ROBERT MANSKE

Fifth Edition

FUNDAMENTAL ORTHOPEDIC MANAGEMENT

for the Physical Therapist Assistant

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for the Physical Therapist Assistant

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Fifth Edition

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It is my honor to dedicate this Fifth Edition of
Fundamental Orthopedic Management for the Physical Therapist Assistant
to the greatest PTA in the world – Janice Lam.

Janice has taught me many valuable lessons: The importance of the PT/PTA relationship, the incredible value of PTAs in the outpatient setting, the importance of the mid-evening nap, and, most importantly, she has taught me about unconditional love.

Love you Janice.

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PREFACE

Another 5 years has flown by since the fourth edition of ***Fundamental Orthopedic Management for the Physical Therapist Assistant*** was published. There have been many new Physical Therapist Assistant (PTA) programs opening and existing programs adding additional students due to the demand for PTAs. We are proud that this text is utilized by many of the existing and new PTA programs. The quality of this great text is that it has been able to stand the test of time and continues to be the go-to source for PTA orthopedic education.

As in all previous editions, the focus of the fifth edition is to teach critical thinking and application of physical therapy interventions, and development of treatment plans that can be used by PTA students and practicing clinicians alike. Almost every chapter has been updated with the latest literature and reflects current up to date practice patterns. Regional experts have enhanced every updated chapter in this fifth edition.

In addition to completely updated chapters throughout the book, there are also new and updated educational resources, including new test questions and quiz material. These materials enhance the educational process by giving instructors ways to test learning while also giving students ways to better gauge their knowledge comprehension. The highlighted areas that were included in the fourth edition, continue to be included in the updated fifth edition. We hope that all these educational enhancements allow the educator more ease and allow a variety of teaching methods but also allow the PTA student to better understand and comprehend the valuable concepts within each chapter.

It is my hope that you continue to rely on the fifth edition of ***Fundamental Orthopedic Management for the Physical Therapist Assistant*** for your PTA educational needs.

ACKNOWLEDGMENTS

(Amended from fourth edition)

Three editions ago, Gary Shankman had a vision to write a text, Fundamental Orthopedic Management for the Physical Therapist Assistant. The concept was to write a textbook specifically focusing on the needs of the physical therapist assistant (PTA) that addressed basic, foundational information on orthopedic management. He felt that there was a need for a condensed, yet not simplified, text to equip entry-level PTA students with essential and practical information concerning orthopedics written from the perspective, training, and experience of a PTA for PTAs. This became the seminal textbook for orthopedics in PTA programs and ever hard-working clinicians over the years.

As the years have passed, this textbook has evolved. And like a great wine, it gets better every year. I was fortunate enough to be asked by Gary to help with the third edition of this text. We addressed more issues and added respected and very qualified educators and clinicians to help with various chapters. The third edition became a multi-authored unity of various orthopedic topics, addressing a wide range of issues and pathologies with substantial depth to challenge the student and practicing clinician alike. Without these contributors, the book would have remained unidimensional, as it is extremely hard for a single author to be an expert in all areas of rehabilitation. With the addition of new authors in each section, richness was developed that continues today with the fourth edition.

To begin with, I have to thank Gary Shankman for developing this unbelievable text. Gary, your vision has educated thousands upon thousands of PTAs throughout the years! To each and every contributor, I say thank you for your time, expertise, and willingness to share your wisdom, talents, and gifts. To the contributors of the three new chapters—Daryl Menke, Jeromy Jones, Terry Malone, Charles Hazle, and Jennifer Celso—I offer a deep and personal thank you for your time and effort in creating totally new chapters that will help continue the tradition of excellence for this state-of-the-art text.

Naturally, there are numerous individuals at Elsevier who enabled a project of this magnitude to take shape. To each of these, I say thank you. The leadership team on this project started with Lauren Willis and finished with Dominque McPherson. Thank you both for all the time and effort put forth to get this book on track and finished. To Beula Christopher, I could not have done this without your help too! Hopefully this book will honor all of the patients, therapists, physicians, and educators that both Gary and I have had the privilege to learn from and work with. From the words of Gary himself: "It is with great delight, humility, deep appreciation, and profound gratitude that I say thank you for this remarkable journey of learning and sharing."

Robert C. Manske

CONTENTS

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PART I

Basic Concepts of Orthopedic Management

1

Patient Supervision and Observation During Treatment

Jamie Dehan

LEARNING OBJECTIVES

1. Discuss the "Problem-Solving Algorithm Utilized by PTAs in Patient/Client Intervention."
2. Identify and discuss the rationale for clear and concise communication among all members of the rehabilitation team.
3. Discuss the skills necessary to provide patient supervision.
4. Define objective scales of measurement used to communicate changes in a patient's status to the supervising physical therapist.
5. Apply proactive listening skills and objective scales of measurement to provide appropriate, accountable, and responsible observation and supervision of the patient during treatment.
6. Define open-ended and closed-ended questioning.
7. Describe the differences between prompting and cueing.
8. Describe professional behaviors a PTA can demonstrate while supervising a patient.

CHAPTER OUTLINE

KEY TERMS

Accountability
Clinical decision making
Closed-ended questions
Communication
Cueing
Empathy
Interpersonal communication
Interventions
Listening
Open-ended questions
Patient-centered
Proactive
Probing questions
Prompting
Responsibility
Sympathy

SUPERVISING THE PATIENT DURING TREATMENT

Among the many challenges for the physical therapist assistant (PTA) are supervising the patient during selected **interventions**, solving problems effectively, and making appropriate decisions. The PTA must recognize that **interpersonal communication** skills, patient supervision methods, data collection skills, effective problem solving, and responsive **clinical decision making** must be learned, practiced, and demonstrated to function efficiently and effectively.

! IMPORTANT CONCEPTS

"Physical therapist assistants provide physical therapy services under the direction and supervision of the physical therapist. They implement selected components of patient/client interventions and obtain data related to that intervention; make modifications in selected interventions either to progress the patient/client as directed by the physical therapist or to ensure patient/client safety and comfort; educate and interact with physical therapist assistant students, aides, technicians, volunteers, patients/clients families, caregivers; and respond to patient/client and environmental emergency situations."[1]

Initial contact with a patient establishes a framework of rapport and sets the stage for all future interactions with that individual. The PTA can convey confidence, capability, and sensitivity during the initial introductions by the supervising physical therapist (PT). This leads the patient to trust the PTA and minimizes fear and anxiety.

The PTA is responsible for carrying out prescribed selected interventions, patient supervision, data collection, and appropriate problem solving and clinical decision making. The Department of Education, Accreditation, and Practice of the American Physical Therapy Association developed the "Problem-Solving Algorithm Utilized by PTAs in Patient/Client Intervention,"[1] which reflects current policies and positions on the problem-solving processes to be used by PTAs in the provision of selected interventions (Fig. 1.1). For proper care to be given, the PTA must monitor the patient's response to selected interventions and accurately and swiftly report changes to the supervising PT. This involves constant patient interaction, observation, data collection, reassessment of initial data, problem solving, and responsive action to clarify and enhance the effectiveness of prescribed selected interventions. Positive and negative changes in the patient's status can occur throughout the treatment program, whether during a single treatment or over the span of multiple treatments. Some of these changes are subtle and require keen awareness of the initial objective data and acute sensitivity to the patient's subjective reports. Other changes are profound and sudden. In either situation, the PTA observes the patient and collects appropriate data, such as range of motion, strength, pain, balance, coordination, swelling, endurance, or gait deviations. When reported to the supervising PT, these changes dictate and can significantly affect the course of treatment.

COMPONENTS OF PATIENT SUPERVISION

Clinical patient supervision can be viewed as a process to:

- Gather relevant information and data;
- Establish and enhance rapport, trust, and confidence;
- Facilitate understanding of the PTA's concept of the patient's problem as outlined, described, and initially determined by the supervising PT;
- Assist in the management of the patient; and
- Provide a conduit or therapeutic outlet for the patient to voice concerns about his or her problem.

Gathering clear information from the patient and interpreting the data during the initial evaluation are the responsibility of the PT. However, the PTA may need to assist the PT in helping the patient understand the problem throughout the course of rehabilitation. The PTA must recognize how difficult it is for patients to grasp all the components of their condition well enough to appreciate fully the rationale for the prescribed treatment. The PTA may be asked, when appropriate, to help the patient understand the disorder being treated, the supervising PT's plan of care, and the selected interventions to be provided. To do this, it is important for the PTA to demonstrate **empathy** toward the patient rather than **sympathy**. The PTA can demonstrate empathy toward the patient by attempting to understand their feelings and point of view of the injury and situation, rather than demonstrating sympathy by simply acknowledging the patient has feelings about their current injury and situation and not attempting to relate to them. During this patient interaction, the PTA must be keenly aware of and sensitive to subtle or apparent signs of patient apprehension, fear, and anxiety. The PTA must also establish a professional connection with the patient as they "[are] experiencing [something] that brought [him or her] to you instead of seeking out a friend, loved one, or business associate for help."[2]

Although direct patient supervision is frequently the task of one individual, responsibility for the patient's care is shared by the entire rehabilitation team. In addition, the patient must be actively involved in the treatment and accept shared responsibility for their own care.

