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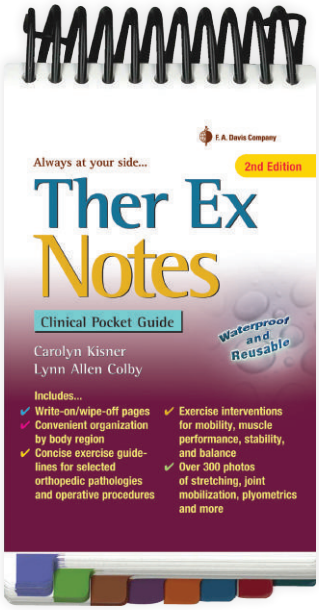

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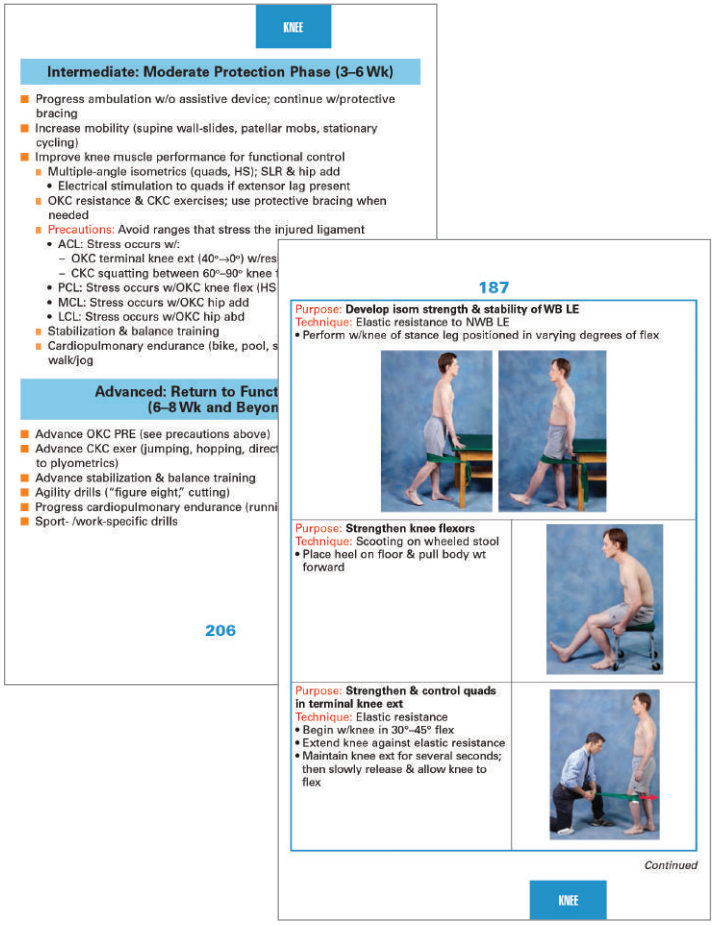

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To Jerry, Craig and Kathleen, Jodi, and our grandchildren—as always, thank you for your love and support.
—CK

To Rick and my extended family—a source of constant support and joy.
—LC

To Alex and our children—for your support, inspiration, and hope.
—JB

To our parents—who were supportive throughout our lives.

To our students—who have taught us so much.

To our colleagues—who have been helpful and stimulating in our professional growth.
—LC, CK, and JB

Preface to the Seventh Edition

When Lynn Colby and I first began writing a book on therapeutic exercise over 30 years ago, it was simply an idea to fill a basic need in the education of physical therapists. Our first effort was a soft-cover product in outline form that was primarily marketed as a laboratory manual. The evolution of each succeeding edition came about from our creative insights and collaborative efforts to bring to the student and professional community the most up-to-date resource possible. Lynn has decided that this is the last edition with which she will be involved—I will miss her exceptional abilities, her collegiality, and the partnership that has grown over the years. I am at a loss to know how to thank her for her many years of love and dedication to this project and the friendship that has developed through our partnership. I simply say, thank you Lynn. Enjoy your well-deserved retirement.

For this edition we brought on a new co-author, John Borstad, PT, PhD. He was a contributor in our 6th edition and has been involved in other publications and research. You will see his name on many of the chapters in this edition as he has stepped into the roles of updating, revising, and editing. His biographical information follows in the About the Authors section. It is exciting to have him on board, and I look forward to our ongoing collaborative efforts.

The authors and contributors of this book have continually sought to incorporate current trends and research to support the foundational concepts of therapeutic exercise on which the student can learn and the practitioner can grow in their expertise of treating patients. In addition to the extensive and thorough revisions of content, the Focus on Evidence and Clinical Tips features, as well as links to video demonstrations of key interventions, are again highlighted in this edition. Whenever applicable, ***Clinical Practice Guidelines (CPGs)*** are included within the Focus on Evidence sections.

We have added a new chapter on Exercise in the Older Adult (Chapter 24). With this being such a critical area of practice in physical therapy, we anticipate that the content of the chapter will provide a foundation of information and suggested interventions that all practitioners will find useful when working with older individuals. There has also been important updating of information on use of the ICF language (International Classification of Functioning Disability and Health) in Chapter 1; an expansion of information on prevention, health, and wellness in Chapter 2; and incorporation of managing male incontinence in Chapter 25. With the expanding use of the Internet we decided to move some of our tables, boxes, and glossary online. When these resources are available, the reader will be referred to the F.A. Davis website associated with this edition for easy access to this feature.

As with previous editions, it is our hope that this updated text will provide a resource for learning and professional growth for the students and health-care practitioners who utilize therapeutic exercise.

Acknowledgments

We wish to acknowledge and express our sincere gratitude to the educators and clinicians who contributed their knowledge, insights, and professional perspectives to the revision of this edition.

A special thank you to Vicky Humphrey for editing the ancillary features for faculty that are associated with this edition and for her contributions to the pocket version ***Ther Ex Notes, ed. 2.***

A special thank you goes to Marsha Hall, Project Manager, Progressive Publishing Services, who spearheaded the copy-editing and production process. And once again, a special thank you to the F. A. Davis staff, particularly to our Senior Acquisitions Editor, Melissa Duffield, and to our Senior Developmental Editor, Jennifer Pine, both of who helped bring the 7th edition to fruition.

About the Authors

Carolyn Kisner, PT, MS

Carolyn was on the faculty at The Ohio State University for 27 years and was awarded Emeritus status after taking early retirement. During her tenure at OSU she received the Excellence in Teaching award from the School of Allied Medical Professions and was recognized as Outstanding Faculty by the Sphinx and Mortarboard Honor Societies. She organized and managed the honors and research program for the Physical Therapy Division, managed the Advanced Orthopedic track in the master's program, and advised numerous graduate students. Carolyn then taught at the College of Mount St. Joseph in Cincinnati for 7 years. During her tenure there she chaired the curriculum committee, which coordinated revision of the master's program and developed the entry-level Doctor of Physical Therapy program. She was awarded the Sister Adele Clifford Excellence in Teaching at the Mount and at the spring convocation in 2010 was awarded with the Lifetime Achievement in Physical Therapy.

Carolyn co-authored the textbook *Therapeutic Exercise: Foundations and Techniques* with Lynn Colby, PT, MS, first published in 1985. She and Lynn have always attempted to maintain current with the trends in physical therapy, which is reflected in each of the revisions of this book; they have also co-authored the pocket-sized flip book titled *Ther Ex Notes: Clinical Pocket Guide*. Her primary teaching experience includes medical kinesiology, orthopedic evaluation and intervention, therapeutic exercise, and manual therapy. She has presented numerous workshops on peripheral joint mobilization, spinal stabilization, kinesiology, gait, and functional exercise both nationally and internationally, including multiple visits to the Philippines, Brazil, Canada, and Mexico. Active clinical involvement throughout her career has primarily been in outpatient orthopedics and home health.

Lynn Allen Colby, PT, MS

Lynn Allen Colby is Assistant Professor Emeritus, The Ohio State University (OSU). She received her BS in physical therapy and MS in Allied Medicine from OSU, Columbus, Ohio. She is co-author of the textbook, *Therapeutic Exercise: Foundations and Techniques*, now in its 7th edition, and *Ther Ex Notes: Clinical Pocket Guide.*

Recently retired, she taught in the physical therapy program in the School of Allied Medical Professions at OSU for 35 years. As a faculty member, she also advised physical therapists enrolled in the postprofessional graduate program in Allied Medicine. Her primary teaching responsibilities in the physical therapy curriculum included therapeutic exercise interventions for musculoskeletal and neurological conditions and pediatric physical therapy. Experience in the clinical setting has included acute care in orthopedics, extended care in skilled nursing facilities, and inpatient and outpatient care in various pediatric settings.

During her long career in physical therapy, she was a recipient of the Excellence in Teaching Award from the School of Allied Medical Professions at OSU and was named the Ohio Physical Therapist of the Year in 2001 by the Ohio Physical Therapy Association. Most recently, she was honored by the OSU Alumni Association with the Ralph Davenport Mershon Award for Service and Leadership.

John Borstad, PT, PhD

John is professor and chair at the College of St. Scholastica in Duluth, Minnesota. After 7 years as a clinician, he began the academic phase of his career in 1999 at the University of Minnesota, earning a PhD in Rehabilitation Science in 2003. He spent the next 13 years on the faculty of the Physical Therapy Division in the School of Health and Rehabilitation Sciences at The Ohio State University. While at Ohio State, he was funded by the NIH, the Komen Foundation, and NHTSA to study shoulder biomechanics and to advise and train several MS and PhD students. John has presented his research at many national and international forums, including in Scotland, Japan, and Brazil. He was a co-author on the study that received the Rose Research Award for Excellence in Orthopaedic Physical Therapy Research in 2005 and received the School of Health and Rehabilitation Sciences Faculty Research Award in 2007. He moved back to his home state of Minnesota in 2016 to begin serving in academic leadership at St. Scholastica.

John has taught biomechanics, musculoskeletal science and application, evidence-based practice, and advanced therapeutic progressions during his academic career. In addition to being a contributor to the 6th edition of *Therapeutic Exercise: Foundations and Techniques*, he has co-authored textbook chapters related to the shoulder for Levangie and Norkin's *Joint Structure and Function: A Comprehensive Analysis* and for *Grieve's Musculoskeletal Physiotherapy*.

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Brief Contents

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CHAPTER 1

Therapeutic Exercise: Foundational Concepts

VICKY N. HUMPHREY, PT, MS ■ LYNN ALLEN COLBY, PT, MS

Almost everyone, regardless of age, values the ability to function as independently as possible during activities of everyday life. Health-care consumers (patients and clients) typically seek out or are referred for physical therapy services because of physical impairments associated with disorders of the movement system caused by injury, disease, or health-related conditions that restrict their ability to participate in any number of activities that are necessary or important to them. Physical therapy services may also be sought by individuals who have no impairments or functional deficits but who wish to improve their overall level of fitness and quality of life or reduce the risk of injury or disease. An individually designed therapeutic exercise program is almost always a fundamental component of the physical therapy services provided. This stands to reason because the ultimate goal of a therapeutic exercise program is the achievement of an optimal level of symptom-free movement during basic to complex physical activities.

