping
10. **Faulty scapulohumeral rhythm**
11. **Tender point, sulcus, and eminence at insertion of supraspinatus**
12. **Pain, catching, hitching, and crepitus with elevation**

One of the first comprehensive classifications for shoulder overuse injury was introduced by Neer,[10] who labeled conditions as *primary* or *mechanical impingement*. Mechanical impingement results from compression of subacromial tissues, such as the rotator cuff muscle tendons, tendon of the long head of the biceps, or subacromial bursa, underneath the anterior inferior acromial process. Table 4–1 identifies Neer's classification as a continuum of three stages of pathology. Each stage is correlated with a distinct group of impairments. The listing of impairments provides the clinician with treatment guidelines that are consistent with the philosophy of physical therapy to optimize function by identifying and correcting impairments.[1] The relationship between impairments and pathology was further developed by sports medicine physicians involved in treating shoulder pathology related to ''overhead sports.''[11,12]

Later Work

Currently, classifications of shoulder conditions often contain hybrids of both pathologic features and impairments. Newer classification systems were developed in response to the unique stresses and strains imparted on the shoulder complex by the athlete involved in overhead sports, such as throwing and swimming, and the resulting orthopedic injuries.[11,12] These sports involve movement patterns of glenohumeral elevation more than 90° combined with extreme internal-external rotation and

TABLE 4–1 Neer Stages of Impingement

Stages	Clinical Presentation (Impairments)	Treatment Principles
Stage I Age: Less than 25 years old Pathology: Edema and hemorrhage	Subacromial pain / tenderness Painful arc (+) Impingement / Neer test Resisted abduction and external rotation strong and painful	Reduce / eliminate inflammation Educate patient Restore proximal control: parascapular muscular control
Stage II Age: 25-40 years old Pathology: Bursitis / bursitis and fibrosis	Capsular pattern of restriction at glenohumeral joint	Re-establish glenohumeral capsular mobility
Stage III Age: More than 40 years old Pathology: Bone spurs and tendon disruption	Weakness of abduction and external rotation, ''squaring'' of acromion	Depends on size of tear

Adapted from Neer,[10] 1973. See Chapter 9 for definitions.

horizontal abduction-adduction. Additionally, many of these overhead sports require quick acceleration-deceleration muscle activity. The neuromuscular and biomechanical demands of these activities are different from those placed on the shoulder by the pedestrian athlete and by sedentary individuals.[13]

A biomechanical analysis of throwing illustrates how impairments lead to tissue pathology. During throwing, the glenohumeral joint accelerates in excess of 7000° per second. To enhance limb acceleration during throwing, excessive anterior glenohumeral (GH) joint laxity is required to allow the arm to achieve maximum external rotation.[12] Maximum external rotation provides a prestretch to the anterior shoulder musculature and activates muscle spindles, enhancing the concentric contraction. Athletes involved in throwing often exhibit 125° to 140° of external rotation. Excessive motion requires fine motor control to provide dynamic glenohumeral joint stability. Dynamic stability is accomplished through the combined efforts of the rotator cuff musculature, the deltoid, and long head of the biceps. Thus, the thrower is continuously balancing the necessary capsular laxity required to throw with the neuromuscular control and strength of the surrounding musculature to provide dynamic joint stability. Injuries may occur because of impairments of muscle imbalance, altered ROM, or poor motor control.[12]

A common finding in competitive swimmers and baseball pitchers with musculoskeletal shoulder injuries is instability.[11,12,13] *Instability* is defined as excessive glenohumeral mobility resulting in pain and altered motion during function.[13] The essential treatment element in patients who develop shoulder impingement in the presence of instability is to correct the instability.[14] Excessive translation of the humeral head within the glenoid fossa during a throwing motion results in a greater than normal demand for the rotator cuff muscles to provide dynamic stability.[15] Fatigue of these muscles often results in tissue overload and strain to the rotator cuff tendons with secondary subacromial impingement.[11] Specific pathophysiology of instability will be discussed in Chapter 8.

TABLE 4–2 Jobe's Classification of Shoulder Dysfunction

Group	Physical Findings	Tissue Pathology
Group I Isolated impingement without instability Age: Older, recreational athlete	(See Chapters 8 and 9 for definition of tests) (+) Impingement sign	Rotator cuff lesions of the bursal surface Subacromial spurs
Group II Instability with impingement due to overuse microtrauma Age: Young overhead athletes	(+) Impingement sign (+) Relocation test Excessive translation of the humeral head	Microtrauma to the posterior labrum, anterior capsule, and ligaments Deterioration on the posterior aspect of the humeral head Glenohumeral ligamentous laxity Tears in undersurface of supraspinatus and infraspinatus
Group III Instability due to ligamentous laxity Age: Young overhead athlete	Generalized ligamentous laxity (+) Relocation test Excessive translation of the humeral head	Humeral head, rotator cuff, and labral lesions
Group IV Singular traumatic event Instability without impingement Partial dislocations	Possibly (-) apprehension or relocation test	Bankart lesion Erosion of the posterior humeral head

Adapted from Jobe and Pink,[11] 1993.