While providing selected interventions, the PTA makes observations of the patient, collects relevant data, and develops an objective assessment using appropriate scales of measurement (Box 1.1). Using applicable questioning techniques ensures that the patient is actively involved. This interactive approach to supervision and the skills of the PTA to seek, understand, and accurately relay information related to the patient's status distinguishes the PTA from an aide who is trained on the job.[3]

PATIENT SUPERVISION BY THE REHABILITATION TEAM

The PTA must be aware of the key members of the rehabilitation team. The PT and PTA are involved with direct patient care daily and may be assisted by supportive personnel, such as physical therapy aides or technicians. Occupational therapists and occupational therapy assistants, speech language pathologists, audiologists, rehabilitation counselors, nurses, respiratory therapists, psychologists, and dietitians all play significant roles in daily patient care. These rehabilitation specialists seek to maximize recovery for each patient and always must be regarded as resources to meet specific patient needs as they are identified by any member of the team. The PTA charged with direct patient care and supervision is only one vital member of the team, and can take comfort in knowing that every member of the team is prepared to provide appropriate skills so that the patient can achieve the highest functional gains in recovery. Developing a team mindset helps the PTA be responsible and accountable to the other members of the team for their own contribution and to reach out to others when their expertise is needed.[4]

Effective **communication** is the hallmark of a great team and should be maximized. To supervise effectively and provide the best care for the patient, the PTA must learn to communicate openly and freely with honesty and respect and in a professional manner with every member of the team.[4] He or she must differentiate between the language used for communicating among peers and language used to define and explain injury, disease, and physical therapy interventions to a patient. The PTA must employ appropriate and professional medical terminology to outline and describe an orthopedic problem to a PT and must be able to use familiar terms to describe the same pathologic condition to a patient or family member. If the

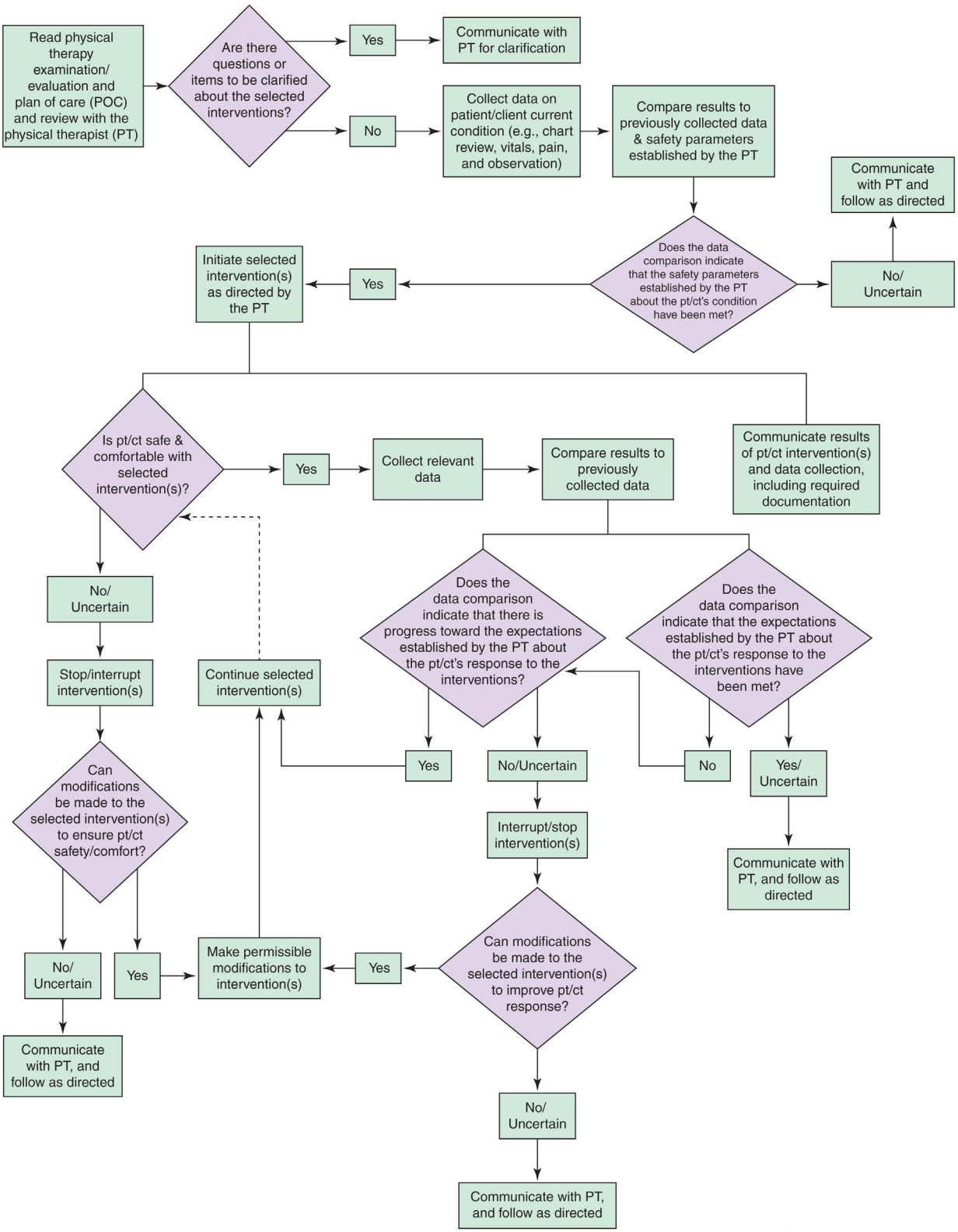

Fig. 1.1 Problem-Solving Algorithm Utilized by physical therapist assistants (PTAs) in Patient/Client Intervention. (Adapted from *A Normative Model of Physical Therapist Assistant Education,* version 2007, with permission of the American Physical Therapy Association.)

BOX 1.1 General Scales of Measurement

Strength: Manual Muscle Testing
- 5/5 Normal: Holds test position against gravity and maximal resistance
- 4/5 Good: Holds test position against gravity and moderate resistance
- 3/5 Fair: Completes full range of motion against only the resistance of gravity
- 2/5 Poor: Completes full range of motion in a gravity-minimized position
- 1/5 Trace: Can detect visually or by palpation some contractile activity in the muscle
- 0/5 Zero: No contraction felt in the muscle

Pain: Analog Scale
- Graded from 0 to 10 (0 absent, 10 severe)

Swelling: Generally Measured by
- Circumferential measurement
- Water displacement

Vital Signs
- Blood pressure: Less than 120/80 mm Hg normal; use sphygmomanometer and stethoscope
- Pulse: Between 60 and 100 bpm; average 72 bpm; pulse can be lower (e.g., 55 bpm) for trained athletes
- Respirations: Average 12 to 16 breaths per minute
- Temperature: Normal range 97 °F to 99 °F
- Oxygen saturation: Normal ranges from 95% to 100%

Coordination
- Tapping foot or hand
- Finger to nose
- Heel to shin
- Coordination activities are tested first with eyes open, then with eyes closed. All events are described as degrees of rhythmic, symmetric, even, and consistent.

Stretch Reflex (DTR)
- 0 = Areflexia
- 1 to 3 = Average
- 3+ to 4 = Hyperreflexia

Range of Motion: Standard Goniometry
- Shoulder
  - Flexion 1 degree to 180 degrees
  - Extension 0 degree to 60 degrees
  - Abduction 0 degree to 180 degrees
  - Internal rotation 0 degree to 70 degrees
  - External rotation 0 degree to 90 degrees
- Hip
  - Flexion 0 degree to 120 degrees
  - Extension 0 degree to 30 degrees
  - Abduction 0 degree to 45 degrees
  - Adduction 0 degree to 30 degrees
  - External rotation 0 degree to 45 degrees
  - Internal rotation 0 degree to 45 degrees
- Ankle
  - Dorsiflexion 0 degree to 20 degrees
  - Plantar flexion 0 degree to 50 degrees
  - Inversion 0 degree to 35 degrees
  - Eversion 0 degree to 15 degrees
- Knee
  - Flexion 0 degree to 135 degrees
- Elbow
  - Flexion 0 degree to 150 degrees

DTR, Deep tendon reflex.

PTA uses medical jargon inappropriately, the patient or family member might perceive the PTA as insensitive, aloof, and impersonal. Use of language appropriate to the patient's comprehension generally conveys understanding, sensitivity, warmth, and reassurance and removes uncomfortable and unnecessary barriers to communication.[5]

! IMPORTANT CONCEPTS

Use of language appropriate to the patient's comprehension conveys understanding, sensitivity, warmth, and reassurance and removes uncomfortable and unnecessary barriers to communication.

The PTA also must be aware that **listening** is an effective communication tool. Listening demonstrates interest and provides the opportunity for a better understanding of the patient's concept of the problem.[6] Through active listening, the PTA is better able to integrate verbal and nonverbal messages that the patient may have received.[6] In addition, patients may be more comfortable and trusting with a good listener and be more willing to provide information.[6]

Supervision of patients by the PTA must be done systematically and reliably, with an emphasis on **accountability** and effective and efficient patient care. Appropriate and responsible investigative questioning of the patient during selected interventions helps the PTA focus on the areas to probe, findings to quantify, and objective changes to assess. As indicated in the "Problem-Solving Algorithm Utilized by PTAs in Patient/Client Intervention,"[1] PTAs are responsible for reporting all findings to the supervising PT so that modifications can be made in accordance with changes in patient status.

! IMPORTANT CONCEPTS

The PT is responsible for the five elements of patient/client management (examination, evaluation, diagnosis, prognosis, and intervention) and the direction and supervision of all selected interventions provided by the PTA.

BASIC PATIENT SUPERVISION SKILLS

Communication Skills

The PTA can be most effective if he or she develops an understanding of human behavior and adopts a **proactive** role in supervising patients. In a proactive role, the PTA does not wait to be placed in a position that requires a response, but rather creates an active situation or environment with the patient by gathering information and directing where the treatment needs to go. Use of appropriate **probing questions** is a proactive method to use during patient supervision. Questioning patients during treatment can be insightful, rewarding, and helpful for both the supervising PT and the PTA. The format of asking probing questions is critical and strongly influences the responses received (Fig. 1.2). Using **open-ended questions** invites the patient to share feelings, thoughts, concerns, and opinions.[7] Examples are:
- "Tell me about your pain."
- "How does that feel?"
- "What do you think about this exercise?"