To develop and implement effective exercise interventions, a therapist must understand how the many forms of exercise affect tissues of the body and body systems and how those exercise-induced effects have an impact on key aspects of physical function as they relate to the human movement system. A therapist must also integrate and apply knowledge of anatomy, physiology, kinesiology, pathology, and the behavioral sciences across the continuum of patient/client management from the initial examination to discharge planning. To develop therapeutic exercise programs that culminate in positive and meaningful functional outcomes for patients and clients, a therapist must understand the relationships among physical functioning, health, and disability and apply these conceptual relationships to patient/client management to facilitate the provision of effective and efficient health-care services. Lastly, a therapist, as a patient/client educator, must know and apply principles of motor learning and motor skill acquisition to exercise instruction and functional training.

Therefore, the purpose of this chapter is to present an overview of the scope of therapeutic exercise interventions used in physical therapy practice. This chapter also discusses several models of health, functioning, and disability as well as patient/client management as they relate to therapeutic exercise and explores strategies for teaching and progressing exercises and functional motor skills based on principles of motor learning.

Therapeutic Exercise: Impact on Physical Function

Of the many procedures used by physical therapists in the continuum of care of patients and clients, therapeutic exercise takes its place as one of the key elements that lies at the center

of programs designed to improve or restore an individual's function or to prevent dysfunction.[4]

Definition of Therapeutic Exercise

Therapeutic exercise[4,5] is the systematic, planned performance of physical movements, postures, or activities intended to provide a patient/client with the means to:

- Remediate or prevent impairments of body functions and structures.
- Improve, restore, or enhance activities and participation.
- Prevent or reduce health-related risk factors.
- Optimize overall health, fitness, or sense of well-being.

The beneficial effects of therapeutic exercise for individuals with a wide variety of health conditions and related physical impairments are documented extensively in the scientific literature[182] and are addressed in each of the chapters of this textbook.

Therapeutic exercise programs designed by physical therapists are *individualized* to the unique needs of each patient or client. A *patient* is an individual with impairments and functional deficits diagnosed by a physical therapist and is receiving physical therapy care to improve function and prevent disability.[4] A *client* is an individual without diagnosed movement dysfunction who engages in physical therapy services to promote health and wellness and to prevent dysfunction.[4] Because the focus of this textbook is on the management of individuals with body function and structure impairments, activity limitations, and participation restrictions, the authors have chosen to use the term "patient," rather than "client" or "patient/client," throughout this text. We believe that all individuals receiving physical therapy services must be active participants rather than passive recipients in the rehabilitation process to learn how to self-manage their health needs.

Components of Physical Function Related to Human Movement: Definition of Key Terms

The ability to function independently at home, in the workplace, within the community, or during leisure and recreational activities is contingent upon physical as well as psychological and social function. The multidimensional aspects of physical function encompass the diverse yet interrelated areas of movement performance that are depicted in Figure 1.1. These elements of function are characterized by the following definitions.

Balance. The ability to align body segments against gravity to maintain or move the body (center of mass) within the available base of support without falling; the ability to move the body in equilibrium with gravity via interaction of the sensory and motor systems.[4,94,107,125,166,169,170]

Cardiopulmonary endurance. The ability to perform moderate-intensity, repetitive, total body movements (walking, jogging, cycling, swimming, etc.) over an extended period of time.[2,115] A synonymous term is cardiopulmonary fitness.

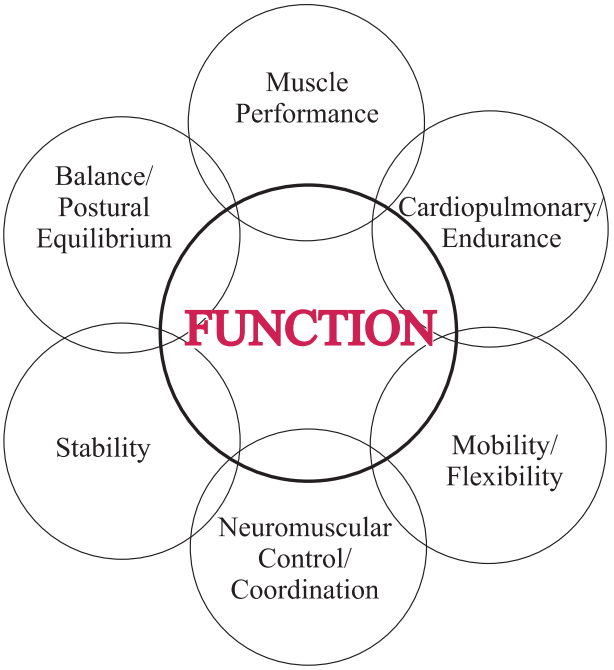

FIGURE 1.1 Interrelated components of physical function.

Coordination. The correct timing and sequencing of muscle firing combined with the appropriate intensity of muscular contraction leading to the effective initiation, guiding, and grading of movement. Coordination is the basis of smooth, accurate, efficient movement and occurs at a conscious or automatic level.[139,142,165]

Flexibility. The ability to move freely, without restriction; used interchangeably with mobility.

Mobility. The ability of structures or segments of the body to move or be moved in order to allow the occurrence of range of motion (ROM) for functional activities (functional ROM).[4,177] Passive mobility is dependent on soft tissue (contractile and noncontractile) extensibility; in addition, active mobility requires neuromuscular activation.

Muscle performance. The capacity of muscle to produce tension and do physical work. Muscle performance encompasses strength, power, and muscular endurance.[4]

Neuromuscular control. Interaction of the sensory and motor systems that enables synergists, agonists, and antagonists, as well as stabilizers and neutralizers, to anticipate or respond to proprioceptive and kinesthetic information and, subsequently, to work in correct sequence to create coordinated movement.[102]

Postural control, postural stability, and equilibrium. Used interchangeably with static or dynamic balance.[73,166,169]

Stability. The ability of the neuromuscular system through synergistic muscle actions to hold a proximal or distal body

segment in a stationary position or to control a stable base during superimposed movement.[73,169,177] Joint stability is the maintenance of proper alignment of bony partners of a joint by means of passive and dynamic components.[122]

The human movement system is the foundation for physical therapy and the focus for physical function.[160] The systems of the body that interact to control each of these elements of physical function react, adapt, and develop in response to forces and physical stresses (stress = force / area) placed upon tissues that make up the component parts of movement.[115,121,160] Gravity, for example, is a constant force that affects the musculoskeletal, neuromuscular, and circulatory systems. Additional forces, incurred during routine physical activities, help the body maintain a functional level of strength, cardiopulmonary fitness, and mobility. Imposed forces and physical stresses that are excessive can cause acute injuries, such as sprains and fractures, or chronic conditions, such as repetitive stress disorders.[121] The absence of typical forces on the body also can cause degeneration, degradation, or deformity. For example, the absence of normal weight bearing associated with prolonged bed rest or immobilization weakens muscle and bone.[2,3,17,121] Prolonged inactivity also leads to decreased efficiency of the circulatory and pulmonary systems.[2]

Impairment of any one or more of the body systems and subsequent impairment of any aspect of the human movement system, separately or jointly, can limit or restrict an individual's ability to carry out or participate in daily activities. Therapeutic exercise interventions involve the application of carefully graded physical stresses and forces that are imposed on the human movement system, specific tissues, or individual structures in a controlled, progressive, safely executed manner to enhance movement and improve the human experience.[5,160]

NOTE: In a recent article, Sahrmann[160]summarized the culmination of several decades of research by physical therapy leaders to more clearly define the role of physical therapy in health care. It has been proposed that physical therapy identify as a profession with a specific body system rather than with a type of intervention in order to gain professional recognition for content expertise. These proponents have defined the human movement system as a physiological system that represents the scope of practice and expertise of physical therapy. In this context, the human movement system is described as a separate physiological system comprised of interacting organs and systems including the nervous and musculoskeletal systems that produce movement and the pulmonary, cardiovascular, endocrine and integumentary systems that support movement.

Types of Therapeutic Exercise Interventions

Therapeutic exercise embodies a wide variety of activities, movements, and techniques. The individualized therapeutic exercise program is based on a therapist's determination of the underlying risk or cause of impairments in body function or structure, activity limitations, or participation restrictions as identified in the patient examination.[5] The types of therapeutic exercise interventions presented in this textbook are listed in Box 1.1.

NOTE: Although joint mobilization and manipulation procedures often are categorized as manual therapy techniques, not therapeutic exercise,[4] the authors of this textbook have chosen to include joint manipulative procedures under the broad definition of therapeutic exercise to address the full scope of soft tissue stretching techniques.

Exercise Safety

Regardless of the type of therapeutic exercise intervention, safety is a fundamental consideration whether the exercises are performed independently or under a therapist's direct supervision. Patient safety, of course, is paramount; nonetheless, the safety of the therapist also must be considered, particularly when the therapist is directly involved in the application of an exercise procedure or a manual technique.

Many factors can influence a patient's safety during exercise. Prior to engaging in exercise, a patient's health history and current health status must be explored. A patient unaccustomed to physical exertion may be at risk for the occurrence of an adverse effect from exercise associated with a known or an undiagnosed health condition. Medications can adversely affect a patient's balance and coordination during exercise or cardiopulmonary response to exercise. Therefore, risk factors must be identified and weighed carefully before an exercise program is initiated. Medical clearance from a patient's physician may be indicated before beginning an exercise program.

The environment in which exercises are performed also affects patient safety. Adequate space and a proper support surface for exercise are necessary prerequisites for patient safety. If exercise equipment is used in the clinical setting or at home, to ensure patient safety the equipment must be well maintained and in good working condition, must fit the patient, and must be applied and used properly.

Specific to each exercise in a program, the accuracy with which a patient performs an exercise affects safety, including proper posture or alignment of the body, execution of the correct movement patterns, and performance of each exercise

BOX 1.1 Therapeutic Exercise Interventions

- Aerobic conditioning and reconditioning
- Muscle performance exercises: strength, power, and endurance training
- Stretching techniques including muscle-lengthening procedures and joint mobilization/manipulation techniques
- Neuromuscular control, inhibition, and facilitation techniques and posture awareness training
- Postural control, body mechanics, and stabilization exercises
- Balance exercises and agility training
- Relaxation exercises
- Breathing exercises and ventilatory muscle training
- Task-specific functional training

with the appropriate intensity, speed, and duration. A patient must be informed of the signs of fatigue, the relationship of fatigue to the risk of injury, and the importance of rest for recovery during and after an exercise routine. When a patient is being directly supervised in a clinical or home setting while learning an exercise program, the therapist can control these variables. However, when a patient is carrying out an exercise program independently at home or at a community fitness facility, patient safety is enhanced and the risk of injury or re-injury is minimized by effective exercise instruction and patient education. Suggestions for effective exercise instruction and patient education are discussed in a later section of this chapter.

As mentioned, therapist safety also is a consideration to avoid work-related injury. For example, when a therapist is using manual resistance during an exercise designed to improve a patient's strength or is applying a stretch force manually to improve a patient's ROM, the therapist must incorporate principles of proper body mechanics and joint protection into these manual techniques to minimize his or her own risk of injury.

Throughout each of the chapters of this textbook, precautions, contraindications, and safety considerations are addressed for the management of specific health conditions, impairments, activity limitations, and participation restrictions and for the use and progression of specific therapeutic exercise interventions.