Jobe's classification of shoulder dysfunction (Table 4–2) describes the instability-impingement relationship, and can be represented by the following scheme:

Instability ——— Subluxation ——— Impingement ——— Rotator Cuff Tear[11]

Instability is the central theme of this classification. In the young athlete, participation in overhead sports, such as throwing, swimming, tennis, and volleyball, requires large ranges, forces, and repetitions. This increased stress to the shoulder girdle can result in acquired laxity and weakness in the static (capsule) and dynamic structures (muscles), possibly leading to instability and impingement of subacromial tissues or muscle strains. Although instability with impingement occurs principally in athletes performing overhead sports, individuals may present with the same complex findings resulting from work-related activity. Repetitive overhead hammering or other construction activities produce similar loads to the shoulder as swimming and throwing do. The underlying impairments must be assessed and corrected within the context of the presenting signs and symptoms. Correction of the impairments is significantly important to physical therapists because authorities such as Jobe and Pink conclude that approximately 95% of patients with *instability-impingement* will respond to conservative treatment.[11]

The relationship between impairments and pathology was also described by Andrews.[12] Similar to Jobe's classification, Andrews distinguishes between primary compressive disease (impingement) and tensile overload and secondary compressive

TABLE 4–3 Andrews' Classification of Rotator Cuff Disease

Type	Classification
I	Primary compressive disease
II	Instability with secondary compressive disease
III	Primary tensile overload failure
IV	Tensile overload failure secondary to capsular instability
V	Macro-traumatic failure

Adapted from Meister and Andrews,[12] 1993.

disease and tensile overload (Table 4–3). Primary compressive disease and tensile overload of the rotator cuff tendons occurs during repetitive overhead movements such as throwing. Primary tensile overload results from eccentric contraction of the infraspinatus and teres minor, which occurs during deceleration of the humeral head in the follow-through phase of throwing. Primary compressive disease results from mechanical impingement of the rotator cuff tendons or long head of the biceps underneath the acromion. These conditions are referred to as types I and III in Table 4–3. According to Andrews, both type I and type III rotator cuff disease usually result from fatigue of the rotator cuff muscles and decrease the efficiency required to decelerate the throwing arm adequately. Mechanical impingement is discussed in detail in Chapter 9.

Secondary compressive disease and secondary tensile overload (types II and IV, respectively) (Table 4–3) occur in the presence of primary glenohumeral instability. The increased demand of the rotator cuff muscles to stabilize the humeral head in the glenoid fossa in the presence of capsular laxity is the primary cause of the muscle-tendon failure. Patients with types I and III rotator cuff disease present with a positive impingement sign, although patients with types II and IV present with a positive impingement sign and positive apprehension and relocation tests.[12]

Current Work

The work of both Jobe and Andrews provided the groundwork for later studies that examined impairments related to faulty posture or alignment of the upper thoracic and cervical spine, scapular position, muscle balance and performance, and motor control as measured by electromyography.[15–22] For example, Gowan et al.[15] conducted a study to determine whether muscle recruitment of professional pitchers was significantly different from that of amateur pitchers. During the acceleration phase of throwing, professional pitchers recorded increased activity of the pectoralis major, latissimus dorsi, and serratus anterior muscles, with decreased activity of the supraspinatus, infraspinatus, and teres minor muscles. These findings indicated increased efficiency during throwing motion with good proximal control of the scapula. Throwing athletes with glenohumeral instability were compared to healthy athletes in a similar manner by Glousman et al.[16] This study tested the activity of the biceps, middle deltoid, supraspinatus, infraspinatus, pectoralis major, subscapularis, latissimus dorsi, and serratus anterior muscles. Differences were noted in every muscle group except the deltoid. The authors suggest that the increased activity of the biceps and supraspinatus compensated for the instability present in the anterior capsule. The serratus anterior showed decreased activity, resulting in less control of

the scapula and placing the glenoid in a compromising position during the late cocking phase. Decreased scapular control results in more stress on the labrum and anterior capsule.

Muscle imbalances around the shoulder girdle have been assessed in many studies using isokinetic dynamometry.[17–22] For example, McMaster et al.[17] found that swimmers had 52% greater concentric peak torque in shoulder internal rotation and 43% greater concentric peak torque for adduction compared to nonswimmers. In a similar study, Alderink and Kuck[18] found that baseball players had 50% greater concentric peak torque for adduction than nonthrowers. Both Chandler et al.[19] and Brown et al.[20] found higher external to internal concentric peak torque ratios in the nondominant sides of tennis and baseball players compared to the dominant sides. These differences have been referred to as athletic torque ratio shifts,[21] which are training induced changes that create disproportionate increases in concentric peak torque for internal rotators and adductors without concomitant increases in peak torque for external rotation or abduction. The resulting muscle imbalance may predispose the shoulder to injury, possibly explaining why some overhead athletes develop functional instability. These findings are supported by similar research in swimmers presenting with impingement secondary to instability.[22] Concentric peak torque values for external to internal rotation were consistently less than 50%.

The relationship between posture and tissue pathology in the shoulder has been studied by Kibler.[23] He described the lateral slide test to evaluate the function of the muscles that stabilize, outwardly rotate, and protract the scapula. These muscles include the upper and lower trapezius, serratus anterior, and rhomboid major and minor muscles. A measurement was taken from the inferior angle of the scapula to the nearest thoracic spinous process in three different GH joint positions. Results indicated that baseball pitchers exhibited a difference of 1 cm of lateral slide of the scapula on the injured shoulder. The lateral slide reflected excessive posterior rotation or ''winging'' of the medial scapular border, indicating weakness of the scapular stabilizers.

Evolution of Diagnosis in Physical Therapy

Musculoskeletal diagnosis in physical therapy was largely influenced by the work of James Cyriax.[24] Cyriax used a clinical assessment system based on selective tissue tension tests (Table 4–4). This approach considered the nature and characteristics of the problem in addition to isolating the tissue at fault. His work introduced the concepts of clinical reactivity and the manner in which different stresses and movements altered the clinical signs and symptoms. Cyriax was concerned with the ability of clinicians to perform ongoing clinical tests that would gauge any subtle changes in the patient's clinical signs and symptoms. The uniqueness of his work added a new body of language to the orthopedic community in detailing and describing musculoskeletal conditions (Table 4–5). By introducing a diagnosis scheme that guided treatment, he provided a foundation for classifications in physical therapy.