Probe	Definition	Objectives	Characteristics	Examples
Open-ended questions	A question or statement that invites a wide-ranging response, often asks for ideas, opinions, or views.	• Open up discussion • Invite broad response • Give others freedom to talk • Gets involvement	• Can't be answered "yes" or "no" • Gets at feelings, opinions, thoughts	• "What do you think about...?" • "Tell me about..." • "Why do you feel...?" • "What's your opinion?"
Pause	An intentional, purposeful period of silence.	• Give other a chance to think and respond • Slow down pace • Draw out other	• Usually follows open-ended question • Deliberate	• "Why do you say that?" (silence) • "Tell me more." (silence)
Reflective	A statement that describes and reflects a feeling or emotion (without implying agreement or disagreement).	• Identify emotions • Show you understand • Vent interfering emotions	• Names a feeling or emotion • Usually uses the word "you" or "you're" • May state cause of the emotion	• "You're pretty mad about it." • "You seem reluctant to talk about it." • "Sounds like you're excited."
Neutral phrase or question	A question or statement that encourages other to elaborate.	• Get other to tell more about a subject	• Few words • About subject under discussion	• "Tell me more." • "Please elaborate." • "Explain that." • "Amplify on that."
Brief assertion	A short statement, sound, or gesture, which shows involvement.	• Encourage other to continue • Increase receptivity	• Elicits additional information • Occurs automatically	• "Oh, okay." • "Yes, sure." • "I see." • Nodding your head.
Summary statements	A brief statement, in your own words, of the content of what was said.	• Check understanding • Prove you're listening • Give structure and direction • Help other clarify thinking • Invite other to comment or expand	• Summarizes content, not feelings • Restatement of essential ideas • In own words	• "So you disagree about..." • "The way you see it is..." • "You prefer working overtime..." • "Let me summarize how I..."
Closed-ended questions	A question that limits the answer by requesting specific facts, or a "yes" or "no" answer.	• Find out details, specifics • Check understanding • Direct the discussion • Get other to take a stand	• Often starts with "Who," "Which," "When," "Where," "How many," etc. • Can sometimes be answered with a simple "yes" or "no"	• "Who is...?" • "Which order...?" • "When will you...?" • "Do you think...?"
Leading questions	A question that implies only one answer, or a rhetorical question—no answer is needed.	• Pin down positions or agreements • Can verify assumptions • Can be threatening	• The question gives the answer • No answer is required	• "Shouldn't we discuss...?" • "This is the best way to go, isn't it?"

Fig. 1.2 Probes and Probing Questions: The Use of Questions, Statements, and Pauses to Elicit Information, Thoughts, and Opinions. The type of question used elicits a characteristic response. (From Buzzotta VR, Lefton RE. *Dimensional Management Training.* St Louis: Psychological Associates; 1989.)

These types of questions are generally not answered by "yes" or "no." They open discussions and prompt the patient to express a wide range of views and opinions.[7] Open-ended questions for patients have been described as "a good medium for facilitating rapport and, as such, are particularly useful…"[6] Using open-ended questions promotes personal interactions between the PTA and patient, may allow the patient to give a more in-depth explanation of the problem, and may lead to discussions of what the patient identifies as important. Although this type of questioning does not enable the patient to give precise, clear

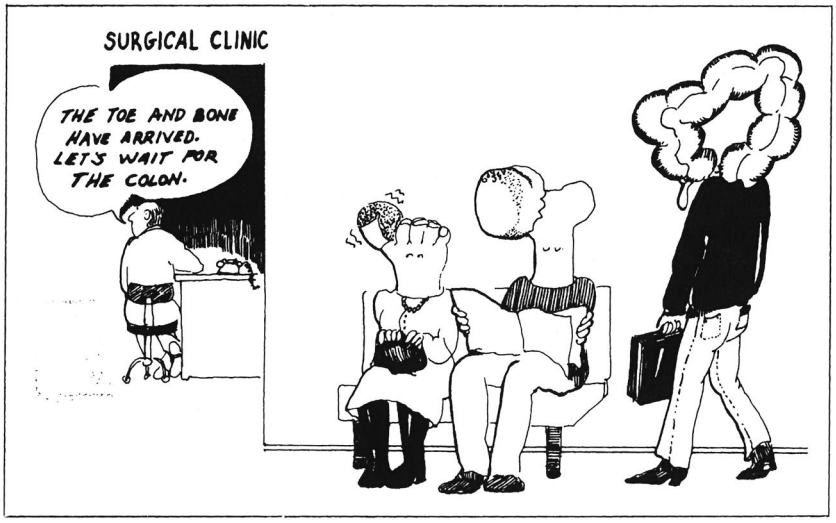

Fig. 1.3 Viewing Patients in a Non–Patient-Centered Manner. (From Haddad A, Doherty R, Purtilo R. *Health Professional and Patient Interaction.* 9th ed. St. Louis: Elsevier; 2019.)

answers, it is appropriate in situations that require compassion and empathy from the PTA and shared feelings between the PTA and patient.

Closed-ended questions are directed toward finding facts, obtaining specific responses, and filling in details. They can be helpful in focusing and clarifying essential details of the patient's condition.[7] By asking the patient questions such as, "Where is your pain?", "When does your knee feel unstable?", or "Does your back hurt when you bend forward?", the PTA proactively directs the discussion and sequence of questions instead of sifting out pertinent information from among all the data gathered in open-ended questioning.

Summary-type statements check understanding, help the patient clarify thinking, and provide direction for the PTA. Examples include the following: "So your back hurts only at night?" and "Then your knee doesn't hurt with this exercise." Using precise closed-ended questions with summary statements elicits information that can lead to an objective assessment of the patient. The approach the PTA takes influences the balance of questioning between open-ended and closed-ended questions.

! IMPORTANT CONCEPTS

Open-ended questions: Invite the patient to share feelings, thoughts, concerns, and opinions.
Closed-ended questions: Are directed toward finding facts, obtaining specific responses, and filling in details.
Summary-type statements: Check understanding, help the patient clarify thinking, and provide direction for the PTA.

Behavior

The behavior of the PTA during patient supervision can either reassure the patient and demonstrate appropriate responsive professional care or create a sense of indifference. Conducting patient supervision in a **patient-centered** manner allows the PTA to build a professional relationship with the patient based on trust and respect and ensures respect is operating at the core of the relationship.

The law categorizes the relationship between a healthcare provider and patient as a fiduciary relationship meaning "faith in someone or something."[2] The patient trusts that the PTA has the technical skills and knowledge to help them. The patient also trusts the PTA sees them as a unique individual and treats them as such. The PTA needs to ensure the patient feels the PTA has the patient's best interest and well-being in mind and is carrying out supervision of the patient as an individual and not just the injured body part. One cartoonist illustrated how some patients feel they are viewed by health care providers when a professional relationship built on trust and respect is not well established (Fig. 1.3).

The PTA should demonstrate professional behaviors during each interaction with the patient. Professional behavior means conducting oneself with:

- Responsibility
- Integrity
- Accountability
- Excellence
- Effective and appropriate communication
- Efficiency and productivity[8]

A PTA who initiates treatment with the patient at the arranged time; who looks clean, neat and is dressed appropriately for the treatment environment; who demonstrates good personal hygiene; and who shows enthusiasm and a caring and interested attitude toward the patient exhibits professional behaviors that will build trust and respect with the patient.

! IMPORTANT CONCEPTS

Professionalism is being responsible, ethical, a team player, and a good communicator, and demonstrating interpersonal and problem-solving skills.

The goal of the PTA during supervision of the patient is to demonstrate consistently the qualities of being appropriately

friendly, attentive, responsive, involved, exploring, analytical, and task oriented. When supervising patients, the PTA must understand the differences between **prompting** and **cueing** a patient to perform a specific task. Prompting a patient to perform a task can be viewed as the presentation of a question. For example, when instructing a patient to ambulate with a standard walker, the assistant should prompt the patient by asking, "After you move the walker, what foot do you move next?" Prompting allows patients to decipher information, solve problems, and provide solutions to activities they must overcome during recovery. Cueing can be viewed as a direction. An example is, "After you move the walker, move your injured leg." Although the solution is provided for the patient, they must still demonstrate appropriate follow-through and proper understanding of the command.

! IMPORTANT CONCEPTS

Prompting: The presentation of a question. Allows patients to decipher information, solve problems, and provide solutions to activities they must overcome during recovery.

Cueing: Viewed as a direction. Although the solution is provided for the patient, they must still demonstrate appropriate follow-through and proper understanding of the command

Modifications During Treatment

Using attentive behavior with balanced open-ended and closed-ended questioning of the patient helps the PTA identify and quantify changes in the patient's condition. After consulting the supervising PT and receiving direction, the PTA can effectively modify a specific intervention in accordance with changes in patient status.

The following example helps to clarify the scope of treatment modifications during postoperative rehabilitation after anterior cruciate ligament reconstruction.

Swelling (joint effusion) after knee surgery is common and occurs in about 13% of cases after knee ligament surgery.[9] Usually the effusion is a hemarthrosis (blood within the joint, which can impair voluntary muscle contraction). In such a case, the supervising PT provides baseline evaluation data about the degree of swelling present by making comparative circumferential measurements at midpatella, 2 inches superior to the midpatella, and 2 inches inferior to the midpatella. The PTA maintains daily records of the three comparative circumferential measurements. Because reeducation and strengthening of muscle is influenced negatively by postoperative swelling, any increase or decrease in swelling necessitates a modification in the initial program outlined by the supervising PT. The degree of swelling documented influences the adjustment made in the exercise prescription.

As the PTA identifies objective changes in the patient's status each day, the concept of visual, nonresponsive, and noninteractive supervision is altered to one of appropriate, responsive, and accountable supervision.

Isometric exercises generally are used early in the rehabilitation of acute postoperative knee injuries. Concentric and eccentric exercises are introduced as rehabilitation proceeds. Concentric and eccentric exercises are defined as dynamic, producing work, and creating changes in joint angles and muscle length.[10] The progression from isometric to dynamic exercise produces an increase in force generated, increases muscle soreness, and causes greater articular stresses.[11] If swelling and pain increase as the patient progresses from isometric to concentric and eccentric contractions, the PTA, with direction and input from the supervising PT, can adjust or modify the program back to isometrics or reduce the amount of resistance, joint angle of exercise, volume of exercise, or velocity of movement. The specific sequence or combination of these modifications depends on the patient's specific needs, the surgical procedure, and the patient's tolerance to exercise. Usually it is prudent to begin with the least drastic change in exercise prescription, and then progress (Box 1.2).