Classification of Health Status, Functioning, and Disability—Evolution of Models and Related Terminology

Background and Rationale for Classification Systems

Knowledge of the complex relationships among health status, functioning, and disability provides a foundation for the delivery of effective health-care services.[87,153,174] Without a common conceptual understanding and vocabulary, the ability to communicate and share information across disciplines and internationally is compromised for research, clinical practice, academia, policy making, and legislation.[153,176,199]

Disablement refers to the impact and functional consequence of acute or chronic conditions, such as disease, injury, and congenital or developmental abnormalities, that compromise basic human performance and an individual's ability to meet necessary, customary, expected, and desired societal functions and roles.[85,123,193] Disability is more than a consequence of a medical condition; rather, it is part of the human condition that is experienced by everyone either temporarily or permanently.[76,199] The disabling process depends on countless factors, such as access to quality care, severity and duration of the condition, motivation and attitude of the patient, and support from family and society. Depending on individual variables and social support, the disabling course is altered and levels of functioning vary among patients with the same medical diagnosis.[85,123,176,193] Defining a person's ability to function in the presence or absence of a health condition is a complex task that is better understood if practitioners, researchers, educators, policy makers, and legislators are using the same vocabulary and classification system.

Models of Functioning and Disability—Past and Present

Early Models

Several models that describe disability have been proposed worldwide over the past several decades. Two early theories were the Nagi model [123,124] and the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) model for the World Health Organization (WHO).[67,75] The National Center for Medical Rehabilitation Research (NCMRR) created a third model that introduced individual risk factors for disability based on both physical and social risks.[126]

During the 1990s, physical therapists began to explore the potential use of disablement models and suggested that disablement schema and related terminology provided an appropriate framework for clinical decision-making in practice and research.[64,84,162] In addition, practitioners and researchers suggested that adoption of disablement-related language could be a mechanism to standardize terminology for documentation and communication in the clinical and research settings.[65] The American Physical Therapy Association (APTA) subsequently incorporated an extension of the Nagi disablement model and related terminology in its consensus document, the *Guide to Physical Therapist Practice* [4] (often called the *Guide*) in both its first edition in 1997 and second edition in 2001. Within the profession, this created a unifying force for documentation, communication, clinical practice, and research by designating a disablement framework for organizing and prioritizing clinical decisions made during the continuum of physical therapy care.

The conceptual frameworks of the Nagi, ICIDH, and NCMRR models, although applied widely in clinical practice and research, have been criticized internationally for their perceived focus on pathology.[41] These early models all describe a *unidirectional* path toward disability caused directly by the consequences of disease based on a medical-biological description without consideration of environmental or social influences.[41,176] In response to these criticisms, the WHO undertook a broad revision of its ICIDH model, and in 2001 the International Classification of Functioning, Disability, and Health (ICF) was introduced and characterized as a biopsychosocial model where environmental factors and personal factors are integrated into the concept of functioning and disability (Fig. 1.2).[76,77,173,174,175]

While the ICF is used to classify functioning and disability associated with health conditions, the WHO has a companion classification system to classify health conditions (diseases, disorders, and injuries) called the International Classification of Disease (ICD). Together, the use of these two classification systems provides a broader and more

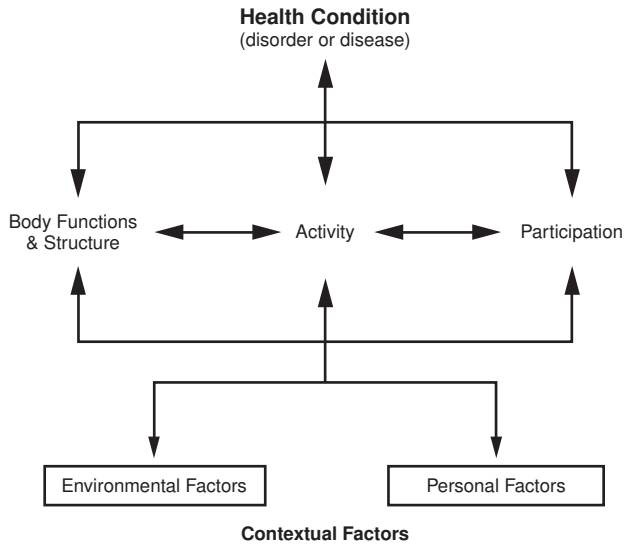

FIGURE 1.2 The ICF Framework.

meaningful picture of the health of both individuals and populations worldwide.[77]

The ICF—An Overview of the Model

Unlike previous models, the ICF does not focus on disability or on disease, but is intended to classify and code different health and health-related states experienced by everyone. The ICF takes a neutral approach to the human experience as it relates to components of health and functioning, experienced by all people, not just people with disabilities.[76,77,199] The ICF also includes both environmental and personal factors that influence how people with or without disability live and participate in society.[41,77,199]

As shown in Table 1.1, the ICF model organizes information about health into two basic parts. The first, labeled *Part 1: Functioning and Disability,* is subdivided into two components: (1) Body Functions and Structures and (2) Activities and Participation. The two *umbrella* terms, functioning and disability, are based on the classification of body functions and structures combined with activities and participation. *Functioning* is characterized by positive interactions that are defined by the integrity of body functions and structures and the ability to perform activities and participate in life situations. In contrast, *disability* is characterized by the negative interactions of health situations defined as impairments in body functions and structures, activity limitations, and participation restrictions.[76,77]

The second, labeled *Part 2: Contextual Factors,* also shown in Table 1.1, is subdivided into two components: (1) Environmental Factors and (2) Personal Factors. Contextual factors represent the complete background of an individual's life and living situation.[77] Environmental factors make up the physical, social, and attitudinal circumstances in which the individual lives either with or without a health problem.[77] These factors are external to the individual but have either facilitating or hindering influences on the individual's performance at the levels of body functions and structures, execution of activities, and participation in society. For this reason, Part 1 of the model is not classified separately from Part 2 as they are hierarchal in their coding to represent the biopsychosocial paradigm of a person's health condition.[1,77,144]

TABLE 1.1 An Overview of the International Classification of Functioning, Disability and Health (ICF)*

	Part 1: Functioning and Disability		Part 2: Contextual Factors	
Components	***Body Functions and Structures***	***Activities and Participation***	***Environmental Factors***	***Personal Factors***
Domains	Body functions Body structures	Life areas (tasks, actions)	External influences on functioning and disability	Internal influences on functioning and disability
Constructs	Changes in body functions (*physiological*) Changes in body structures (*anatomical*)	*Capacity*: Executing tasks in a standard environment *Performance:* Executing tasks in the current environment	Facilitating or hindering impact of features of the physical, social, and attitudinal world	Impact of attitudes of the person
Functioning				
Positive aspect	Functional and structural integrity	Activities Participation	Facilitators	Not applicable
Disability				
Negative aspect	Functional and/or structural Impairment	Activity limitation Participation restriction	Barriers Hindrances	Not applicable

*From *International Classification of Functioning, Disability and Health: ICF*. Geneva: World Health Organization, 2008, p 13, with permission.

Definitions of key terms are summarized in Box 1.2.[76,77,184] Numerous examples of these components are identified later in this chapter.

NOTE: The ICF classification and coding methodology is also unique from other models in its unit of measure. The *individual* is not placed in a classification, but rather the coding describes the *situation* of each person within an array of health and health-related domains. The coding used in ICF is complex and multifactorial, with inclusion of health, functioning, and environmental elements combined to describe the ability of an individual to perform activities and participate in society.[1,41,77,88,174,175]

Components of the ICF and Applications in Physical Therapy

Background

Traditionally, the physical therapy profession has been defined by a body of knowledge and clinical applications that are directed toward the elimination or remediation of disability.[150] However, as the physical therapy profession has evolved, the scope of practice has moved beyond solely the management and remediation of disability and now includes promoting the well-being of healthy individuals and preventing or reducing risk factors that may lead to disability while considering the external environmental and internal personal factors that influence each person's response to their health condition.[6]

BOX 1.2 Definition of Key Terms in the ICF

- **Impairments in body function:** Problems associated with the physiology of the body systems (including psychological functions).
- **Impairments in body structure:** Problems with the anatomical features of the body.
- **Activity limitations:** Difficulties an individual may have in executing actions, tasks, and activities.
- **Participation restrictions:** Problems an individual may experience with involvement in life situations, including difficulties participating in self-care; responsibilities in the home, workplace, or the community; and recreational, leisure and social activities.
- **Contextual factors:** The entire background of an individual's life and living situation composed of:
  - **Environmental factors:** Factors associated with the physical, social, and attitudinal environment in which people conduct their lives; factors may facilitate functioning (facilitators) or hinder functioning and contribute to disability (barriers).
  - **Personal factors:** Features of the individual that are not part of the health condition or health state; includes age, gender, race, lifestyle habits, coping skills, character, affect, cultural and social background, education, etc.

In 2008, the APTA officially endorsed the biopsychosocial framework, vocabulary, and classification system of the ICF. This began a continuing initiative over the past decade to integrate this framework and vocabulary into research, clinical documentation, education, policy making, and legislation.[5,77,141] To facilitate use of the ICF in clinical practice, several articles have been published to provide suggestions for integrating the ICF into specific components of physical therapy practice, ethics, and patient management.[1,48,49,144,153] In 2013, the third edition of the *Guide* was published and is available only in an electronic version in order to facilitate timely updates to reflect the rapid changes in physical therapy practice, including the integration of ICF as the adopted framework for defining the realm of functioning and disability.[5]

For example, use of ICF language for documentation in the clinical setting is being encouraged.[16,141] The most noteworthy application of the ICF can be found in a series of clinical practice guidelines developed and published by the specialty sections of the APTA. These guidelines use the ICF as the basis for describing and classifying care provided by physical therapists.[58,95] Information from the guidelines addressing the efficacy of therapeutic exercise interventions for health conditions and associated impairments commonly seen in orthopedic physical therapy practice is discussed in the regional chapters of this textbook.

Health Conditions

Health conditions, based on the terminology of the ICF framework, are acute or chronic diseases, disorders, or injuries or circumstances such as aging, pregnancy, or stress that have an impact on a person's level of function (see Fig. 1.2).[76,77] Health conditions are the basis of a medical diagnosis and are coded using the WHO's companion classification system, the International Classification of Disease (ICD).[77]

Physical therapists in all areas of practice treat patients with a multitude of health conditions. Knowledge of health conditions is important background information, but it does not tell the therapist how to assess impairments in body function or structure or how to assess when activities are limited or participation is restricted as a result of the health condition. Despite an accurate medical diagnosis and a therapist's thorough knowledge of specific health conditions, the experienced therapist knows that two patients with the same medical diagnosis, such as rheumatoid arthritis, and the same extent of joint destruction (confirmed radiologically) may have very different severities of impairment, activity limitation, and participation restriction. Consequently, they may have very different degrees of disability. This emphasizes the need for physical therapists to always assess the impact of a particular health condition on movement and function when designing meaningful management strategies to improve functional abilities.

Body Functions and Body Structures

As noted previously, the first component of classification in Part 1 of the ICF is body functions and structures (see Table 1.1). Body functions are the physiological functions of the body,

whereas body structures describe the anatomical parts of the body. These domains of classification occur at the cellular, tissue, or body system level.