One of the first physical therapists to integrate a framework of disablement into evaluation and treatment was McKenzie.[25] His work involved classifying back conditions based on the relationship of impairments, movement, and pain. Although this system is based on the premise that much of spinal dysfunction is attributed to intervertebral disc pathology, patients are classified into one of three groups based on

TABLE 4–4 Selected Tissue Tension Tests

Test Movements	Assessment
Active elevation in abduction	For a painful arc
Active elevation in abduction	For scapulohumeral mechanics
Repeated active elevation in abduction	For pain, overall ROM, quality of movement and muscle endurance
Passive elevation in flexion	For ROM and end feel resistance or pain
Passive elevation in abduction internal rotation, external rotation, adduction, scapular elevation, protraction and retraction.	For ROM and end feel resistance or pain
Resisted abduction, adduction, internal and external rotation, shoulder flexion and extension, and elbow flexion and extension.	For strength, pain and / or weakness due to injury to the contractile elements (muscle-tendon unit)

Adapted from Cyriax,[24] 1978.

TABLE 4–5 Terminology Used to Describe Orthopedic Conditions As Developed by James Cyriax

Terminology	Definition
End range	The last few degrees of freedom when a tissue or structure is loaded mechanically and passively to the point just before damage occurs.
End feel	The quality of resistance at end range. Examples of end feel include hard or bony, soft tissue, ligamentous, springy, and empty.
Contractile tissue	Tissues, including the muscle belly, musculotendinous junction, tendon, and tenoperiosteal bone, that are directly stressed by the process of isometric contraction during a resisted muscle test.
Noncontractile tissue	Tissues that are not directly mechanically stressed by isometric muscle contraction; includes ligaments, joint capsule, synovial membrane, articular cartilage, and intra-articular menisci.
Capsular pattern	Limitation of pain and movement loss in a joint-specific ratio, usually present with arthritis after prolonged immobilization. The capsular pattern in the glenohumeral joint is greatest limitation in external rotation, followed by abduction, and internal rotation.
Noncapsular pattern	Limitation in a joint in any pattern other than a capsular one reflecting either a derangement that obstructs joint motion, an extra-articular lesion that limits joint motion, or a dysfunction that affects one part of the capsule.

From Cyriax, J: Textbook of Orthopedic Medicine, Vol 1, ed 6. Balliere and Tindall, London, 1975.

presentation of signs and symptoms. The categories of impairments described by McKenzie include dysfunction, derangement, and postural syndrome. Patients with dysfunction syndrome present with limited motion in their lumbar spine with pain at end range. Those with derangement syndrome demonstrate an unstable nucleus pulposus that shifts position and produces pain based on the direction of repetitive active lumbar movement. Patients with postural syndrome present with impaired posture and pain when normal tissues are placed in abnormal positions. Although this treatment-based approach emphasizes impairments, this system is limited to the treatment of patients with spinal pathology.

Maitland[26] also incorporated the work of Cyriax in a more global system of evaluation and treatment based on signs and symptoms. Although tissue pathology influences treatment, the essential elements that guide treatment are clinical signs and

symptoms. Use of this system by physical therapists requires that clinicians, when taking a history and performing an evaluation, recognize how clusters of signs and symptoms relate to different movement patterns. The effect of a specific treatment technique or program on reproducible signs and symptoms is reassessed to determine effectiveness.

Recently, an impairment-based diagnostic scheme for the upper extremity was described by Laslett.[27] Using this system, patients with tissue tightness in their shoulders are classified with *dysfunction* and typically present with limited and painful end range motion. These patients may have several pathologies, including myofascial restrictions, adhesive capsulitis, or secondary impingement. Patients with shoulder *derangement* present with full active and passive ROM but with a painful arc or pain or catching in the midrange of humeral elevation. Examples of pathologies in this category include labral tears or osteochondral fractures in the GH joint.

The contributions provided by these professionals have given physical therapists their own unique language and a process of clinical decision making based on the precepts of their professional training as clinical movement experts.

As the profession evolved through the 20th century, the need for a diagnostic classification system that accurately reflected practice patterns in physical therapy became apparent.[1] Today, the use of a disablement paradigm to guide clinical practice has been advocated.[1–5] Reviewing the process of disablement demonstrates how this model conforms to the scope of practice and definition of physical therapy.

PROCESS OF DISABLEMENT

The physical therapy model for musculoskeletal rehabilitation is based on *disablement* and focuses on the evaluation and treatment of impairments.[2] *Disablement* describes how disease or tissue pathology can lead to *impairments* and affect function (Fig. 4–1). For example, patients with severe rotator cuff tendonitis (tissue pathology) can have limited range of motion (impairment) and may not be able to comb their hair with the involved extremity (loss of function). Impairments, as mentioned previously, are the discrete losses or alterations in anatomy, structure, and action in body parts.[2] Specific impairments in the musculoskeletal system include loss of range of motion and muscle strength, abnormal posture, muscle spasms, and pain. Impairments may lead to *functional limitations* if accompanied by a restriction in the ability to perform a physical action, activity, or task in an efficient or expected manner. *Disability* results if an individual is unable to engage in age-specific, gender-specific, or sex-specific roles in a social context. In an effort to provide a framework for understanding and organizing physical therapy practice, the American Physical Therapy Association has incorporated these principals into a comprehensive guide that focuses on optimizing function through evaluation, treatment, prevention, and wellness strategies.[1] The evolution of the disablement model is presented in Chapter 3.