BOX 1.2 Knee Extension: Isotonic Exercise Modifications

If pain and swelling develop during full range of motion isotonic knee extension:

- Adjust the resistance. Reduce the amount of weight being used
- Adjust the range of motion to limit full knee flexion: Example: Begin knee extension exercises from 45 degrees of flexion or less instead of 90 degrees or greater. Note: Some acute, chronic, and postsurgical conditions prohibit terminal knee extension (0°). In this case, limit full extension to −10 degrees or greater.
- Adjust the speed or velocity of the performance of the exercise. Closely observe the speed of the exercise. Perform slow, controlled, nonballistic exercise.
- Adjust the volume of exercise
  - Reduce the number of repetitions being performed
  - Reduce the number of sets being performed
  - Reduce the number of days per week performing the exercise
- Change the performance of exercise
  - Perform only isometric holds followed by eccentric loads. No concentric lifting

The clinical decision-making process used by the PTA involves recognizing that a problem exists, then taking orderly and specific steps to notify the supervising PT and adjust the program accordingly. The PTA takes an active, participatory role when supervising patients, using their training and skills to the fullest extent.

! IMPORTANT CONCEPTS

Clinical decision making by the PTA involves observation, information processing, critical thinking, evaluation of evidence, application of relevant knowledge, problem solving, reflection, and clinical judgment to select the best course of action that would benefit the patient.

The recognition of changes in patient status does not imply interpretation of objective measurable data by the PTA. The task of the PTA is to provide information to the supervising PT on a daily basis, keep the supervising PT informed concerning patient status, and provide insightful and meaningful suggestions for modifications.

The objective data supplied to the supervising PT by the PTA may include, but are not limited to, goniometric measurements, circumferential measurements, manual muscle testing, endurance grading, heart rate, blood pressure, respirations, dynamic

balance, and coordination measurements, according to the scope of the assistant's training.

UNDERSTANDING DIFFERENT PHILOSOPHIES OF PHYSICAL THERAPISTS

Fundamental differences exist among PTs concerning the methods, protocols, and directives they use to treat patients. In addition, just as the PTA is directed by the supervising PT, the PT may sometimes be directed by the physician. Within a hospital physical therapy department, the PTA may have contact with many supervising PTs, each with different backgrounds, experiences, and education. The PTA sees PTs use various protocols to manage the same pathologic condition. It is not the role of the PTA to change or modify treatment plans or protocols without the direction and approval of the supervising PT. Opinions and controversies exist concerning how best to manage various orthopedic pathologic conditions. Changes in surgery and physical therapy occur because of advanced technology and rigorous research in rehabilitation medicine and orthopedic surgery. New procedures in arthroscopic anterior cruciate ligament surgery allow a more rapid return to function, motion, and strength than ever before. Although we ideally presume all surgical procedures and rehabilitation techniques to be universally accepted, the specialties of orthopedics and physical therapy are both art and science; therefore, diversity is accepted.

The PTA can be placed in frustrating and confusing situations when dealing with various supervising PTs with different backgrounds and opinions concerning the management of patients. To minimize the confusing array of treatment protocols, the PTA must communicate effectively and efficiently with the supervising PT to clarify differences in patient care, always remembering that the PT has ultimate **responsibility** for the physical therapy interventions provided. The PTA does not divest interest in the care of any patient because of a disagreement in strategy with the supervising PT. The PTA's role requires a broader perspective and understanding that there are many ways to effectively manage the same pathology.

Having strong opinions on how to care for patients with orthopedic conditions is appropriate and shows passion, interest, and confidence in a certain method or protocol that has demonstrated good results. However, particular experience with the successful management of patients by one supervising PT may conflict with the course of treatment prescribed by another. On the surface, this situation may seem particularly frustrating and stressful. To understand this difference better, the PTA must identify the key elements of disagreement and seek an appropriate explanation from the supervising PT. This situation gives the supervising PT the opportunity to teach and explain the rationale for the particular treatment and exposes the PTA to new information. The PTA then can observe and learn new methods that may prove equally or more successful than the previous plan of care.

Fully understanding the rationale and purpose of each selected intervention allows for improved delivery of service to the patient. During direct patient supervision, the PTA can provide any selected interventions the supervising PT directs them to perform, so long as allowed by law, and the safety and welfare of the patient are not compromised.

A well-adapted PTA views any apparent roadblocks as learning opportunities. The PTA is advised to take advantage of the broad knowledge and experience of many PTs, constantly inquire about the rationale and scientific basis for a particular program, and establish themself as an eager learning participant who is open to innovative ways of managing various pathologic conditions.

SUMMARY

Patient supervision and observation are an inherently important role of the PTA. The job of supervision requires a keen eye to detail, an ability to problem solve quickly and efficiently, and appropriate decision-making skills. Interpersonal communication, data collection, and responsive clinical decision making are the hallmarks of effective patient management. A PTA with a patient-centered attitude will always look out for what is best for each and every patient. Professional behavioral skills every PTA should embody include: responsibility, integrity, accountability, drive for excellence, and effective and appropriate communication.

GLOSSARY

Accountability: Systematic, reliable, and appropriate investigative questioning, listening, and active participation at all levels of patient care.

Clinical decision making: Complex process that involves observation, information processing, critical thinking, evaluation of evidence, application of relevant knowledge, problem solving, reflection, and clinical judgment to select the best course of action that would benefit the patient.

Closed-ended questions: Communication technique that requires a "yes" or "no" answer. This method effectively directs specific responses aimed at details of the patient's condition.

Communication: The exchange of information between people. In health care, to gather information relevant to the patient's problem; to establish rapport and to provide confidence; to facilitate understanding of the patient's problem to assist in comprehensive patient management.

Cueing: Can be viewed as a direction; although a solution is provided, appropriate follow-through and proper understanding of the direction(s) must be demonstrated.

Empathy: The ability to identify, understand, and subjectively simulate another's psychological state, feelings, or perspective in an attempt to understand their feelings and point of view, while maintaining a clear self-other

differentiation with internal motivation of concern for the other and a desire to act to relieve their suffering by caring and driving acts of altruism.[12]

Interpersonal communication: Selective, systemic, individual, ongoing transactions that allow people to reflect and build personal knowledge and insight about one another and create shared meanings.

Interventions: Purposeful and skilled interactions with the patient and other individuals involved in the patient's care, using various physical therapy procedures and techniques to produce a change in the patient's condition.

Listening: An effective communication tool that demonstrates interest and concern for the patient and their individual needs.

Open-ended questions: A communication technique to facilitate rapport and let the patient see that the PTA is effectively listening that allows patients the opportunity to provide substantial information concerning their care.

Patient-centered: A communication technique to facilitate trust between the patient and the PTA, wherein the PTA demonstrates "appreciation of the patient's uniqueness among persons, attention to that person's health-related need, and commitment to conscientiously providing professional knowledge and skill to address that need."[2]

Proactive: Creating a situation by using probing questions and appropriate communication skills, accountability, listening, and responsibility, so that active responses occur rather than simply reacting once something happens.

Probing questions: Technique of questioning patients that leads to insightful, rewarding, and responsive care.

Prompting: The presentation of a question; allows patients to decipher information, solve problems, and provide solutions to activities.

Responsibility: A component of active involvement of all areas of patient care.

Sympathy: A general fellow feeling, no matter of what kind, caused by the realization that something bad has happened to another person with an egoistic self-motivation to help the other person in order to relieve one's own distress without making any attempt to understand their feelings and point of view.[12]

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REVIEW QUESTIONS

Multiple Choice

1. Which of the following require a "yes" or "no" answer?
   - **a.** Closed-ended questions
   - **b.** Open-ended questions
   - **c.** Probing questions
   - **d.** None of the above
2. Which of the following statements demonstrates patient-centered language?
   - **a.** "The knee patient's gait is improving until she is fatigued."
   - **b.** "Schedule the two total hip replacement patients at the same time so they can support each other during treatment."
   - **c.** "I have all my ankle patients stand on this foam pad to help improve their balance."
   - **d.** "When you ascend stairs, your right hip is still weak so we're going to add this exercise to increase your hip strength."
3. During a treatment, the patient becomes very emotional and expresses her frustration that she cannot sit on the floor with her grandchildren anymore because of impairments from her stroke. The PTA pauses the therapy activity to discuss things in the plan of care that will help the patient to interact with her grandchild. This PTA demonstrated:
   - **a.** Empathy
   - **b.** Sympathy
   - **c.** Patient-centered language
   - **d.** Proactive behavior

4. Which type of questioning allows the patient the opportunity to provide substantial information concerning their care and is a technique to facilitate rapport between the patient and the PTA?
   a. Open-ended questions
   b. Closed-ended questions
   c. Probing questions
   d. Prompting questions
5. Which of the following is an example of "cueing?"
   a. "After you move the walker and right leg, move your left leg."
   b. "After you move forward in your chair, what do you do next?"
   c. "After you move your cane, what leg do you move next?"
   d. None of the above
6. During a patient treatment session, the patient becomes very emotional and expresses how much he misses his wife who passed away in the same MVA that caused his injuries. The PTA attempts to console the patient by pointing out how supportive his family has been during treatments. This PTA demonstrated:
   a. Empathy
   b. Sympathy
   c. Prompting
   d. Cueing
7. All of the following are examples of "summary-type" statements except which one?
   a. "So your knee hurts only when you run?"
   b. "Your back doesn't hurt when you do your home exercise program?"
   c. "Tell me about your work environment."
   d. "Your neck only bothers you when you work at your desk?"
8. In general, use of language appropriate to the patient's comprehension conveys:
   a. Understanding
   b. Sensitivity
   c. Warmth
   d. All the above
9. Components of patient supervision by the PTA include all of the following except:
   a. Gathering of relevant information and data about the patient
   b. Assisting in the management of the patient
   c. Determining the plan of care for the patient
   d. Establishing rapport with the patient
10. The PTA is responsible for carrying out all of the following except:
    a. Appropriate problem solving
    b. Patient supervision
    c. Data collection
    d. Prescribing and selecting interventions
11. All of the following are key members of the rehabilitation team except:
    a. PT and PTA
    b. OT and OTA
    c. Nurse
    d. Housekeeping staff member
12. According to the "Problem-Solving Algorithm Utilized by PTAs in Patient/Client Intervention," PTAs are responsible for reporting all findings to:
    a. The patient's medical doctor
    b. The patient's nurse
    c. The supervising PT
    d. The patient's discharge planner
13. All of the following are true statements except which one?
    a. The PTA has ultimate responsibility for the physical therapy interventions provided.
    b. To minimize confusion, the PTA must effectively and efficiently communicate with the supervising PT to clarify differences in patient care.
    c. A well-adapted PTA views any apparent roadblocks as learning opportunities.
    d. Having strong opinions on how to care for various diagnoses is appropriate and shows passion, interest, and confidence in a certain method or protocol that has demonstrated good results.
14. Clinical decision making involves which of the following?
    a. Observation and information processing
    b. Application of relevant knowledge and problem solving
    c. Critical thinking and evaluation of evidence
    d. All the above
15. In describing "prompting," which of the following is true?
    a. Can be viewed as a direction
    b. Allows patients to decipher information and solve problems
    c. Is the presentation of a question
    d. Both b and c

Short Answer

16. Give three examples of open-ended probing questions that may be appropriate during patient observation and interactive supervision.
17. Give three examples of closed-ended probing questions that may be appropriate during patient observation and interactive supervision.
18. Give three examples of professional behaviors a PTA may demonstrate during patient supervision.
19. Give an example of prompting a patient to attempt a specific task.
20. Give an example of cueing a patient to attempt a specific task.