Types of Impairments

Impairments are defined by the loss of integrity of the physiological, anatomical, and/or psychological functions and structures of the body and are a partial reflection of a person's health status.

Some *impairments of body structure* are readily apparent during a physical therapy examination through visual inspection. Such impairments include joint swelling, scarring, presence of an open wound, lymphedema or amputation of a limb, or through palpation, such as adhesions, muscle spasm, and joint crepitus. Other structural impairments must be identified by a variety of imaging techniques, such as radiographic imaging to identify joint space narrowing associated with arthritis or magnetic resonance imaging (MRI) to identify a torn muscle or ligament.

Impairments of body function such as pain, reduced sensation, decreased ROM, deficits in muscle performance (strength, power, and endurance), impaired balance or coordination, abnormal reflexes, and reduced ventilation are those most commonly identified by physical therapists and managed with therapeutic exercise interventions. Some representative examples are noted in Box 1.3.

BOX 1.3 Common Body Function Impairments Managed With Therapeutic Exercise

Musculoskeletal
- Pain
- Muscle weakness/reduced torque production
- Decreased muscular endurance
- Limited range of motion due to:
  - Restriction of the joint capsule
  - Restriction of periarticular connective tissue
  - Decreased muscle length
  - Joint hypermobility
- Faulty posture
- Muscle length/strength imbalances

Neuromuscular
- Pain
- Impaired balance, postural stability, or control
- Incoordination, faulty timing
- Delayed motor development
- Abnormal tone (hypotonia, hypertonia, and dystonia)
- Ineffective/inefficient functional movement strategies

Cardiovascular/Pulmonary
- Decreased aerobic capacity (cardiopulmonary endurance)
- Impaired circulation (lymphatic, venous, and arterial)
- Pain with sustained physical activity (intermittent claudication)

Integumentary
- Skin hypomobility (e.g., immobile or adherent scarring)

Physical therapists typically provide care and services to patients with impairments associated with the musculoskeletal, neuromuscular, cardiovascular/pulmonary, and integumentary body systems when movement is compromised. In a biopsychosocial model, like the ICF, impairments are identified and documented as a first step to investigating the impact that a health condition has on activities and participation within the specific environment of the patient.

Primary and secondary impairments. Impairments may arise directly from the health condition (*direct/primary impairments*) or may be the result of preexisting impairments (*indirect/secondary impairments*). A patient, for example, who has been referred to physical therapy with a medical diagnosis of impingement syndrome or tendonitis of the rotator cuff (pathological condition), may exhibit primary impairments of body function, such as pain, limited ROM of the shoulder, and weakness of specific shoulder girdle and glenohumeral musculature during the physical therapy examination (Fig. 1.3 A and B). The patient may have developed

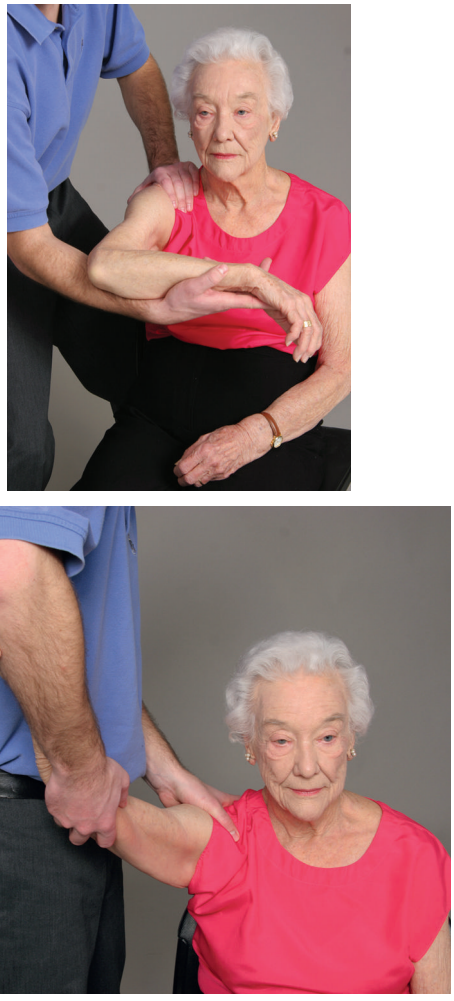

FIGURE 1.3 (A) Impingement syndrome of the shoulder and associated tendonitis of the rotator cuff (health condition/pathology) leading to **(B)** limited range of shoulder elevation (impairment of body function) are identified during the examination.

the shoulder pathology from a preexisting postural impairment (secondary impairment), which led to altered use of the upper extremity and impingement from faulty mechanics.

Composite impairments. When an impairment is the result of multiple underlying causes and arises from a combination of primary or secondary impairments, the term *composite impairment* is sometimes used. For example, a patient who sustained a severe inversion sprain of the ankle resulting in a tear of the talofibular ligament and whose ankle was immobilized for several weeks is likely to exhibit a balance impairment of the involved lower extremity after the immobilizer is removed. This composite impairment could be the result of chronic ligamentous laxity (body structure impairment) and impaired ankle proprioception from the injury or muscle weakness (body function impairments) due to immobilization and disuse.

Regardless of the types of physical impairment exhibited by a patient, a therapist must keep in mind that impairments manifest differently from one patient to another. An important key to effective patient management is to identify *functionally relevant impairments,* in other words, impairments that directly contribute to current or future activity limitations and participation restrictions in a patient's daily life. Impairments that can predispose a patient to secondary health conditions or impairments also must be identified.

Equally crucial for the effective management of a patient's condition is the need to analyze and determine, or at least infer and certainly not ignore, the *underlying causes* of the identified physical impairments of body function or body structure, particularly those related to impaired movement.[158,159,160] For example, are biomechanical abnormalities of soft tissues the source of restricted ROM? If so, which soft tissues are restricted, and why are they restricted? This information assists the therapist in the selection of appropriate, effective therapeutic interventions that target the *underlying causes* of the impairments, the impairments themselves, and the associated activity limitations and participation restrictions.

Although most physical therapy interventions, including therapeutic exercise, are designed to correct or reduce physical impairments of body function, such as decreased ROM or strength, poor balance, or limited cardiopulmonary endurance, the focus of treatment ultimately must be to improve performance of activities and participation in life events. From a patient's perspective, *successful outcomes* of treatment are determined by restoration of activities and participation levels.[144] A therapist cannot simply assume that intervening at the impairment level (e.g., with strengthening or stretching exercises) and subsequently reducing physical impairments (by increasing strength and ROM) generalize to improvement in a patient's level of activity and participation in work and social roles. Mechanisms for integrating task-specific training within the therapeutic exercise intervention are explored in a model of effective patient management presented in a later section of this chapter.

Activities and Participation

The second component of Part 1 of the ICF is Activities and Participation (see Table 1.1). *Activity* is defined as the execution of a task or action by an individual, whereas *participation* is the involvement of the individual in a life situation. The ICF structure of classification for this component is based on one single list of activities and life areas.[77] The therapist is encouraged to differentiate the components on a case by case basis depending on the patient's life situation. There has been extensive research to determine if these two components of functioning are distinct or interrelated.[1,26,89,144] Because of the varied environmental and personal influences (contextual factors), there is not a clear distinction between an individual's ability to perform a task and participation. Additional empirical research is recommended to provide a clearer operationalization of the two components to enhance data comparison between disciplines and countries.[77]

Activity Limitation and Participation Restriction

In the language of the ICF, *activity limitations* occur when a person has difficulty executing or is unable to perform tasks or actions of daily life (see Box 1.2).[41,76,77,173,174,175,184] For example, as shown in Figure 1.4, restricted ROM (impairment of body function) of the shoulder as the result of adhesive capsulitis (health condition) can limit a person's ability to reach overhead (activity limitation) while performing personal grooming or household tasks.

FIGURE 1.4 Limited ability to reach overhead (activity limitation) as the result of impaired shoulder mobility may lead to loss of independence in self-care and difficulty performing household tasks independently (participation restriction).

Many studies have linked body function impairments with activity limitations, particularly in older adults. Links have been identified between limited ROM of the shoulder and difficulty reaching behind the head or back while bathing and

dressing,[185] between decreased isometric strength of lower extremity musculature and difficulty stooping and kneeling,[71] as well as a link between decreased lower extremity peak power and reduced walking speed and difficulty moving from sitting to standing.[140] However, it should also be noted that a single or even several mild impairments of body function or structure do not consistently result in activity limitations for all individuals. For example, results of a 2-year observational study of patients with symptomatic hip or knee osteoarthritis (OA) demonstrated that increased joint space narrowing (a body structure impairment that is considered an indicator of progression of the disease) confirmed radiologically was not associated with an increase in activity limitations as measured on a self-report assessment of physical functioning.[24] Furthermore, evidence from other studies suggests that the severity and complexity of impairments must reach a critical level, which is different for each person, before degradation of functioning begins to occur.[134,143] These examples reinforce the ICF construct that environmental and personal factors interact with all aspects of functioning and disability. Thus, each individual experiences a unique response to a health condition.

Activity limitation. Activities and participation require the performance of sensorimotor tasks—that is, total body actions that typically are *components or elements* of functional activities. Activity limitations involve technical and physiological problems that are task-specific and related to performance. Box 1.4 identifies a number of activity limitations that can arise from physical impairments in body function or structure, involve *whole-body movements or actions,* and are necessary component motions of simple to complex daily living tasks. Defining limitations in this way highlights the importance of identifying abnormal or absent component motions of motor skills through task analysis during the physical therapy examination and later integrating task-specific functional motions into a therapeutic exercise program.

When a person is unable or has only limited ability to perform any of the whole-body component motions identified in Box 1.4, activities may be limited and participation may be restricted. The following is an example of the interplay of activities and participation in everyday life. To perform a basic home maintenance task such as painting a room, a person must be able to grasp and hold a paintbrush or roller, climb a ladder, reach overhead, kneel, or stoop down to the floor. If any one of these component movements is limited, it may not be possible to perform the overall task of painting the room. If the individual views home maintenance as a personal or social role, the inability to perform the task of painting may result in participation restriction.

An essential element of a physical therapy examination and evaluation is the analysis of motor tasks to identify the component motions that are difficult for a patient to perform.

BOX 1.4 Common Tasks Related to Activity Limitations

Difficulties with or limitation of:

- Reaching and grasping
- Lifting, lowering, and carrying
- Pushing and pulling
- Bending and stooping
- Turning and twisting
- Throwing and catching
- Rolling
- Sitting or standing tolerance
- Squatting (crouching) and kneeling
- Standing up and sitting down (from and to a chair, the floor)
- Getting in and out of bed
- Moving around (crawling, walking, and running) in various environments
- Ascending and descending stairs
- Hopping and jumping
- Kicking or swinging an object

This analysis helps the therapist determine why a patient is unable to perform specific daily living tasks. This information, coupled with identification and measurement of the impairments that are associated with the altered or absent component movement patterns, in turn, is used for treatment planning and selection of interventions to restore the ability to complete activities or to participate in personal, social, work, or life situations.