FIGURE 4–1. Nagi's Model of Disablement (Adapted from Nagi, SZ: Some conceptual issues in disability and rehabilitation. In Sussman, MB, (ed): Sociology and Rehabilitation: American Sociological Association, Washington, DC, 1965.)

GUIDE TO PHYSICAL THERAPIST PRACTICE

As stated in the *Guide to Physical Therapist Practice* (the *Guide*),[1] physical therapy seeks to embrace the process of disablement as the foundation for evaluation and treatment. This document includes newly revised descriptions of patient management, as well as preferred practice patterns or categories of diagnoses based on clusters of common impairments (Table 4–6). Preferred practice patterns are diagnostic groups defined by a common set of impairments and functional limitations, rather than pathologies. These practice patterns describe the boundaries within which physical therapists may select a number of clinical paths. Patients with different pathologies but with similar impairments may be classified in the same group. Because many shoulder conditions, regardless of their medical diagnoses, present with a common set of clinical findings, physical therapists should cluster these conditions under a common label of impairments.

Each practice pattern contains five elements, including examination, evaluation, diagnosis, prognosis, and intervention (Fig. 4–2). Through the examination (history, systems review, and tests and measures), the physical therapist identifies impairments, functional limitations, disabilities, or changes in physical function or health. The physical therapist performs an evaluation (makes clinical judgments) for the purpose of establishing the diagnosis and the prognosis. A *diagnosis*, a label encompassing a cluster of signs and symptoms, syndromes, or categories, is a result of the examination process, which includes evaluating, organizing, and interpreting examination data. An example of a musculoskeletal diagnosis for the shoulder is impingement syndrome due to impaired motor control. This diagnosis identifies a specific impairment, which guides treatment.

TABLE 4–6 Musculoskeletal Preferred Practice Patterns

Practice Pattern	Impairments
Pattern A	Primary prevention / risk factor reduction for skeletal demineralization
Pattern B	Impaired posture
Pattern C	Impaired muscle performance
Pattern D	Impaired joint mobility, motor function, muscle performance, and range of motion associated with capsular restriction
Pattern E	Impaired joint mobility, muscle performance, and range of motion associated with ligament or other connective tissue disorders
Pattern F	Impaired joint mobility, motor function, muscle performance, and range of motion associated with localized inflammation
Pattern G	Impaired joint mobility, motor function, muscle performance, range of motion, or reflex integrity secondary to spinal disorders
Pattern H	Impaired joint mobility, muscle performance, and range of motion associated with fracture
Pattern I	Impaired joint mobility, motor function, muscle performance, and range of motion associated with joint arthroplasty
Pattern J	Impaired joint mobility, motor function, muscle performance, and range of motion associated with bony or soft tissue surgical procedures
Pattern K	Impaired gait, locomotion, and balance and impaired motor function secondary to lower extremity amputation

Adapted from the Guide to Physical Therapist Practice, 1998.[1]

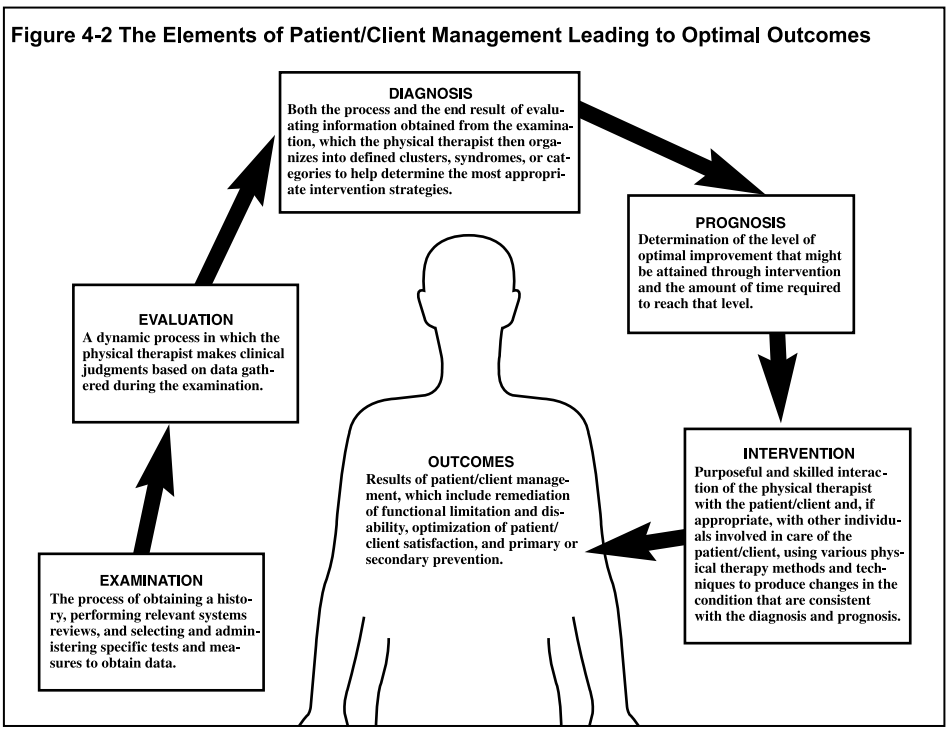

FIGURE 4–2. The Elements of Patient / Client Management Leading to Optimal Outcomes (From Guide to Physical Therapist Practice. Part One: Description of patient / client management and Part Two: Preferred practice patterns. Phys Ther 77:1163, 1997, with permission.)