Fill in the Blank

21. The five components of patient supervision are _____, _____, _____, _____, and _____.
22. Effective _____ is the hallmark of a great team and should be maximized.
23. Appropriate medical language used with the patient and his or her family helps to convey _____, _____, _____, and _____.
24. The PTA also must be aware that _____ is an effective communication tool.
25. A professional relationship with the patient should be based on _____ and _____.

True/False

26. As the PTA identifies objective changes in the patient's status each day, the concept of appropriate, responsive, and accountable supervision should be altered to one of visual, nonresponsive, and noninteractive supervision.

27. The clinical decision-making process used by the PTA involves recognizing that a problem exists, then taking orderly and specific steps to notify the supervising PT and adjust the patient's treatment.

28. The objective data supplied to the supervising PT by the PTA should be limited to goniometric measurements, manual muscle testing, heart rate, blood pressure, and respirations.

29. According to the "Problem-Solving Algorithm Utilized by PTAs in Patient/Client Intervention," it is the role of the PTA to change and/or modify treatment plans and/or protocols.

30. Showing up on time and dressed appropriately for the treatment environment are two behaviors a PTA can exhibit to demonstrate professionalism.

2

The Role of the Physical Therapist Assistant in Physical Assessment

Jamie Dehan

LEARNING OBJECTIVES

1. Apply the language of the *Guide to Physical Therapist Practice* to physical assessment procedures.
2. Identify the common elements of examination, evaluation, and assessment.
3. Describe the role of the physical therapist assistant in the performance of physical assessment based on the physical therapy plan of care.
4. Discuss the role of the physical therapist assistant in data collection.
5. Explain methods of modifying the physical therapy plan of care or actions to be taken in response to physical assessment of the patient.
6. Identify critical elements to include with documentation of physical assessment.
7. Relate physical assessment to goals and outcomes of a physical therapy plan of care.

CHAPTER OUTLINE

KEY TERMS

Assessment
Centralization
Evaluation
Examination
Peripheralization
Referred pain
Trigger points
Visceral pain

As any prospective or current student in the field of physical therapy is aware, changes in the profession are emerging rapidly. In an effort to bring physical therapy professionals to the "health-care table" for discussion of legislative, regulatory, and reimbursement issues, the leaders of our profession are striving for standardization of terminology and recognition and application of evidence-based practice.[1] Needless to say, controversy or at least animated debate occurs among interested parties any time such an in-depth self-scrutiny of a profession takes place. One significant element of this debate in physical therapy revolves around the role of the physical therapist assistant (PTA) in the profession, including how the PTA participates in the administration of the physical therapy plan of care, including selected interventions, data collection techniques, and the terminology associated with the PTA's role. The purpose of this chapter is to summarize available standards and guidelines associated with the PTA's role in physical therapy treatments and to discuss techniques and implications of selected interventions and their associated data collection techniques to be used for patients with musculoskeletal conditions.

AMERICAN PHYSICAL THERAPY ASSOCIATION GUIDING DOCUMENTS

Guide to Physical Therapist Practice 3.0

The *Guide to Physical Therapist Practice 3.0* (the *Guide*)[1] is a tool that was developed by the American Physical Therapy Association (APTA) in part to "…describe physical therapist practice;…standardize terminology used in and related to physical therapist practice;…delineates the clinical decision-making process that occurs as part of patient and client management…describes the examination and evaluation process with a focus on tests and measures; [and] describes how outcome measures are used…"[1] The stated purpose of the *Guide* reads, in part, that it is a resource for "…physical therapist and physical therapist assistant educators, students, and clinicians."[1] According to the *Guide,* the PTA "assists the physical therapist in the provision of selected physical therapy interventions… [and] play a vital role in providing the public with access to physical therapist services."[1] **Assessment** can be described as measuring or quantifying a variable or placing value on something. It is important that assessment is not confused with examination or evaluation. **Examination** involves preliminary gathering of data and performing various screens, tests, and measures to obtain a comprehensive base from which to make decisions about physical therapy needs for each individual patient, including the possibility of referral to another health care provider. **Evaluation** is the specific process reserved solely for the physical therapist (PT), in which clinical judgments are made from this base of data obtained during the examination.[1]

Standards of Ethical Conduct for the Physical Therapist Assistant

The Standards of Ethical Conduct for the Physical Therapist Assistant is a tool developed by the APTA to delineate the ethical obligations of all PTAs.[2] There are eight standards of ethical conduct for the PTA, and they can be found in the "Practice & Patient Care" section under "Ethics & Professionalism" and "Standards of Ethical Conduct for the Physical Therapist Assistant" on the APTA website (www.apta.org). Another tool "intended to serve physical therapist assistants in interpreting the Standards of Ethical Conduct for the Physical Therapist Assistant" provided by the APTA is the *Guide for Conduct of the Physical Therapist Assistant.*[3]

Professionalism in Physical Therapy: Core Values

The APTA has also developed a list of values, known as *core values,* which reflect what one would call a professional in physical therapy. The core values include accountability, altruism, compassion/caring, excellence, integrity, professional duty, and social responsibility.[4] Each core value, along with its corresponding definition as provided by the APTA, can be found in the "Practice" section on the APTA website. From these core values, *Values-Based Behaviors for the PTA* was developed by the Advisory Panel of PTAs to the APTA Board of Directors to help guide professionalism in physical therapist practice, education, and research.[5]

Another tool for developing professionalism in physical therapy is the *Professional Behaviors Assessment Tool* (the *Tool*) developed by the research team of May, Kontney, and Iglarsh building on the work the faculty of the physical therapist education program at University of Wisconsin at Madison began in 1991.[6,7] The *Tool* identifies the repertoire of professional behaviors required for success within the practice of physical therapy and offers a sequential development pathway for students to follow to progress toward entry level performance both in the classroom and the clinic by the end of their academic career. The *Professional Behaviors Student Self Assessment Tool* is available on the Marquette University Physical Therapy webpage (https://www.marquette.edu/physical-therapy/documents/professional-behaviors-student-self-assessment.pdf). The *Tool* includes the following professional behaviors:

1. Critical Thinking
2. Communication
3. Problem Solving
4. Interpersonal Skills
5. Responsibility
6. Professionalism
7. Use of Constructive Feedback
8. Effective Use of Time and Resources
9. Stress Management
10. Commitment to Learning[6]

The Physical Therapist Assistant Clinical Performance Instrument

The Physical Therapist Assistant Clinical Performance Instrument, a uniform clinical education grading tool developed by the APTA,[8] includes the following essential skills related to the PTA's role in clinical problem solving (criterion #7):

- "Presents sound rationale for clinical problem solving, including review of data collected and ethical and legal arguments."

- "Seeks clarification of plan of care and selected interventions from clinical instructor and/or supervising physical therapist."
- "Collects and compares data from multiple sources (e.g., chart review, patient caregivers, team members, observation) to determine patient's readiness before initiating interventions."
- "Demonstrates sound clinical decisions within the plan of care to assess and maximize patient safety and comfort while performing selected interventions."
- "Demonstrates sound clinical decisions within the plan of care to assess and maximize intervention outcomes, including patient progress and/or intervention modifications."
- "Demonstrates the ability to determine when the clinical instructor and/or supervising physical therapist needs to be notified of changes in patient status, changes or lack of change in intervention outcomes, and completion of intervention expectations (i.e., goals have been met)."
- "Demonstrates the ability to perform appropriately during an emergency situation to include notification of appropriate staff."

! IMPORTANT CONCEPTS

Only a physical therapist may perform any of the following:

- Interpretation of a referral
- Performance and documentation of an initial examination, testing, evaluation, diagnosis, and prognosis
- Development or modification of a plan of care that is based on a reexamination of the patient or client that includes the physical therapy goals for intervention
- Timely review of documentation, reexamination of the patient or client, and revision of the plan of care when indicated
- Establishment and documentation of the discharge plan and discharge summary
- Spinal and peripheral joint mobilization techniques[9]

Frequently, the response to the question about the difference between PTs and PTAs is simply, "PTAs don't do evaluations." Considering the elements of judgment and decision making involved with evaluation and from the preceding discussion, does this imply that the PTA does not exercise judgment or make decisions? Of course not. However, the judgments and subsequent decisions of the PTA are made within the context of the existing physical therapy plan of care, established by the supervising PT through the examination and evaluation process. This process occurs on an ongoing basis.[10] Without effective data collection and reporting by the PTA, the PT would lack key information on which this data management process relies.[10]

It may be helpful to consider the functions of data collection and patient management as integral parts of managing a patient's physical therapy case, which is a dynamic process as illustrated in the APTA's "Problem-Solving Algorithm Utilized by PTAs in Patient/Client Intervention" (see Fig. 1.1).[9]

This discussion of specific assessment techniques and issues begins with two conditions frequently encountered among patients with musculoskeletal involvement: inflammation and pain.