Participation restrictions. As identified in the ICF model (see Table 1.1), participation restrictions are defined as problems a person may experience in his or her involvement in life situations as measured against social standards (see Box 1.2).[76,77,173,174,175,184] More specifically, participation restriction is about not being able to take part in social practices in situations of significance or meaningfulness in the context of a person's attitudes and environment (contextual factors).[26,144]

Social expectations or roles that involve interactions with others and participation in activities are an important part of the individual. These roles are specific to age, gender, sex, and cultural background. Categories of activities or roles that, if limited, may contribute to participation restrictions are summarized in Box 1.5.

Contextual Factors

In the ICF, Part 2 consists of *contextual factors,* once again divided into two components: (1) *environmental factors* and (2) *personal factors.* These classifications represent the external and internal domains that influence functioning and disability, taking into consideration the complete

BOX 1.5 Areas of Functioning Associated With Participation Restrictions

- Self-care
- Mobility in the community
- Occupational tasks
- School-related tasks
- Home management (indoor and outdoor)
- Caring for dependents
- Recreational and leisure activities
- Socializing with friends/family
- Community responsibilities and service

background of an individual's life and living situation (see Table 1.1).

Environmental factors are outside of the individual, but every feature of the physical, social, and attitudinal world has either a facilitating or hindering impact on functioning and disability. [77]

Because disability is such a complex concept, the extent to which each aspect of functioning affects one's perceived level of disability is not clearly understood. An assumption is made that when impairments and activity limitations are so severe or of such long duration that they cannot be overcome to a degree acceptable to an individual, a family, or society, the perception of "being disabled" occurs.[143] The perception of disability is highly dependent on a person's or society's expectations of how or by whom certain roles or tasks *should* be performed.

Personal factors are unique to the individual and may include characteristics such as race, gender, family background, coping styles, education, fitness, and psychological assets.[77]

NOTE: Because personal factors are features of the individual, they are not part of the health condition, and they are not classified or coded in the ICF (see Table. 1.1). However, they must be considered in any provision of care because they will influence the outcome of the intervention.[77]

The Role of Prevention

Understanding the relationships among a health condition, impairments, activity limitations, participation restrictions, and the impact of environmental and personal factors on functioning is fundamental to the prevention or reduction of disability.[25,61,85] Disability is not caused by any one level of impairment or activity limitation or participation restriction; rather, the process is bidirectional and complex.

Take, for example, a relatively inactive person with long-standing osteoarthritis of the knees. The inability to get up from the floor or from a low seat (activity limitation) because of limited flexion of the knees and power deficits of the hip and knee extensors (impairments in body function) could indeed lead to restricted participation in life's activities and disability in several areas of everyday functioning. Disability could be expressed by problems in self-care (inability to get in and out of a tub or stand up from a standard height toilet seat), home management (inability to perform selected housekeeping, gardening, or yard maintenance tasks), or community mobility (inability to get into or out of a car or van independently).

The perception of disability possibly could be minimized if the patient's functional ROM and strength can be improved with an exercise program and the increased ROM and strength are incorporated into progressively more challenging functional activities or if the physical environment can be altered sufficiently with the use of adaptive equipment and assistive devices.

Adjusting expected roles or tasks within the family might also have a positive impact on the prevention or reduction of disability. Factors within the individual also can have an impact on the prevention, reduction, or progression of disability. Those factors include level of motivation or willingness to make lifestyle changes and accommodations as well as the ability to understand and cope with an adjusted lifestyle.[193] This example highlights that inherent in any discussion of disability is the assumption that it can be prevented or remediated.[25]

Categories of prevention. Prevention falls into three categories.[4]

- *Primary prevention:* Activities such as health promotion designed to prevent disease in an at-risk population.
- *Secondary prevention:* Early diagnosis and reduction of the severity or duration of existing disease and sequelae.
- *Tertiary prevention:* Use of rehabilitation to reduce the degree or limit the progression of existing disability and improve multiple aspects of function in persons with chronic, irreversible health conditions.

Therapeutic exercise, the most frequently implemented physical therapy intervention, has value at all three levels of prevention. Health and wellness have moved to the forefront of health care, and physical therapists are becoming involved in wellness screens, community health fairs, and annual checkups as a form of primary prevention. The use of resistance exercises and aerobic conditioning exercises in weight-bearing postures is often advocated for the primary and secondary prevention of age-related osteoporosis.[40,70] In addition, therapists who work with patients with chronic musculoskeletal or neuromuscular diseases or disorders routinely are involved with tertiary prevention of disability.

Risk Factors

Modifying risk factors through an intervention, such as therapeutic exercise, is an important tool for preventing or reducing the impact of health conditions and subsequent impairments, activity limitations, and participation restrictions associated with disability. Risk factors are influences

or characteristics that predispose a person to impaired functioning and potential disability. As such, they exist *prior to* the onset of a health condition and associated impairments, limitations, or restrictions.[25,85,193] Some factors that increase the risk of disabling conditions are biological characteristics, lifestyle behaviors, psychological characteristics, and the impact of the physical and social environments. Examples of each of these types of risk factor are summarized in Box 1.6.

Some of the risk factors, in particular lifestyle characteristics and behaviors and their impact on the potential for disease or injury, have become reasonably well known because of public service announcements and distribution of educational materials in conjunction with health promotion campaigns, such as *Healthy People 2010*[188] and *Healthy People 2020*.[189] Information on the adverse influences of health-related risk factors, such as a sedentary lifestyle, obesity, and smoking, has been widely disseminated by these public health initiatives. Although the benefits of a healthy lifestyle, which includes regular exercise and physical activity, are well founded and widely documented,[2,188,189] initial outcomes of a previous national campaign, *Healthy People 2000*,[191] suggest that an increased awareness of risk factors has not translated effectively into dramatic changes in lifestyle behaviors to reduce the risk of disease or injury.[50] This demonstrates that increased knowledge does not necessarily change behavior.

When a health condition exists, the reduction of risk factors by means of *buffers* (interventions aimed at reducing the progression of a pathological condition, impairments, limitations, restrictions, and potential disability) is appropriate.[85] This focus of intervention is categorized as secondary or tertiary prevention. Initiating a regular exercise program, increasing the level of physical activity on a daily basis, or altering the physical environment by removing architectural barriers or using assistive devices for a range of daily activities are examples of buffers that can reduce the risk of disability. (Refer to Chapter 2 of this textbook for additional information on prevention, reduction of health-related risk factors, and wellness.)

BOX 1.6 Risk Factors for Disability

Biological Factors
- Age, sex, and race
- Height/weight relationship
- Congenital abnormalities or disorders (e.g., skeletal deformities, neuromuscular disorders, cardiopulmonary diseases, or anomalies)
- Family history of disease; genetic predisposition

Behavioral/Psychological/Lifestyle Factors
- Sedentary lifestyle
- Cultural biases
- Use of tobacco, alcohol, and/or other drugs
- Poor nutrition
- Low level of motivation
- Inadequate coping skills
- Difficulty dealing with change or stress
- Negative affect

Physical Environment Characteristics
- Architectural barriers in the home, community, and workplace
- Ergonomic characteristics of the home, work, or school environments

Socioeconomic Factors
- Low economic status
- Low level of education
- Inadequate access to health care
- Limited family or social support

Summary

An understanding of the concepts of functioning and disability; of the relationships among the components of functioning, disability, and health; and of the various models and classification systems that have been developed over the past several decades provides a conceptual framework for practice and research. This knowledge also establishes a foundation for sound clinical decision-making and effective communication and sets the stage for delivery of effective, efficient, meaningful physical therapy care and services for patients.

Principles of Comprehensive Patient Management

An understanding of the concepts of functioning and disability, coupled with knowledge of the process of making informed clinical decisions based on evidence from the scientific literature, provides the foundation for comprehensive management of patients seeking and receiving physical therapy services. Provision of quality patient care involves the ability to make sound clinical judgments; solve problems that are important to a patient; and apply knowledge of the relationships among a patient's health condition(s), impairments, limitations in daily activities, and participation restrictions throughout each phase of management.

The primary purpose of this section of the chapter is to describe a model of patient management used in physical therapy practice. Inasmuch as clinical reasoning and evidence-based decision-making are embedded in each phase of patient management, a brief overview of the concepts and processes associated with clinical decision-making and evidence-based practice is presented before exploring a systematic process of patient management in physical therapy. Relevant examples of the clinical decisions a therapist must make are highlighted within the context of the patient management model.

Clinical Decision-Making

Clinical decision-making refers to a dynamic, complex process of reasoning and analytical (critical) thinking that involves making judgments and determinations in the context of patient care.[93] One of the many areas of clinical decision-making in which a therapist is involved is the selection, implementation, and modification of therapeutic exercise interventions based on the unique needs of each patient or client. To make effective decisions, merging clarification and understanding with critical and creative thinking is necessary.[101] A number of requisite attributes are necessary for making informed, responsible, efficient, and effective clinical decisions.[46,101,113,167] Those requirements are listed in Box 1.7.

There is a substantial body of knowledge in the literature that describes various strategies and models of clinical decision-making in the context of patient management by physical therapists.[43,46,65,79,80,92,93,148,151,152] One such model, the Hypothesis-Oriented Algorithm for Clinicians II (HOAC II), describes a series of steps involved in making informed clinical decisions.[152] The use of clinical decision-making in the diagnostic process also has generated extensive discussion in the literature.[19,22,42,46,59,62,83,84,149,158,183,187,201]

To assist in the decision-making process and ultimately improve patient care, tools known as *clinical prediction rules* (CPRs), first developed in medicine, also have been developed for use by physical therapists.[32,52] Some CPRs contain predictive factors that help a clinician establish specific diagnoses or improve the accuracy of prognoses, whereas others identify subgroupings of patients within large, heterogeneous groups who are most likely to benefit from a particular approach to treatment or specific therapeutic interventions. To date, some prediction tools in physical therapy have been developed to assist in the diagnosis of health conditions, including osteoarthritis in patients with hip pain[178] and deep vein thrombosis in patients with leg pain.[147] However, a greater number of CPRs in physical therapy have been established to predict likely responses of patients to treatment. As examples, CPRs have been developed to identify a subgrouping of patients with patellofemoral pain syndrome who are most likely to respond positively to lumbopelvic manipulation,[78] patients with low back pain most likely to respond to stabilization exercises,[72] and those with neck pain for whom thoracic spine manipulation is most likely to be effective.[35]

It is important to note, however, that little research, thus far, has focused on validation of published CPRs[15] or their impact on the effectiveness of patient care from specific therapeutic interventions. The results of two systematic reviews of the literature underscore these points. One review[15] concluded that there is considerable variation in the quality of studies used to validate CPRs developed for interventions used by physical therapists. The results of the other review of CPRs for musculoskeletal conditions[172] demonstrated that currently there is only limited evidence to support the use of these rules to predict the effectiveness of specific interventions or to optimize treatment. Additional information from studies directed toward clinical decision-making is integrated into the remainder of this section on patient management or is addressed in later chapters.