Diagnosis by physical therapists differs from the medical diagnosis in its overall purpose and scope. Although the medical diagnosis is concerned with identifying the underlying pathology, diagnosis in physical therapy is concerned with determining its characteristics — the cause, nature, and extent of the problem. *Evaluation* in this model focuses on impairments, functional limitations, disabilities, or changes in physical health status resulting from injury, disease, surgical intervention, or other causes.

The *prognosis* is the determination of the optimal level of improvement that might be attained and the amount of time required to reach that level.[1] The prognosis includes establishing short and long-term goals. These goals are affected by degree of tissue pathology or extent of surgical procedure, general health condition of the patient including prior level of activity, and psychological factors. The physical therapist must consider these issues when developing treatment interventions.

Intervention is the purposeful and skilled interaction of the physical therapist with the patient to achieve treatment goals. Examples of musculoskeletal interventions include range of motion exercises, joint and soft tissue mobilization, flexibility exercises, strengthening and endurance training, proprioceptive exercises, and pain control with modalities.

The *Guide* is intended to serve as a changing and evolving document, which parallels the transition from the medical to the physical therapy model. The goal of this transition is to produce a uniform body of knowledge that clearly labels diagnostic categories of *selected* orthopedic conditions based on clusters of similar impairments. The following section presents a classification of shoulder conditions incorporating preferred practice patterns of the APTA.

CLASSIFICATION OF SHOULDER CONDITIONS

The APTA's *Guide to Physical Therapist Practice* classifies *dysfunction* based on clusters of impairments that are commonly attributed to various disorders, procedures, or conditions[1] (Table 4–7). Clustering impairments that occur in repeating patterns and result in functional limitations provide physical therapists with boundaries for effective treatment intervention. As the physical therapist becomes more experienced and proficient in recognizing these patterns in response to specific conditions, the hope is that clinical decision making and treatment pathways will become more refined and consistent. For example, restoring impaired shoulder mobility in a patient with a postoperative anterior stabilization procedure (pattern J) may follow treatment guidelines that are slightly different than restoring impaired mobility in a patient with adhesive capsulitis (pattern D). Protection of the anterior capsule in the early stages of rehabilitation is necessary for the patient who has had an anterior stabilization procedure. Pain and tissue inflammation are the primary limiting factors when restoring impaired mobility in the patient with adhesive capsulitis.

Every musculoskeletal practice pattern may not be appropriate for the shoulder. For example, pattern K refers to lower extremity amputation, which has little relevance for shoulder treatment. Other patterns, such as impaired posture (pattern B) and impaired muscle performance (pattern C), contain impairments that often occur concurrently with other conditions. When applied to the shoulder, impaired posture can be associated with impingement syndrome (pattern F) and impaired muscle performance can exist across multiple patterns (patterns D to J).

The clinician must also rule out all potential causes of shoulder symptoms when examining the shoulder. Chapter 10 integrates two musculoskeletal practice patterns (patterns B and G) and a neuromuscular practice pattern (pattern D) that include common conditions involving referred pain to the shoulder. These conditions include thoracic outlet syndrome, peripheral entrapment neuropathies, reflex sympathetic dystrophy, and adverse neural tension. This chapter integrates the relevant practice patterns to the principles of evaluation and treatment of the shoulder. The purpose of implementing practice patterns is to provide a meaningful classification, which guides treatment for physical therapists.

Pattern D

Practice pattern D involves impaired joint mobility, motor function, muscle performance, and range of motion associated with *capsular restriction*.

CLASSIFICATION

The primary impairment in pattern D is hypomobility due to capsular restriction. The term *adhesive capsulitis* is reserved for conditions where limited ROM is directly attributed to structural changes in periarticular tissues such as capsular contracture and adhesion formation. Because this condition also involves inflammation of the capsule, a patient with adhesive capsulitis could also be classified under musculoskeletal pattern F. Specific causes and pathophysiology of adhesive capsulitis will be discussed in Chapter 7. Secondary impairments in this pattern include decreased motor control and muscle performance. Practice pattern D also includes arthritic conditions of the shoulder girdle, which can also lead to capsular restriction, resulting in limited ROM.

TABLE 4–7 Classifications of Shoulder Conditions

APTA Practice Patterns	Impairments	Procedures / Tissue Pathology	Clinical Findings
1. Pattern D (Capsular restriction)	a. Motor function b. Muscle performance c. Joint mobility d. ROM	a. Capsulitis b. Bursitis c. Tendinitis	a. Pain b. Limited ROM c. Capsular pattern of restriction d. Altered scapulohumeral rhythm e. Crepitus f. (+) Impingement
2. Pattern E (Connective tissue disorders)	a. Motor function b. Muscle performance c. ROM d. Joint mobility	a. Tendinitis b. Capsulitis c. Bursitis d. Synovitis e. Labral pathology	a. Pain with movements above 90° elevation b. (+) Apprehension c. (+) Sulcus sign d. Altered scapulohumeral rhythm e. (+) Relocation sign
3. Pattern F (Localized inflammation)	a. Motor function b. Muscle performance c. ROM d. Joint mobility	a. Tendinitis b. Bursitis c. Capsulitis	a. (+) Impingement sign b. Pain at end range elevation c. Altered scapulohumeral rhythm d. Weak rotator cuff e. Pain with resisted tests f. Tight posterior capsule
4. Pattern G (Spinal disorders)	a. Motor function b. Muscle performance c. ROM d. Joint mobility	a. Neural tension b. Nerve root	a. (+) Upper limb tension tests b. (+) Thoracic outlet signs c. (+) Nerve root compression signs
5. Pattern H (Fractures)	a. ROM b. Muscle performance c. Joint mobility	a. Scapula b. Humerus c. Clavicle	Same as above
6. Pattern I (Joint arthroplasty)	a. Motor function b. Muscle performance c. Joint mobility d. ROM	a. Glenohumeral AC, SC joint arthritis b. Humeral neck / head fractures	Same as above
7. Pattern J (Bony / soft tissue surgical procedures)	a. Motor function b. Muscle performance c. Joint mobility d. ROM	a. Stabilization procedures b. Rotator cuff repair c. Capsule / labral repairs d. Debridement	Same as above