INFLAMMATION

What Is Inflammation?

Inflammation is the first response of a living organism to injury or disruption of normal processes. It is a normal response and can be considered the body's immediate trigger for healing. Different tissues have different responses. Inflammation responses depend on the injury source, site of the injury, state of local homeostasis, and stage of the injury. Two important factors must be kept in mind when assessing inflammation: (1) inflammation is a normal and necessary response to trigger tissue healing, and (2) unresolved (chronic) inflammation may lead to permanent and undesired tissue changes. The body's goals of an inflammatory response are: (1) to eliminate pathologic or physical insult, (2) replace tissue, (3) promote regeneration of normal tissue structure, and/or (4) restore function. It is imperative for the PTA to monitor changes in the inflammatory response of the area being treated. The PTA must use critical thinking to assess a patient's inflammation to understand the physiology of healing, the biomechanics of the joint(s) involved, and the effects of immobilization and therapeutic interventions on the inflamed area. In addition, extreme changes in the appearance of inflammation may signal the onset of serious complications, necessitating further evaluation by the PT or, in some cases, referral to the physician for immediate medical evaluation.

Physical agent interventions may be employed to control (but not eliminate) the acute inflammatory response or accelerate it, moving the healing process along. Depending on the degree of inflammation present, certain physical agent interventions may be contraindicated. How does the PTA differentiate between normal inflammation and an inflammatory reaction indicating the potential for contraindicated procedures or serious complications?

The commonly accepted and normal (cardinal) signs and symptoms of inflammation are localized heat, redness, swelling, and pain with a resultant loss of function in the injured area. Temperature and redness are discussed here in relation to the PTA's role in collecting data and communicating concerns appropriately to the PT. The assessments of edema and pain are discussed in separate sections.

! IMPORTANT CONCEPTS

Cardinal Signs and Symptoms of Inflammation

- Localized heat
- Redness
- Swelling
- Pain

General Contraindications and Precautions Concerning Inflammation

In general, remember that inflammation is a reaction to tissue trauma or injury; the increased inflammatory reactions after exercise or other interventions may indicate that the intervention is too aggressive or contraindicated, resulting in new trauma or injury to healing tissues. Responses to interventions between visits must also be assessed; if a patient experiences

joint pain or muscle soreness lasting longer than 24 hours after application of exercise or stretching techniques, the techniques were too intense.[11]

Acute Versus Chronic Inflammation

Under normal circumstances, signs of acute inflammation persist for 4 to 6 days, assuming the precipitating condition, agent, or event is removed. In the initial 48 hours after tissue injury, the observable signs of inflammation are associated with the normal inflammatory vascular response to trauma.[11] An important distinction to make is the definition of acute versus chronic in relation to the actual cause of injury or trauma. It is common for sources to refer to these tissue states in terms of time frames only, with the acute phase lasting 4 to 6 days and the chronic phase lasting 6 months to 1 year.[11] A more useful way to consider inflammation incorporates the concept of whether there is real or impending tissue damage present. The significance of this designation relates to the PTA's role in determining whether, based on the stage of inflammation present, certain interventions may be implemented or are contraindicated.[12] If an intervention normally results in an inflammatory reaction, it is contraindicated when the tissue is in an acute inflammatory state that indicates ongoing tissue damage. For example, in the presence of acute inflammation (indicating an active state of injury, tissue damage, or early tissue healing), dynamic resistance exercises are contraindicated.[11] However, the PTA also may proceed with interventions included in the plan of care that accelerate the inflammatory process if it has been determined that the original causal agent or condition no longer results in ongoing tissue damage.

During interventions involving range-of-motion (ROM) activities, the PTA also may note that the patient reports pain before tissue resistance is felt (before end ROM, empty end-feel); this is an indication of acute inflammation.[11] Pain reported at the same time end ROM is reached is indicative of a subacute inflammatory state, and pain reported as a stretching sensation at the limit of ROM is a sign of inflammation in the chronic state.[11] If the PTA determines that the established plan of care includes interventions that are not appropriate for the apparent stage of inflammation, the PT must be consulted to adjust goals, time frames, or possibly the plan itself to ensure that the treatment does not contribute to a prolonged or abnormal state of inflammation.

Temperature

The PTA must be able to differentiate between expected temperature responses in a normal inflammatory response and abnormal responses. A normal increase in temperature is local and initially mild to moderate (compared with the contralateral anatomic region) versus a more pervasive change, which may manifest as significant compared with the contralateral side or as a systemic increase in temperature (fever). In the former case, joint effusion may be present; the latter may represent a systemic response to the injury (e.g., infection) or an unrelated condition, such as an acute disease process (e.g., flu). Either of these situations warrants action on the part of the PTA. In the presence of systemic infection, the patient's ability to participate in the physical therapy plan is affected. Because of the exclusive one-on-one time traditionally associated with physical therapy care, it is common for the PTA to be the member of the health care team who provides important pieces to the puzzle of the patient's total health or illness picture.

Both the degree of temperature elevation and the duration of fever are relevant to diagnostic processes when elevated body temperature is evident. During the initial examination and evaluation, any abnormality in temperature, either locally or systemically, should be noted. The PTA's role is to note deviations from the examination findings; determine the length of time the fever has been present (through patient interview); and note other possible related signs and symptoms, such as rash, cough, and complaints of sore throat. Also, it should be noted if the patient reports any pattern of temperature changes because this may have diagnostic implications for the PT or physician. Immediate implications include whether or not exercise or other interventions may be contraindicated and to what extent infection control issues must be addressed. Normal adult body temperature (oral measurement) ranges from 96.8° F to 99.5° F (36° C to 37.5° C).[13] Temperature is affected by factors including age, time of day, emotions and stress, exercise, menstrual cycle, pregnancy, external environment, measurement site, and ingestion of warm or cold foods.[14] Clinical signs and symptoms of fever vary based on the underlying cause and stage and may include general malaise, headache, increased pulse and respiratory rates, general chills, shivering, piloerection, loss of appetite, pale skin, nausea, irritability, restlessness, constipation, sweating, thirst, coated tongue, decreased urinary output, insomnia, and weakness.[14] In the case of the presence of fever, the PTA must gather the related data, document it, and report it to the supervising PT. The data and report should include adequate information to enable the PT to respond appropriately, with either immediate modification to the physical therapy plan of care or consultation with the medical team.

Fever and Infection Control

As always, the PTA must attend to their responsibility of exercising appropriate precautions for both the patient and themself. The importance of hand washing by the caregiver and patient cannot be overstated as an effective means of controlling the transmission of infectious agents. In addition, treatment areas should be thoroughly cleaned and disinfected as a routine procedure, not only in the case of patients with obvious infectious conditions. (Detailed information and guidelines for hand washing in the health care setting can be found on the website of the US Centers for Disease Control and Prevention.)

Fever and Exercise

In terms of exercise precautions, discretionary caution should be applied with any patient with a fever because of stresses on the cardiopulmonary and immune systems and the possible further complications related to dehydration.[13] The PTA must be familiar with specific exercise techniques (e.g., aquatic exercise) contraindicated in the presence of diseases transmitted via water or air.

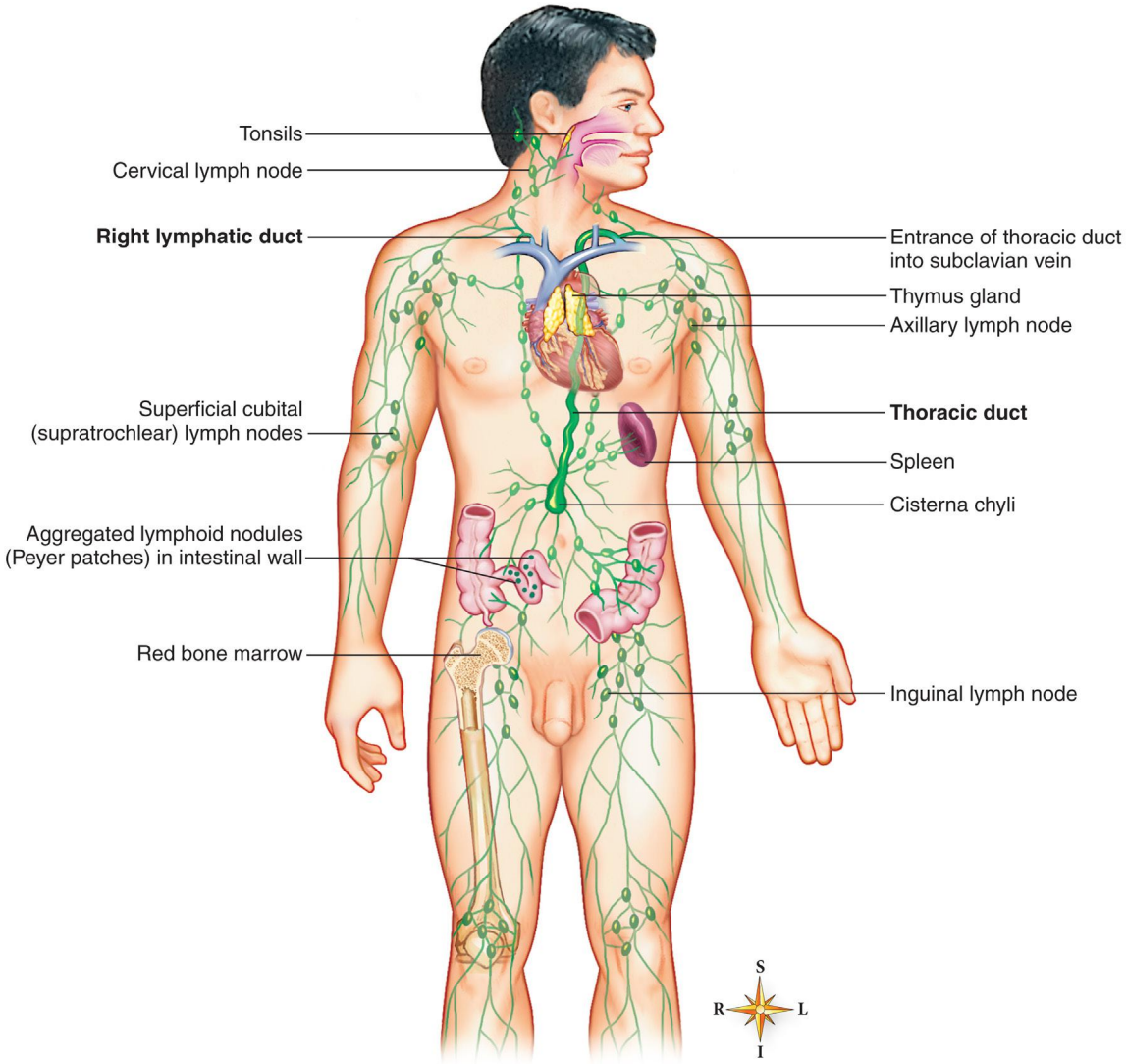


Fig. 2.1 Location of Lymph Vessels and Nodes. Note clusters of nodes in axillae and groin areas. (From Patton KT, Thibodeau GA. *Anatomy and Physiology.* 7th ed. St Louis: Mosby; 2010.)