BOX 1.7 Requirements for Skilled Clinical Decision-Making During Patient Management

- Knowledge of pertinent information about the problem(s) based on the ability to collect relevant data by means of effective examination strategies
- Cognitive and psychomotor skills to obtain necessary knowledge of an unfamiliar problem
- Use of an efficient information-gathering and information-processing style
- Prior clinical experience with the same or similar problems
- Ability to recall relevant information
- Ability to integrate new and prior knowledge
- Ability to obtain, analyze, and apply high-quality evidence from the literature
- Ability to critically organize, categorize, prioritize, and synthesize information
- Ability to recognize clinical patterns
- Ability to form working hypotheses about presenting problems and how they might be solved
- Understanding of the patient's values and goals
- Ability to determine options and make strategic plans
- Application of reflective thinking and self-monitoring strategies to make necessary adjustments

Coordination, Communication, and Documentation

Health care continues to move in the direction of physical therapists being primary practitioners through whom consumers gain access to services without physician referral. As the coordinator of physical therapy care and services, the therapist has the responsibility to communicate verbally and through written documentation with all individuals involved in the care of a patient. The adoption of direct access has been scrutinized in regard to the ability of physical therapists to make sound clinical decisions and the potential for therapists to miss critical signs and symptoms (*red flags*) and neglect to refer patients when appropriate.[91] However, the literature shows several circumstances where therapists have shown evaluative and diagnostic skills resulting in appropriate decisions to involve other providers in the coordination of care of the patient.[23,68,91]

The following are descriptions of circumstances where it is appropriate for the physical therapist to communicate and coordinate care of the patient with another provider.[5]

- *Comanagement*: Sharing responsibility.
- *Consultation:* Providing or seeking professional expertise/judgement.

- *Supervision:* Delegation of some portion of treatment while remaining responsible for the care provided.
- *Referral:* Includes both referring to another provider and receiving referrals from another provider.

Even during the intervention or discharge phase of patient management, a therapist might make the clinical decision that referral to another practitioner is appropriate and complementary to the physical therapy services. This requires coordination and communication with other health-care practitioners. For example, a therapist might refer a patient who is generally deconditioned from a sedentary lifestyle and who is also obese to a nutritionist for dietary counseling to complement the physical therapy program designed to improve the patient's aerobic capacity (cardiopulmonary endurance) and general level of fitness.

Coordination, communication, and documentation are required of the physical therapist throughout the entire episode of patient management. This role encompasses many patient-related administrative tasks and professional responsibilities, such as writing reports (evaluations, plans of care, and discharge summaries); designing home exercise programs; contacting third-party payers, other health-care practitioners, or community-based resources; and participating in team conferences.

Evidence-Based Practice

Physical therapists who wish to provide high-quality patient care must make informed clinical decisions based on sound clinical reasoning and knowledge of the practice of physical therapy. An understanding and application of the principles of evidence-based practice provide a foundation to guide a clinician through the decision-making process during the course of patient care.

In recent years, evidence-based practice has been highlighted in the strategic plans of the APTA by establishing guidelines, setting goals for therapists to be engaged in applying and integrating research findings into everyday practice, and encouraging use of validated clinical practice guidelines.[8]

Definition and Description of the Process

Evidence-based practice is "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of an individual patient."[156] Evidence-based practice also involves combining knowledge of evidence from well-designed research studies with the expertise of the clinician and the values, goals, and circumstances of the patient.[157]

The process of evidence-based practice involves the following steps:[37,157]

1. Identify a patient problem and convert it into a specific question.
2. Search the literature and collect clinically relevant, scientific studies that contain evidence related to the question.
3. Critically analyze the pertinent evidence found during the literature search and make reflective judgments about the quality of the research and the applicability of the information to the identified patient problem.
4. Integrate the appraisal of the evidence with clinical expertise and experience and the patient's unique circumstances and values to make decisions.
5. Incorporate the findings and decisions into patient management.
6. Assess the outcomes of interventions and ask another question if necessary.

This process enables a practitioner to select and interpret the findings from the evaluation tools used during the examination of the patient and to implement effective treatment procedures that are rooted in sound theory and scientific evidence (rather than anecdotal evidence, opinion, or clinical tradition) to facilitate the best possible outcomes for a patient.

FOCUS ON EVIDENCE

In a survey of physical therapists, all of whom were members of APTA, 488 respondents answered questions about their beliefs, attitudes, knowledge, and behavior about evidence-based practice.[90] Results of the survey indicated that the therapists believed that the use of evidence in practice was necessary and that the quality of care for their patients was better when evidence was used to support clinical decisions. However, most thought that carrying out the steps involved in evidence-based practice was time consuming and seemed incompatible with the demands placed on therapists in a busy clinical setting.

It is impractical to suggest that a clinician must search the literature for evidence to support each and every clinical decision that must be made. Despite time constraints in the clinical setting, when determining strategies to solve complex patient problems or when interacting with third-party payers to justify treatment, the "thinking therapist" has a professional responsibility to seek out evidence that supports the selection and use of specific evaluation and treatment procedures.[12]

Accessing Evidence

One method for staying abreast of evidence from the current literature is to read one's professional journals on a regular basis. It is also important to seek out relevant evidence from high-quality studies (randomized controlled trials, systematic reviews of the literature, etc.) from journals of other professions.[38] Journal articles that contain systematic reviews of the literature or summaries of multiple systematic reviews are an efficient means to access evidence because they provide a concise compilation and critical appraisal of a number of scientific studies on a topic of interest.

Evidence-based *clinical practice guidelines* for management of specific physical conditions or groupings of impairments also have been developed; they address the relative effectiveness of specific treatment strategies and procedures. These guidelines provide recommendations for management based on systematic reviews of current literature.[139,161] Initially, clinical practice guidelines that address four broadly defined musculoskeletal conditions commonly managed by physical therapists—specifically knee pain,[135] low back pain,[136] neck pain,[137] and shoulder pain[138]—were developed by the Philadelphia Panel, a panel of experts from physical therapy and medicine.

As mentioned previously in this chapter, a series of clinical practice guidelines has been created and published by several sections of the APTA. These guidelines provide evidence-based recommendations for physical therapy management (diagnosis, prognosis, selection of therapeutic interventions, and use of outcome measures) of a number of impairment/function-based groupings that are based on the ICF.[58] Some examples include clinical practice guidelines for management of neck pain,[33] knee pain and mobility impairments,[104] knee stability impairments,[105] hip pain and mobility deficits associated with osteoarthritis,[34] heel pain associated with plantar fasciitis,[117] and deficits associated with Achilles tendonitis.[29] All of the published clinical practice guidelines can be found at PTNow.org—a resource of the APTA.[7] More specific information from recently published guidelines is integrated into the regional chapters of this textbook.

If articles that contain systematic reviews of the literature on a specific topic have not been published, a therapist may find it necessary and valuable to perform an individual literature search to identify evidence applicable to a clinical question or patient problem. Journals exclusively devoted to evidence-based practice are another means to assist the practitioner who wants to identify well-designed research studies from a variety of professional publications without doing an individual search. These journals provide abstracts of research studies that have been critically analyzed and systematically reviewed.

Online bibliographic databases also facilitate access to evidence. Many databases provide systematic reviews of the literature relevant to a variety of health professions by compiling and critiquing several research studies on a specific patient problem or therapeutic intervention.[12,37,119] One example is the Cochrane Database of Systematic Reviews, which reports peer-reviewed summaries of randomized controlled trials and the evidence for and against the use of various interventions for patient care, including therapeutic exercise. Although a recent study [118] identified CENTRAL (Cochrane Central Registry of Controlled Trials), PEDro (Physiotherapy Evidence Database), PubMed, and EMBASE (Excerpta Medica Database) as the four most comprehensive databases indexing reports of randomized clinical trials of physical therapy interventions, only PEDro exclusively reports trials, reviews, and practice guidelines pertinent to physical therapy.[109] Easily accessed online databases such as these streamline the search process and provide a wealth of information from the literature in a concise format.

To further assist therapists in retrieving and applying evidence in physical therapist practice from the Cochrane online library, the *Physical Therapy* journal publishes a recurring feature called Linking Evidence and Practice (LEAP). This feature summarizes a Cochrane review and other scientific evidence on a single topic relevant to physical therapy patient care. In addition, LEAP presents case scenarios to illustrate how the results of the review of evidence can be applied to the decision-making process during patient management.

In support of evidence-based practice, relevant research studies are highlighted or referenced throughout each of the chapters of this text in relationship to the therapeutic exercise interventions, manual therapy techniques, and management guidelines presented and discussed. However, there is also an absence of research findings to support the use of some of the interventions presented. For such procedures, a therapist must rely on clinical expertise and judgment as well as each patient's response to treatment to determine the impact of these interventions on patient outcomes. Interventions without evidence to support efficacy should be used discriminately, and attempts to support and identify new research in those areas is a professional expectation. Examples of how to incorporate the ongoing process of clinical decision-making and application of evidence into each phase of patient management are presented in the following discussion of a model for patient management.

A Patient Management Model

The physical therapy profession has developed a comprehensive approach to patient management designed to guide a practitioner through a systematic series of steps and decisions for the purpose of helping a patient achieve the highest level of functioning possible.[6] This model is published online in the *Guide to Physical Therapist Practice* and is illustrated in Figure 1.5.

As described in the *Guide to Physical Therapist Practice,* the process of patient management has the following elements:[5,6,19,54]

1. A comprehensive *examination* including successive re-examination as indicated.
2. *Evaluation* of data collected.
3. Determination of a *diagnosis* based on impairments of body structure and function, activity limitations, and participation restrictions that result in movement dysfunction and/or are amenable to physical therapy intervention.
4. Establishment of a *prognosis* and plan of care based on patient-oriented goals.
5. Implementation of appropriate *intervention.*
6. Analysis and communication of *outcomes* resulting from interventions.

The ability to make timely decisions and appropriate judgments and to develop or adjust an ongoing series of working hypotheses makes transition from one phase of patient management to the next occur in an effective, efficient manner.