PATIENT PRESENTATION

Patients in pattern D present with a chief complaint of limited movement, usually accompanied by pain (Table 4–7). If structural changes are present, passive ROM will be restricted in a capsular pattern, a limitation of movement that occurs in a predictable pattern due to lesions in a joint capsule.[24] The pattern of glenohumeral restriction includes the greatest limitation in external rotation, followed by abduction, flexion, and internal rotation. Capsular limitation usually occurs after a period of immobilization following trauma or surgery (pattern H, I, J). Patients with shoulder hypomobility due to acute inflammation or internal derangement would have limitation in ROM in directions, which stress the inflamed tissue. Other findings include altered scapulohumeral rhythm and pain inhibition of inflamed tissues.

CLINICAL DECISION MAKING

The primary treatment goal in this category is restoring ROM. The concern for clinicians treating patients in this pattern is usually the degree of inflammation and irritability. Irritability is characterized by the following components: (1) pain intensity, (2) rigor of activity needed to elicit the symptoms, and (3) latent response of symptoms or how long it takes for the symptoms to resolve after provocation.[17] A highly irritable condition has a moderate to high intensity that is brought on by light activity and does not resolve within a few minutes. Patients presenting with capsular restriction and low irritability may require aggressive soft tissue and joint mobilization, whereas patients with high irritability may require pain-easing manual therapy techniques. Specific decision making in manual therapy of the shoulder will be discussed in Chapter 13.

Pattern E

Practice pattern E involves impaired joint mobility, muscle performance, and range of motion associated with *ligament* or *other connective tissue disorders.*

CLASSIFICATION

When applied to the shoulder, this pattern is referred to as instability. *Instability of the shoulder* is defined as excessive movement accompanied by specific signs and symptoms that interfere with function.[28] The cause of glenohumeral instability is a combination of ligamentous laxity and lack of neuromuscular control as defined in pattern E (Table 4–7). The ligaments serve as the primary restraints to movement, whereas the muscles around the shoulder provide secondary restraints.[11] The specific pathophysiology of instability will be discussed in Chapter 8. Although the primary impairment is instability, secondary impairments such as poor muscle performance may also exist.

PATIENT PRESENTATION

The chief complaint of patients with pattern E is typically pain with overhead movements, particularly in a position of abduction and external rotation (Table 4–7).

However, patients usually present with full active ROM and passive ROM. A history of the shoulder ''slipping'' or ''popping out'' during activities of daily living is often described. Activities usually associated with these symptoms include tennis serves, throwing, swimming backstroke, or playing volleyball. Physical examination may reveal impaired posture (pattern B), including excessive winging of the medial scapular border, downward rotation of the glenoid with excessive thoracic kyphosis.[29] Impaired posture can alter length-tension relationships of the muscles and joint arthrokinematics. Other common impairments include imbalances of the scapular and rotator cuff musculature and altered GH joint proprioception.

A positive apprehension sign, a positive relocation test, and a positive sulcus sign are used to confirm instability.[11] Chapter 8 will discuss special tests for instability.

As pattern E indicates, various tissue pathologies are common with this condition. Increased laxity of the ligaments and capsule require more dynamic control of the rotator cuff to hold the head of the humerus in the glenoid fossa. This increased stress can result in injury to the rotator cuff musculature.[12] Patients with this associated tissue pathology will usually have pain with resisted testing of the rotator cuff musculature. Increased translation can also result in glenoid labrum pathology or encroachment of the subacromial space causing secondary impingement. Patients with these tissue pathologies may test positive using Yergason's test, Speed's test, or impingement sign (see Chap. 8).

CLINICAL DECISION MAKING

Because nothing can be done in physical therapy to change capsular or ligamentous laxity, treatment for patients in this category must address motor control. *Motor control* is defined as the ability to learn or demonstrate the skillful and efficient assumption, maintenance, modification, and control of voluntary postures and movement patterns.[1] Addressing motor control problems involves treatment of impaired posture, abnormal movement patterns, dexterity, coordination, agility, and muscle weakness. Successful treatment results in enough dynamic stability to offset the inherent ligamentous laxity. Specific treatment strategies for neuromuscular control are described in Chapter 14.

Pattern F

Practice pattern F involves impaired joint mobility, motor function, muscle performance, and range of motion associated with *localized inflammation.*

CLASSIFICATION

Pattern F includes impaired ROM, motor function, and muscle performance attributed to inflammation. Conditions causing pain and muscle guarding without the presence of structural changes are included in this pattern (see Chap. 9). In these cases, the primary causes of hypomobility, impaired muscle performance and motor function, are attributed to a protective tissue response.[1] Protective tissue response is limitation in joint mobility due to pain, inflammation, muscle weakness or strain, neurovascular changes, sensory changes, or edema. Examples include the following: (1) sprains and strains of the acromioclavicular, sternoclavicular, and scapulothoracic

joints; (2) internal derangements of the GH joint, such as labral pathology and rotator cuff tears; and (3) acute inflammatory conditions due to overuse, such as tendonitis, bursitis, capsulitis, and tenosynovitis. If these conditions are treated with prolonged immobilization or they become chronic, structural changes in the joint may occur (adhesive capsulitis) and patients could also be classified in pattern D.