Fever and Lymph Nodes

Another condition that may become readily apparent to the PTA when carrying out elements of the physical therapy plan of care is tenderness or exquisite pain in particular regions of the body. The presence of tender or enlarged lymph nodes is of particular concern to the PTA who is performing soft tissue interventions on a patient with an elevated body temperature (or otherwise). Fig. 2.1 provides a visual reference for the location of lymph nodes. PTAs using hands-on techniques such as soft tissue massage and manual stretching are incidentally afforded the opportunity during the course of treatment to assess for the presence of unusual conditions in areas of lymph node clusters (e.g., in the neck and axilla). Because symptoms of pain, tenderness, or enlargement of lymph nodes can signify the presence of potentially serious pathologic conditions, the presence of these symptoms represents a situation in which the PTA must consult with the supervising PT to pursue medical follow-up for definitive diagnosis.[13] In addition, certain interventions are considered contraindicated if the patient has an underlying pathology related to changes in the lymph nodes.

Redness and Skin Color Changes

Redness (erythema) is a normal component of the inflammatory reaction. The PTA must be alert to abnormal or unexpected changes in skin color, which may indicate the presence of secondary complications or underlying pathologies (Fig. 2.2). Redness may be considered normal when it is noted in the immediate area of injury and is associated with local temperature changes. Depending on the patient's pigmentation, color changes may appear in tones other than red.

Unexpected findings in terms of changes in skin color should be reported to the supervising PT for further evaluation. These changes include rashes or redness that appear as a streak originating from the site of injury. Red streaks may indicate an acute inflammation secondary to a bacterial infection (streptococci, staphylococci, or both), resulting in acute inflammation of the

Fig. 2.2 A Painful Left Lower Extremity With Severe Swelling and Erythema due to Acute Deep Vein Thrombosis. (From Bergan JJ. *The Vein Book.*1st ed. Burlington: Elsevier Academic Press; 2007.)

lymph vessels.[13] Redness along with superficial tenderness and hardness (induration) of the area may be a sign of superficial thrombophlebitis.[13] These findings should be reported to the supervising PT because they may be a precursor to more serious conditions. A loss of skin color (paleness or pallor) associated with temperature changes, edema, or pain may be indicative of an occlusion in a blood vessel and warrants immediate medical referral. A serious potential complication of a deep vein thrombosis (DVT) is that a piece of the coagulated blood (the clot) may break free from the inside of the vessel wall as a result of the test (or otherwise) and travel through the bloodstream, lodging in a pulmonary artery and causing a life-threatening condition (pulmonary embolism). It is recommended that the PTA be alert to the risk factors and the clinical signs and symptoms of a DVT as outlined in Box 2.1 and report these findings to the supervising PT for further investigation and possible immediate medical referral.

! IMPORTANT CONCEPTS

The following changes in skin color should be reported to the supervising PT:

- Rashes or redness that appear as a streak originating from the site of injury
- Redness along with superficial tenderness and hardness
- Loss of skin color (paleness or pallor) associated with temperature changes, edema, or pain

The PTA should be aware of differences in superficial skin changes based on the patient's skin color. In other words, these findings in individuals with darkly pigmented skin may be less obvious and do not manifest as the same changes in skin tones as in light-skinned individuals. A critical element to be included in the laboratory practice and skill development of the PTA student is exposure to numerous normal subjects of different body types and skin tones (often represented within a classroom population of adult learners). By observing and practicing on different subjects, the PTA student develops an awareness of normal variations, which will subsequently enhance their ability to recognize differences or abnormalities in patients.

BOX 2.1 Risk Factors and Clinical Signs and Symptoms for Deep Venous Thrombosis

Risk Factors

- Previous personal/family history of thromboembolism
- Congestive heart failure
- Age older than 50 years
- Oral contraceptive use

Blood Stasis

- Immobilization or inactivity
- Burns
- Obstetric/gynecologic conditions
- Obesity
- Spinal cord injury, stroke

Endothelial Injury

- Neoplasm
- Recent surgical procedures
- Trauma or fracture of the legs or pelvis
- Blood disorders (e.g., hypercoagulable state, clotting abnormalities)
- History of infection, diabetes mellitus
- Oral contraceptive use

Clinical Signs and Symptoms

Superficial Venous Thrombosis

- Subcutaneous venous distention
- Palpable cord
- Warmth, redness
- Indurated (hard)

Deep Venous Thrombosis

- Unilateral tenderness or leg pain
- Unilateral swelling (difference in leg circumference)
- Warmth
- Discoloration
- Pain with placement of blood pressure cuff around calf inflated to 160 to 180 mm Hg

From Goodman CC, Snyder TE. *Differential Diagnosis for Physical Therapists Screening for Referral.* 4th ed. St Louis: Saunders; 2007:312.

Edema

Because edema and its management have significant implications in the practice of physical therapy, the entry-level PTA should develop the ability to recognize the signs and symptoms of edema and to measure and document it effectively and efficiently. For purposes of this text, the focus is on localized edema, resulting from injury or trauma to musculoskeletal tissue or structures. Other terms and conditions are defined and discussed in relation to the PTA's responsibility in the event unrelated or unexpected conditions are discovered.

Edema refers to excessive pooling of fluid in the spaces between tissues (interstitial spaces).[13] In relation to patients with orthopedic injuries or conditions, the main consideration for assessment by the PTA is measurement of the edematous part or extremity. Typically, the technique used to measure edema in an extremity is straightforward; use of a tape measure to obtain circumferential dimensions of the involved part. The data must be reliable, and the measurement must be reproducible, regardless

TABLE 2.1 Sample Format for Documenting Edema.

Lower Extremity	Right	Left
6 inches above midpatella	_____ inches	_____ inches
3 inches above midpatella	_____ inches	_____ inches
Midpatella	_____ inches	_____ inches
3 inches below midpatella	_____ inches	_____ inches
6 inches below midpatella	_____ inches	_____ inches

of who is conducting the assessment. To ensure this level of consistency, the PTA must use precisely the same landmarks as the evaluating PT. Specifically, palpable bony landmarks must be used as the starting standard reference point; then circumferential measurements can be taken at determined distances from that point. For example, to measure the lower leg, circumference measured with the tape measure at the inferior pole of the patella may be used as a reference point, with measurements taken every 2 inches distally and at the ankle. One note of caution: the PTA must be careful to not pull the tape measure too tight when performing this skill. The skin should not have an indention if the skill is performed correctly. Another example of a flow chart for recording circumferential measurements of the knee is provided in Table 2.1.

A figure-of-eight technique may be used at the ankle to ascertain a gross estimate of generalized ankle edema.[15–17] Refer to Box 2.2 for the steps involved in this procedure.

Another technique used to obtain a quantitative measure of edema in a limb involves immersing the limb into a specially designed container of fluid (a volumeter) and measuring the amount of water displaced.[18] Karges and colleagues[19] established correlations between different techniques of volumetric measurement but also emphasized the importance of ensuring reliability of the data for a given patient, in terms of employing a consistent technique for edema measurement of the same patient. In other words, as stated, the PTA must use the same method of measurement, employing the same technique chosen by the evaluating PT.[18,19]

In addition to a quantitative measurement of edema through circumferential measurement or volumetrics, data relating to the quality of edema should be collected and documented by the PTA. Characteristics of edema that may be observed are described as *brawny* or *pitting*. Brawny edema refers to edema that feels hard, tough, or thick and leathery. This indurated quality is frequently associated with chronic inflammation or systemic pathologies involving fluid shift abnormalities (e.g., congestive heart failure [CHF]). Pitting edema is characterized by the formation of a sustained indentation when the swollen area is compressed.[20,21] Pitting edema may be further quantified according to the scale in Fig. 2.3.

In contrast to transient inflammatory reactions that may normally occur in response to certain physical therapy interventions, a significant increase in edema should be regarded as abnormal and reported accordingly. On first noticing edema in the extremity being treated, the PTA must determine if the swelling is confined to the involved extremity or if the

BOX 2.2 Technique for Figure-of-Eight Edema Measurement of Ankle

1. Position the patient in a long sitting position so that the lower leg is supported and the ankle is in a neutral position.
2. Mark the following landmarks with a skin pencil: tuberosity of the navicular (palpable projection on the anteromedial aspect of the hindfoot), base of the fifth metatarsal, distal tip of the medial malleolus, distal tip of the lateral malleolus, and tibialis anterior tendon.
3. Place the (0) edge of the tape measure midway between the tibialis anterior tendon and the lateral malleolus.
4. Wrap the tape medially across the instep (bottom surface of the foot), and place just distal to the navicular tuberosity.
5. Draw the tape across the arch of the foot, winding it back to the dorsum of the foot just proximal to the tuberosity (base) of the fifth metatarsal.
6. Cross back over the tibialis anterior tendon.
7. Wrap the tape measure around the ankle, drawing it just distal to the tip of the medial malleolus, crossing the calcaneal (Achilles) tendon and drawing the tape measure just distal to the lateral malleolus, back to the starting point.
8. For consistency, it is recommended that this process be repeated three times, with the average of the three measurements recorded.