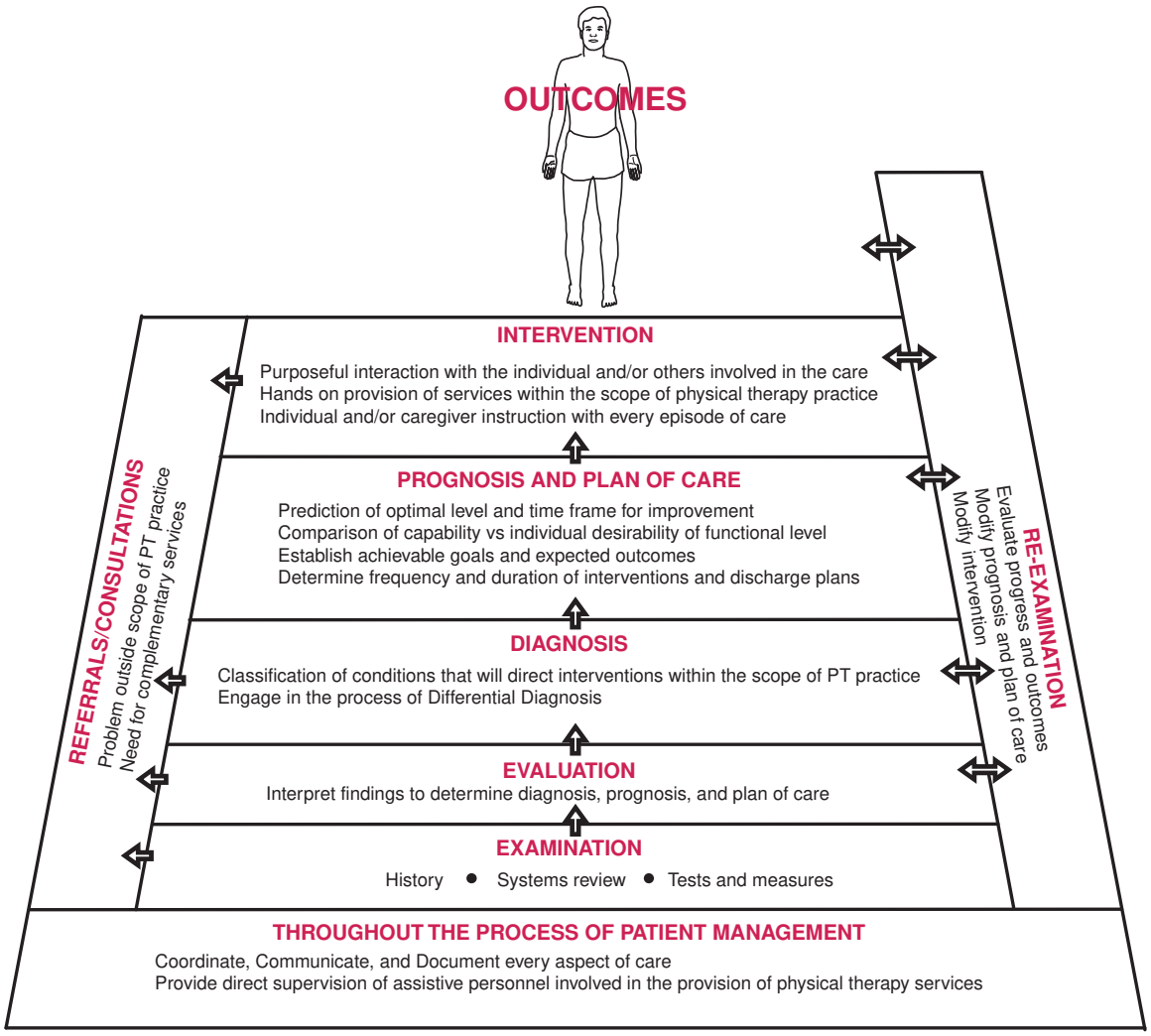

FIGURE 1.5 A comprehensive model of the patient management process.

Examination

The first component of the patient management model is a comprehensive examination of the patient. Examination is the systematic process by which a therapist obtains information about a patient's problem(s) and his or her reasons for seeking physical therapy services. During this initial data collection, the therapist acquires information from a variety of sources. The examination process involves both comprehensive screening and specific diagnostic testing. It is the means by which the therapist gathers sufficient information about the patient's existing or potential problems to ultimately formulate a diagnosis and determine whether these problems can be appropriately treated by physical therapy interventions. If treatment of the identified problems does not fall within the scope of physical therapy practice, referral to another health-care practitioner or resource is warranted. The examination is also the means by which baseline measurements of current impairments of body functions and structures, activity limitations, and participation restrictions are established as a reference point from which the results of therapeutic interventions can be measured and documented.

There are three distinct elements of a comprehensive examination:[5]

- The patient's health history
- A relevant systems review
- Specific tests and measures

Throughout the examination process, a therapist seeks answers to an array of questions and concurrently makes a series of clinical decisions that shape and guide the examination process. Examples of some questions to be asked and decisions to be made are noted in Box 1.8.

Health History

The health history is the mechanism by which a therapist obtains an *overview* of current and past information (both subjective and objective) about a patient's present condition(s), general health status (health risk factors and coexisting health problems), and why the patient has sought physical therapy

BOX 1.8 Key Questions to Consider During the Initial Examination

- What are the most complete and readily available sources for obtaining the patient's history?
- Is there a need to obtain additional information about the patient's presenting health condition or a medical diagnosis if one is available?
- Based on initial working hypotheses, which of the patient's signs and symptoms warrant additional testing by physical therapy or by referral to another health-care practitioner?
- Do the patient's problems seem to fall within or outside the scope of physical therapy practice?
- What types of specific tests and measures should be selected to gather data about the patient's impairments, activity/functional limitations, or extent of participation and resulting disability?
- Based on scientific evidence, which diagnostic tests have a high level of accuracy to identify impairments, functional deficits, or disability?
- What are the most important tests to do first? Which could be postponed until a later visit with the patient?

services. It has been shown in a multicenter study that patients seen in outpatient physical therapy practices have extensive health histories, including use of medications for a variety of medical conditions (e.g., hypertension, pulmonary disorders, and depression) and surgical histories (e.g., orthopedic, abdominal, and gynecological surgeries).[18]

The types of data that can be generated from a patient's health history are summarized in Box 1.9.[4,19,20,97] The therapist determines which aspects of the patient's history are more relevant than others and what data need to be obtained from various sources.

Sources of information about the patient's history include:

- Self-report health history questionnaires filled out prior to or during the initial visit.
- Interviews with the patient, family, or other significant individuals involved in patient care.
- Review of the medical record.
- Reports from the referral source, consultants, or other health-care team members.

The extent of information about a patient's health history that is necessary or available may be extensive or limited and

BOX 1.9 Information Generated from the Initial History

Demographic Data
- Age, sex, race, and ethnicity
- Primary language
- Education

Social History
- Family and caregiver resources
- Cultural background
- Social interactions/support systems

Occupation/Leisure
- Current and previous employment
- Job/school-related activities
- Recreational and community activities/tasks

Growth and Development
- Developmental history
- Hand and foot dominance

Living Environment
- Current living environment
- Expected destination after discharge
- Community accessibility

General Health Status and Lifestyle Habits and Behaviors: Past/Present (Based on Self or Family Report)
- Perception of health/disability
- Lifestyle health risks (smoking and/or substance abuse)
- Diet, exercise, and sleep habits

Medical/Surgical/Psychological History
- Previous inpatient or outpatient services

Medications
- Over-the-counter and prescription meds
- Frequency and dosage of meds

Family History: Current and Past
- Health risk factors
- Family illnesses

Cognitive/Social/Emotional Status
- Orientation and memory
- Communication
- Social/emotional interactions

Current Conditions/Chief Complaints or Concerns
- Conditions/reasons physical therapy services sought
- Patient's perceived level of daily functioning and disability
- Patient's needs and goals
- History, onset (date and course), mechanism of injury, and pattern and behavior of symptoms
- Family or caregiver needs, goals, and perception of patient's problems
- Current or past therapeutic interventions
- Previous outcome of chief complaint(s)

Functional Status and Activity Level
- Current/prior functional status: basic ADL and IADL related to self-care and home
- Current/prior functional status in work, school, and community-related IADL

Other Laboratory and Diagnostic Tests

Review of Systems: Any history of health conditions

may or may not be readily accessible prior to the first contact with the patient. Compare, for example, the information available to the therapist working in an acute care facility who has ready access to a patient's medical record versus the home health therapist who may have only a patient's medical diagnosis or brief surgical history. Regardless of the extent of written reports or medical/surgical history available, reviewing this information prior to the initial contact with the patient helps a therapist prioritize the questions asked and areas explored during the interview with the patient.

A general, verbal *review of systems* is conducted during the history-gathering phase to collect information about all major body systems relative to the patient's overall health condition.[5] The review of systems includes questions about past medical history, review of previous medical reports or lab work available, and other signs or symptoms experienced by the individual (see Table 1.2). This information is used to determine whether there are underlying conditions mimicking or masking musculoskeletal or neuromuscular symptoms or other signs indicative of complications that suggest the need for referral. This is especially important with the prevalence of patients being seen directly by the physical therapist through direct access.[5]

The interview is crucial for determining a patient's chief concerns and functional status—past, current, and desired. It also helps a therapist see a patient's problems from the patient's own perspective, specifically with regard to the perception of limitations in daily activities or participation restrictions in meaningful social or work roles. A patient almost always describes a current problem in terms of limited abilities or perceived quality of life, not the presenting impairment(s). For example, a patient might report, "My elbow really hurts when I pick up something heavy" or "I'm having trouble playing tennis (or bowling or unloading groceries from the car)." During the interview, questions that relate to symptoms (in this case, elbow pain) should identify

TABLE 1.2 Areas of Screening During the Patient Management Process

All Major Body Systems	*Review of Systems:* component of the Health History to determine need for referral for additional medical evaluation
Cardiovascular/pulmonary	Shortness of breath, pressure or pain in the chest, pulsating pain, history of heart or lung disease
Endocrine	History of thyroid or other hormonal conditions, medications
Eyes, Ears, Nose, and Throat	History of surgery or use of adaptive equipment
Gastrointestinal	Heartburn, reflux, diarrhea, constipation, vomiting, severe abdominal pain, swallowing problems
Genitourinary/reproductive	Bowel or bladder function, burning with urination, sexual function, unusual menstrual cycles, pregnancy
Hematological or lymphatic	Results of recent bloodwork or treatment, bleeding or lymphedema
Integumentary	History of skin cancer, dermatological conditions (eczema, psoriasis, etc.), lumps or growths
Neurological/musculoskeletal	History of CNS or peripheral nerve symptoms, muscular cramping, spasms, atrophy, weakness
Overall physical and emotional well-being	Persistent fatigue, malaise, fever, chills, sweats, unexplained weight change, depression, mood swings, suicidal thoughts
Human Movement System	***Systems Review:*** **component of the hands-on Examination specific to systems affecting movement**
Cardiovascular/pulmonary	Heart rate and rhythm, respiratory rate, blood pressure, and edema
Integumentary	Skin temperature, color, texture, integrity, scar formation, wound or incision healing
Musculoskeletal	Symmetry, gross ROM and strength, height and weight
Neuromuscular	General assessment of gross coordinated movement (e.g., balance, gait, locomotion, transfers, transitions) and motor function (motor control, motor learning)
Communication ability, affect, cognition, language, learning style	Ability to make needs known, consciousness, orientation (person, place, time), expected emotional/behavioral responses, learning preferences (e.g., learning barriers, educational needs)

location, intensity, description, and factors that provoke (aggravate) or alleviate symptoms in a 24-hour period.

Collecting health history data through a self-report questionnaire has been shown to be an accurate source of information from patients seen in an outpatient orthopedic physical therapy practice.[22] In addition, depending on a patient's condition and individual situation, the perceptions of family members, significant others, caregivers, or employers are often as important to the overall picture as the patient's own assessment of the current problems.

While taking a health history, it is useful to group the interview questions into categories to keep the information organized. Gathering and evaluating data simultaneously makes it easier to recognize and identify *patterns or clusters of signs and symptoms* and even to begin to formulate one or more initial "working" hypotheses about the patient's problem(s), which later will be supported or rejected as part of the diagnostic process. Making these judgments helps organize and structure the examination.[151,152,183] Experienced therapists tend to form working hypotheses quite early in the examination process, even while reviewing a patient's chart before the initial contact with the patient.[79,80,92,114,194] This enables a therapist to determine and prioritize which definitive tests and measures should be selected for the later portion of the examination.[80]

Systems Review

A brief but relevant screening of the body systems, known as a *systems review*,[4,5] is performed as a part of the hands on examination process after organizing and prioritizing data obtained from the health history. This baseline screening of the components of the movement system helps to determine which areas of tests and measures will be needed to determine specific diagnoses that impact function and the perception of disability. The systems typically screened by physical therapists are the cardiovascular and pulmonary, integumentary, musculoskeletal, and neuromuscular systems and a general overview of a patient's cognition, communication, and learning preferences (see Table 1.2).