Primary impingement is a term used to describe many conditions in practice pattern F. Primary impingement is defined as an encroachment of the tendons and/or bursa in the subacromial space between the greater tuberosity of the humerus and the inferior surface of the acromion.[30] Repetitive impingement can occur with overhead activities, leading to tissue microtrauma and inflammation as defined in practice pattern F. Both intrinsic and extrinsic factors can contribute to the development of primary impingement.[30] Intrinsic factors involve structures in the subacromial space and include changes in vascularity of the rotator cuff, degeneration and thickening of the soft tissue structures, and anatomic or bony anomalies. Extrinsic factors include muscle imbalances, motor control problems, tightness of the posterior capsule, and postural changes (pattern B) that can disturb scapulohumeral rhythm. *Scapulohumeral rhythm* is the pattern of concomitant and coordinated movement of the shoulder girdle, which allows the greatest ROM for the upper limb.[31] Normal scapulohumeral rhythm results from synergistic muscle activity between the rotator cuff, scapular stabilizers, and glenohumeral musculature, which allows ideal length-tension relationships and proper arthrokinematics during upper extremity movement. The etiology of this condition will be discussed in greater detail in Chapter 9.

Secondary impingement is caused by glenohumeral instability and is therefore classified in the category of instability (pattern E).

PATIENT PRESENTATION

Patients in practice pattern F typically have pain with movement more than 90° elevation, particularly when combined with forceful internal rotation (Table 4–7). Range of motion may be limited by pain at end range elevation or end range horizontal adduction. Restriction in the acromioclavicular (AC) joint may be noted, as well as weakness of the rotator cuff, and tightness of the posterior capsule. Symptoms are usually reproduced with an impingement test or combined flexion, internal rotation, and horizontal adduction. Pain resulting from impingement usually goes away when humeral distraction is applied, opening up the subacromial space. The most common tissue pathologies associated with this condition include supraspinatus and bicipital tendonitis, subacromial bursitis, and synovitis.

CLINICAL DECISION MAKING

When treating patients in this pattern, a clinician must determine whether inflammation is due to intrinsic or extrinsic factors. Intrinsic factors such as bony anomalies and soft tissue thickening may need to be addressed through surgical intervention. Inflammation is addressed through antiinflammatory modalities and medication. Physical therapy treatment of this pattern usually addresses extrinsic factors. Restoring normal scapulohumeral rhythm requires treatment of impaired motor function, posture, muscle performance, and ROM.

Referred Pain Syndromes: Integration of Musculoskeletal Patterns B and G, and Neuromuscular Pattern D

Referred pain syndromes, integration of musculoskeletal patterns B and G, and neuromuscular pattern D, involve impaired joint mobility, motor function, muscle performance, range of motion, or reflex integrity secondary to *reflex sympathetic dystrophy, spinal disorders, thoracic outlet syndrome,* and *peripheral entrapment neuropathies.*

CLASSIFICATION

This category encompasses practice patterns related to impairments affecting tissues and structures in the upper quarter of the body. The upper quarter of the body includes the occiput and the temporomandibular joint, cervical spine, shoulder girdle and limbs, thoracic spine and contiguous soft tissue, neural, and visceral structures. Chapters 1 and 2 in this text, as well as other authorities, indicate the interrelationship of structure and function in the upper quarter. Several studies have found associated soft tissue and muscle imbalances, and postural changes in the presence of shoulder pain and injury.[23] Referred pain in the shoulder, or symptoms that originate from an area other than the shoulder, is a common finding.[32] Because several tissues in the upper quarter share the same C5 to C6 spinal innervation with the GH joint capsule, physical evaluation requires a thorough upper quarter screening. Referred pain syndromes of the shoulder are discussed in Chapter 10.

Common conditions that can cause altered shoulder movement or pain include cervical/thoracic dysfunction,[33] adverse neural tension,[34] thoracic outlet syndrome,[35] sympathetic pain,[36] and myofascial pain syndromes.[37] This classification addresses the close relationship of signs and symptoms between the cervical/thoracic spine and shoulder girdle. This category may also include postsurgical patients (patterns I and J) who develop reflex sympathetic dystrophy[36] and patients with impaired posture (pattern B).

Impaired posture is commonly associated with referred pain to the shoulder. Posture is the alignment and positioning of the body relative to gravity, center of mass, and base of support.[38] Ideal posture is a state of musculoskeletal balance that protects the supporting structures of the body against injury or progressive deformity.[1] Patients with impaired posture have functional limitation associated with impairments of muscle weakness and imbalance, pain, structural deviations from normal posture, and altered joint mobility.

According to the practice patterns, if impaired posture contributes to radicular symptoms such as pain, paresthesia, analgesia, and motor weakness usually attributed to nerve root or trunk irritation,[36] patients are classified in neuromuscular pattern B. For example, the relationship between impaired posture and referred symptoms includes irritation of the brachial plexus in the presence of forward head posture (thoracic outlet syndrome or adverse neural tension). Forward head posture is typically characterized by rounded shoulders, cervical back bending, and increased thoracic kyphosis.[38] This posture can lead to soft tissue restriction of the anterior shoulder musculature, suboccipital musculature, and shoulder rotators. The relationships among radicular signs, postural impairment, and shoulder symptoms provide a logical basis for clustering these patterns into one category.

PATIENT PRESENTATION

Physical examination may reproduce symptoms during cervical/thoracic spine provocation tests, upper limb tension tests, and thoracic outlet syndrome tests (Table 4–7). Patients in this classification may have full, pain-free ROM, and special tests of the shoulder may fail to yield any positive results. Additional findings can include impaired posture (as described previously), altered sensation, changes in deep tendon reflexes, and muscle weakness. If sympathetic involvement exists, findings may include trophic changes in the skin, hypersensitivity throughout the upper extremity, and circulatory disturbances.

CLINICAL DECISION MAKING

Determining treatment for patients in this category should involve consideration of the source of the symptoms and may involve mobilization of the cervical/thoracic spine, soft tissue structures, and nerves as they relate to shoulder dysfunction. If impaired posture is contributing to the dysfunction, clinicians may consider patient education for proper stretching, strengthening, and ergonomic postures.

Pattern H

Pattern H involves impaired joint mobility, muscle performance, and range of motion associated with *fracture.*

CLASSIFICATION

Patients in this category will have an upper extremity fracture that affects function of the shoulder complex. Primary impairments in this category are restricted range of motion and decreased muscle performance attributed to disuse.

PATIENT PRESENTATION

Patients usually present following a period of immobilization ranging from 3 to 6 weeks. Hypomobility of the GH joint, with possible involvement of the AC or sternoclavicular (SC) joints, is usually noted. Atrophy of the deltoid and rotator cuff musculature may be observed. As a result of this atrophy, a ‘‘squaring’’ of the acromion may be noted. Resisted muscle testing may yield generalized muscle weakness of the shoulder girdle musculature.

CLINICAL DECISION MAKING

Treatment of patients in this category will focus on addressing impaired joint mobility and impaired muscle performance. Clinicians treating patients following a fracture are faced with many considerations. Patient age, presence of osteoporosis, location of the fracture, type of fracture, and type of reduction can all affect rehabilitation. Although most fractures heal within 5 to 8 weeks, clinicians must understand the individual healing constraints that guide treatment.

Patterns I and J

Patterns I and J involve impaired joint mobility, motor function, muscle performance, and range of motion associated with *joint arthroplasty* or *surgical procedures.*

CLASSIFICATION

Clinicians treating patients following soft tissue surgical procedures or total joint arthroplasty must consider healing constraints when addressing impaired ROM, motor function, and muscle performance. The type of surgical approach used will affect the rehabilitation program. Some procedures require the surgeon to perform an arthrotomy to create a larger field of vision or to have more room for surgical repair. However, arthrotomy involves opening the joint capsule, resulting in more tissue damage than arthroscopy. Additional tissue damage may occur when a surgeon uses muscle resection instead of muscle splitting. Muscle splitting is the process of entering a joint capsule through intervals in the muscle belly, rather than cutting through muscle fibers and resecting the tissue. More pain, swelling, and muscle inhibition occur with more tissue damage. Surgical fixation and, in the case of joint arthroplasty, the type of prosthesis used and use of cement should also be considered in rehabilitation.

PATIENT PRESENTATION

Similar to practice pattern H (fractures), patients in practice patterns I and J usually present following a period of immobilization ranging from 3 to 6 weeks. Hypomobility of the shoulder girdle is usually noted resulting from the period of immobilization and soft tissue scarring. Atrophy of the deltoid and rotator cuff musculature may be observed, resulting in a ‘‘squared’’ appearance of the acromion. Resisted muscle testing may yield generalized muscle weakness of the shoulder girdle musculature.

CLINICAL DECISION MAKING

When treating impairments in a patient who has had a soft tissue surgical procedure or a total shoulder arthroplasty, several considerations must be addressed. The extent of the tissue pathology, location of tissue pathology, and type of surgical fixation will affect treatment progression. By knowing the location, extent of tissue damage, and type of fixation, a clinician will know which exercises and motions are safe and which to avoid. In addition, clinicians must understand soft tissue healing constraints to ensure that patients are progressed quickly enough to avoid complications, but not at a rate that can compromise the surgical procedure.

CHAPTER SUMMARY

The medical model of diagnosing pathology to determine treatment strategies is not consistent with the practice of physical therapy for identifying and correcting impairments to optimize function. Subsequently, the impairment-based diagnosis of

shoulder conditions was developed to provide a framework for developing clinical guidelines for rehabilitation.

Differential diagnosis of selected shoulder conditions formally introduced and popularized by Codman,[7] recognized the importance of clinical diagnosis by clustering signs and symptoms to pathology. His system of differential diagnosis served as a template for the evolution of the medical model. Neer[10] further refined the process of differential diagnosis by offering a comprehensive description of mechanical impingement with specific correlated impairments. The identification and correction of the underlying impairment became as important to treatment as identifying the tissue pathology. Patients with rotator cuff tendonitis were differentiated with either glenohumeral hypermobility or hypomobility. Restoration of normal shoulder mobility to prevent recurrent problems was a primary goal of treatment.

The role and scope of physical therapy practice based on the theoretical framework of movement science became increasingly focused on the identification and correction of patients with impairments and functional limitations. Therapists such as McKenzie and Maitland, spurred by Cyriax, formulated systems of physical therapy diagnosis based on impairments. These systems provided the framework for treatment consistent with the scope and goals of physical therapy practice. The process of disablement recently outlined by the APTA into ''preferred practice patterns,'' provided boundaries within which physical therapists can choose different clinical paths. Impairment-based categories of shoulder injuries are designed to help physical therapists practice in a framework consistent with the process of disablement; that is, the impact of conditions on function. For physical therapists to remain accountable to the public they serve, like other health-care professionals, they must practice in a manner consistent with the scope of their practice.

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