Findings from the systems review, coupled with information about a patient's chief complaints and past history secured from the patient's health history, enable a therapist to begin to make decisions about the possible causes of a patient's impairments and functional deficits and to distinguish between problems that can and cannot be managed effectively by physical therapy interventions.[19] If a therapist determines that a patient has a condition or problem that falls outside the scope of physical therapy practice, then referral to or coordination with another health-care practitioner is appropriate.[4,19,21,59]

FOCUS ON EVIDENCE

In a case report,[68] a patient was referred to physical therapy 5 weeks after shoulder surgery. During the initial examination the physical therapist identified inconsistent signs and symptoms that were indicative of a possible infection or medical complication including bilateral diffuse multi-joint arthralgia, generalized fatigue, and other atypical signs. The therapist made the clinical decision to refer the patient back to the primary care physician where a secondary infection was confirmed. The result of this communication and coordination of care and services by the physical therapist was a positive outcome—the patient was able to fully participate in a rehabilitation program after the addition of antibiotic therapy to her medical care.

Specific Tests and Measures

Once it has been decided that a patient's problems/conditions are most likely amenable to physical therapy intervention, the next determination a therapist must make during the examination process is to decide which aspects of physical function require further investigation through the use of specific tests and measures.

Specific (definitive/diagnostic) tests and measures used by physical therapists provide in-depth information about body function and structure impairments, activity limitations, and participation restrictions.[4,53,57,97] The specificity of these tests enables a therapist to support or refute the working hypotheses formulated while taking the patient's health history and performing the systems review. These tests also give the therapist a clearer picture of a patient's current condition(s) and may reveal information about the patient not previously identified during the history and systems review. If treatment is initiated, the results of these specific tests and measures establish *objective baselines* from which changes in a patient's abilities as the result of interventions are measured.

Given the array of specific tests available to a therapist, the guidelines summarized in Box 1.10 should be considered when determining which definitive tests and measures need to be selected and administered.[4,53,54,146]

There are more than 20 general categories of specific tests and measures commonly performed by physical therapists.[4,180] Typically, testing involves multiple body systems to identify the scope of a patient's functioning or disability by targeting specific impairments, activity limitations, and participation restrictions. When examining a patient with chronic knee pain, for example, in addition to performing a thorough musculoskeletal examination, it also would be appropriate to administer tests that identify the impact of the patient's knee pain on the neuromuscular system (by assessing balance and proprioception) and the cardiopulmonary system (by assessing aerobic capacity).

Because many of the health-related conditions as the result of injury or disease discussed in this textbook involve the neuromusculoskeletal system, some examples of specific tests and measures that identify *musculoskeletal and neuromuscular impairments* are noted here. They include but are not limited to:

- Assessment of pain
- Goniometry and flexibility testing
- Joint mobility, stability, and integrity tests (including ligamentous testing)
- Tests of muscle performance (manual muscle testing and dynamometry)

BOX 1.10 Guidelines for Selection of Specific Tests and Measures

- Consider why particular tests are performed and how the interpretation of their results may influence the formulation of a diagnosis.
- Select tests and measures that provide accurate information and are valid and reliable and whose efficacy is supported by evidence generated from sound scientific studies.
- Administer tests that target multiple levels of functioning and disability: impairments, activity/functional limitations, and the patient's perceived level of participation restrictions.
- Prioritize tests and measures selected to gather in-depth information about key problems identified during the history and systems review.
- Decide whether to administer generic tests or tests that are specific to a particular region of the body.
- Choose tests that provide data specific enough to support or reject working hypotheses formulated during the history and systems review and to determine a diagnosis, prognosis, and plan of care when the data are evaluated.
- Select tests and measures that will help determine the types of intervention that most likely are appropriate and effective.
- To complete the examination in a timely manner, avoid collecting more information than is necessary to make informed decisions during the evaluation, diagnosis, and treatment planning phases of management.

- Posture analysis
- Assessment of balance, proprioception, and neuromuscular control
- Gait analysis
- Assessment of assistive, adaptive, or orthotic devices

Choice of specific tests and measures should be based on clinical decision-making used by the therapist to confirm or reject hypothesis about why the patient is experiencing less than optimal function and to provide data to support the diagnosis, prognosis, and plan of care.

Although specific testing of impairments is crucial, these tests do not tell the therapist how the impairments are affecting the patient's functional capabilities. Therefore, every examination should also include use of instruments that specifically measure extent of activity limitations and participation restrictions. These tools, often referred to as *functional outcome measures*, are designed to reflect the interaction of a patient's health condition and impairments in body function and structure with functional abilities and health-related quality of life.[11]

The Middle Class Tax Relief Act of 2012 mandated that functional outcomes be reported on the billing claims for Medicare and Medicaid patients receiving therapy services. As a result of this act, in 2013 requirements to report functional limitations and outcomes were established by the Centers for Medicare and Medicaid Services (CMS) for all outpatient therapy billing claims through the physician fee schedule final rule (77 Federal Regulation 68958). Functional Limitation Reporting, also referred to as "G-Code Reporting," uses a coding system based on the ICF classification of functioning, disability, and health to quantify the type and severity of functional limitation(s) identified through the use of tests and measures at the onset and throughout the "episode of care." The scope and specifics of this legislation and application of G-code reporting are beyond the scope of this textbook. Box 1.11 lists references and websites for those interested in learning more about this topic.

The format of functional testing procedures and instruments varies. The clinical decision-making skill of the therapist is paramount to the effective selection of the ideal test(s) to use to objectively describe the functional limits or abilities of patients based on the carefully synthesized results of examination and re-examination information. Some tests gather information by *self-report* (by the patient or family member);[96] others require *observation and rating of the patient's performance* by a therapist as various functional tasks are carried out.[11] Some instruments measure a patient's ease or difficulty of performing specific physical tasks. Other instruments incorporate temporal (time-based) or spatial (distance-based) criteria, such as measurement of walking speed or distance, in the format.[10] Test scores also can be based on the level of assistance needed (with assistive devices or by another person) to complete a variety of functional tasks.

Indices of disability measure a patient's perception of his or her degree of participation restriction. These self-report instruments usually focus on BADL and IADL, such as the ability or inability to care for one's own needs (physical, social, and emotional) or the level of participation in the community

BOX 1.11 Resources for Information on Functional Outcome Reporting (G-Codes)

- MLN Matters® Special Edition (SE) 1307: Outpatient Therapy Functional Reporting Requirements: http://www.cms.gov/outreach-and-education/medicare-learning-network-mln/mlnmattersarticles/downloads/se1307.pdf
- CMS Manual System Transmittal 165: Implementing the Claims-Based Data Collection Requirement for Outpatient Therapy Services — Section 3005(g) of the Middle Class Tax Relief and Jobs Creation Act (MCTRJCA) of 2012: https://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/Downloads/R165BP.pdf
- CMS-1500 (02/12) Claim Form Example: Functional Limitation Reporting G-codes and Severity/Complexity Modifiers: https://medicare.fcso.com/Education_resources/0299021.pdf
- APTA Resources for Functional Limitation Reporting under Medicare: http://www.apta.org/Payment/Medicare/CodingBilling/FunctionalLimitation/

that is currently possible, desired, expected, or required. Information gathered with these instruments may indicate that the patient requires consultation and possible intervention by other health-care professionals to deal with some of the social or psychological aspects of disability.

Functional Limitation Reporting and G-code assignment do not require or limit specific tests to be used to define the functional limitation, its severity, or complexity when determining the G-code. It is the responsibility of the therapist to identify valid, objective tests to provide reliable results throughout the course of treatment from initial evaluation to discharge. Familiarity with evidence-based practice guidelines and use of resources for applying evidence as described earlier in this section will assist both the novice and veteran therapist to successfully accomplish this professional responsibility.

NOTE: It is well beyond the scope or purpose of this text to identify and describe the many tests and instruments that identify and measure impairments, activity limitations, and participation restrictions. The reader is referred to several resources in the literature that provide this information.[2,7,10,11,30,108]

Evaluation

Evaluation is a process characterized by the interpretation of collected data. The process involves analysis and integration of information to establish the diagnosis, prognosis, and plan of care using a series of sound clinical decisions.[4,5] Although evaluation is depicted as a distinct entity or phase of the patient management model (see Fig. 1.5), some degree of evaluation goes on at every phase of patient management, from examination through outcome. By pulling together and sorting out subjective and objective data from the examination, a therapist should be able to determine the following:

- A patient's general health status and its impact on current and potential function.
- The acuity or chronicity and severity of the current condition(s).
- The extent of structural and functional impairments of body systems and impact on functional abilities.
- Which impairments are related to which activity limitations.
- A patient's current, overall level of physical functioning (limitations *and* abilities) compared with the functional abilities needed, expected, or desired by the patient.
- The impact of physical dysfunction on social/emotional function.
- The impact of the physical environment on a patient's function.
- A patient's social support systems and their impact on current, desired, and potential function.

The decisions made during the evaluation process may also suggest that additional testing by the therapist or another practitioner is necessary before the therapist can determine a patient's diagnosis and prognosis for positive outcomes from physical therapy interventions. For example, a patient whose chief complaints are related to episodic shoulder pain but who also indicates during the health history that bouts of depression sometimes make it difficult to work or socialize should be referred for a psychological consultation and possible treatment.[19] Results of the psychological evaluation could be quite relevant to the success of the physical therapy intervention.

Addressing the questions posed in Box 1.12 during the evaluation of data derived from the examination enables a therapist to make pertinent clinical decisions that lead to the determination of a diagnosis and prognosis and the selection of potential intervention strategies for the plan of care.

During the evaluation, it is particularly useful to ascertain if and to what extent relationships exist among measurements of impairments, activity limitations, participation restrictions, and the patient's perceived level of disability. These relationships often are not straightforward as indicated in the following investigations.

FOCUS ON EVIDENCE

In a study of patients with cervical spine disorders,[70] investigators reported a strong correlation between measurements of impairments (pain, ROM, and cervical muscle strength) and functional limitations (functional axial rotation and lifting capacity) but a relatively weak statistical relationship between measurements of functional limitations and the patient's perceived level of disability, as determined by three self-report measures. In another study[185] that compared shoulder ROM with the ability of patients to perform basic self-care activities, a strong correlation was noted between the

BOX 1.12 Key Questions to Consider During the Evaluation and Diagnostic Processes

- What is the extent, degree, or severity of structural and functional impairments, activity/functional limitations, or participation restrictions/disability?
- What is the stability or progression of dysfunction?
- To what extent are any identified personal and environmental barriers to functioning modifiable?
- Is the current health condition(s) acute or chronic?
- What actions/events change (relieve or worsen) the patient's signs and symptoms?
- How do preexisting health conditions (comorbidities) affect the current condition?
- How does the information from the patient's medical/surgical history and tests and measures done by other health-care practitioners relate to the findings of the physical therapy examination?
- Have identifiable clusters of findings (i.e., patterns) emerged relevant to the patient's dysfunction?
- Is there an understandable relationship between the patient's extent of impairments and the degree of activity/functional limitation or participation restriction/disability?
- What are the causal factors that seem to be contributing to the patient's impairments, activity/functional limitations, or participation restriction/disability?