Adapted from Magee D, Manske RC. *Orthopedic Physical Assessment.* 7th ed. St Louis: Saunders; 2020. Tatro-Adams D, McGann S, Carbone W. Reliability of the figure-of-eight method of ankle measurement. *J Orthop Sports Phys Ther.* 1995;22(4):161–163; and Esterson PS. Measurement of ankle joint swelling using a figure of 8. *J Orthop Sports Phys Ther.* 1979;1(1):51–52.

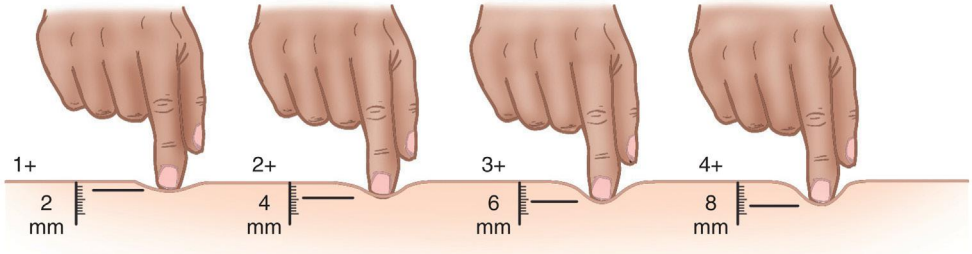


Fig. 2.3 Pitting Edema Scale. 1+: Mild edema; 2-mm depression that disappears rapidly. 2+: Moderate pitting edema; 4-mm depression that disappears in 10 to 15 seconds. 3+: Moderately severe pitting edema; 6-mm depression that may last more than 1 minute. 4+: Severe pitting edema; 8-mm depression that can last more than 2 minutes. (From Potter P, Perry A. *Fundamentals of Nursing.* 7th ed. St Louis: Mosby; 2009.)

contralateral extremity is also involved. If the opposite extremity is also edematous, this finding could indicate a systemic pathologic condition.[13] For example, bilateral pitting edema of the distal lower extremities is a common manifestation in CHF, which is a relatively common diagnosis encountered among individuals with cardiac disease and individuals older than 65 years of age. Because CHF is common and it develops gradually, the PTA may play an important role in the diagnostic process via astute recognition of signs and symptoms associated with the onset of this pathology. In addition to bilateral lower extremity pitting edema, the PTA may note a decrease in tolerance to exercise (fatigue, shortness of breath, and dizziness).[13] The presence of this clinical response necessitates prompt consultation with the supervising PT for medical diagnostic work-up and possible subsequent modifications to the physical therapy plan of care.

! IMPORTANT CONCEPTS

"Red Flag" Symptoms of Congestive Heart Failure

Weight gain of 3 pounds or greater, or gradual, continuous gain over several days that results in swelling of the ankles, abdomen, and hands combined with shortness of breath, fatigue, and dizziness.[13]

Compartment syndrome is a potentially serious condition involving edema. This condition occurs in anatomic compartments (of the calf or, less frequently, the antebrachium) as a result of increased fluids in an area tightly bound by fascia. Because fascia does not "give" to allow more space to accommodate this fluid buildup, this edema can compress nerves and blood vessels as they course through the compartment, leading to ischemia and possible nerve damage. Because the edema is contained within the compartment, the PTA should be alert to other associated signs and symptoms, such as history of blunt trauma, crush injury, or unaccustomed exercise; severe, persistent leg pain that is intensified when a stretch is applied to the involved muscles; swelling, severe tenderness, and palpable tension of the involved structures; and paresthesia, paresis, and pulselessness.[22] Immediate consultation with the supervising PT and possibly immediate medical referral are warranted if the signs and symptoms are noted.

Pain

An important skill that novice clinicians must develop along the path to entry-level competence is to attend to the patient as a whole, with the various elements being assessed working together to produce full function. It is crucial for the PTA to collect data about the patient's pain and behaviors throughout each patient interaction. A common behavior of a novice clinician performing basic assessment and data collection skills is to focus only on the involved body part and overlook the overall response of the patient to specific procedures. For example, a patient may exhibit strength of the quadriceps muscle group that measures 4 + /5. However, if the student PTA performing the assessment of strength fails to observe that the patient is grimacing in pain during the resisted isometric test, they are overlooking an important determinant of true function of the muscle group. Likewise, other components of function, such as ROM and flexibility, must include pain-free performance to be wholly functional. Ideally, the PTA student will make the transition from focusing only on the involved body part during assessment procedures and interventions to performing assessments that include comprehensive observation of the patient's responses and behaviors.

Pain is defined as "an unpleasant sensory and emotional experience with actual or potential tissue damage, or described in terms of such damage."[24] Pain is considered subjective, but because there are multiple internal factors that determine a patient's perception of pain, complaints of pain should always be addressed as legitimate or "real." The PTA's role in assessing pain is to gather data that present a clear picture of the following:

- Changes in pain since last physical therapy visit or examination
- Responses of the patient in terms of how interventions to date or at present affect pain
- Patterns of pain (e.g., physical or temporal)
- Modalities, types, or characteristics of pain (e.g., sharp or burning)

The PTA also has a role in educating the patient about their pain. The PTA can approach this by asking questions such as 'Has anyone explained why you hurt?' or 'Before we start the physical treatment, would you like to learn more about your pain?' while supervising the patient. A PTA can expand their understanding of pain management by further exploring pain neuroscience education as a licensed clinician.

Several standardized instruments are available to record findings of pain assessment. As with all assessment and data collection techniques, the PTA must use the same instrument or same technique for recording data related to a patient's pain complaints as was used by the supervising PT during the initial examination. Simple and commonly used tools are pain rating scales shown in Figs. 2.4 and 2.5.

When carrying out elements of the supervising PT's plan of care, the PTA may notice a change in the quality of a patient's pain from more acute to chronic pain. As described in the section on **inflammation**, a chronic state is one in which the symptoms (pain in this case) persist for a longer period of time than expected, based on physiologic principles of tissue healing. Chronic pain has been described as pain that lasts more than 3 months.[23] Recall also that one descriptive feature of a chronic condition relates to the lack of real, ongoing, or pending tissue damage. Regarding pain, this circumstance also often coincides with complaints of pain that are nonspecific, diffuse, or indirectly proportional to the physical appearance or presentation of the patient.

In this case, the PTA's documentation or other interaction with the supervising PT may assist the therapist in making appropriate changes in the goals and plan of care to address the pain by incorporating interventions that will attend to the more complex issues involved with chronic pain. Specifically, depression and a cycle involving decreased activity levels and associated decreased tolerance to activity often ensue with chronic pain. The PTA may ask the supervising PT about the possible inclusion of relaxation exercises and a comprehensive gradual conditioning program in this case. When the PTA notices that a

McGill-Melzack
Pain Questionnaire

Patient's name _____ Age _____
File No. _____ Date _____
Clinical category (e.g., cardiac, neurologic)
Diagnosis: _____
_____
_____
Analgesic (if already administered):
1. Type _____
2. Dosage _____
3. Time given in relation to this test _____

Patient's intelligence: circle number that represents best estimate.

1 (low) 2 3 4 5 (high)

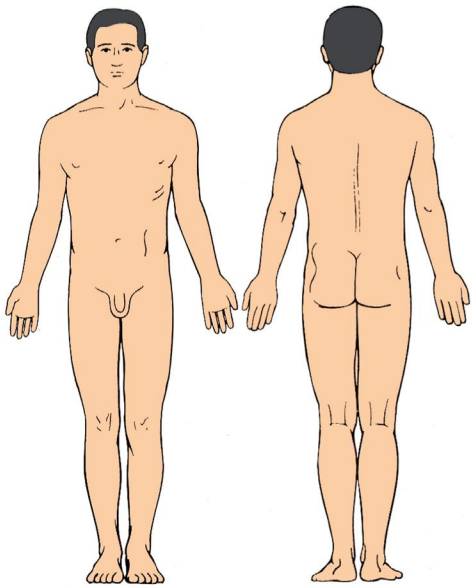
This questionnaire has been designed to tell us more about your pain. Four major questions we ask are:

1. Where is your pain?
2. What does it feel like?
3. How does it change with time?
4. How strong is it?

It is important that you tell us how your pain feels now. Please follow the instructions at the beginning of each part.

Part 1. Where Is Your Pain?

Please mark on the drawing below the areas where you feel pain. Put E if external, or I if internal, near the areas you mark. Put EI if both external and internal.



Part 2. What Does Your Pain Feel Like?

Some of the words below describe your present pain. Circle *ONLY* those words that best describe it. Leave out any category that is not suitable. Use only a single word in each appropriate category—the one that best applies.

1	6	11	16
Flickering	Tugging	Tiring	Annoying
Quivering	Pulling	Exhausting	Troublesome
Pulsing	Wrenching	12	Miserable
Throbbing	7	Sickening	Intense
Beating	Hot	Suffocating	Unbearable
Pounding	Burning	13	17
2	Scalding	Fearful	Spreading
Jumping	Searing	Frightful	Radiating
Flashing	8	Terrifying	Penetrating
Shooting	Tingling	14	Piercing
3	Itchy	Punishing	18
Pricking	Smarting	Grueling	Tight
Boring	Stinging	Cruel	Numb
Drilling	9	Vicious	Drawing
Stabbing	Dull	Killing	Squeezing
Lancinating	Sore	15	Tearing
4	Hurting	Wretched	19
Sharp	Aching	Blinding	Cool
Cutting	Heavy		Cold
Lacerating	10		Freezing
5	Tender		20
Pinching	Taut		Nagging
Pressing	Rasping		Nauseating
Gnawing	Splitting		Agonizing
Cramping			Dreadful
Crushing			Torturing

Part 3. How Does Your Pain Change with Time?

1. Which word or words would you use to describe the *pattern* of your pain?

1	2	3
Continuous	Rhythmic	Brief
Steady	Periodic	Momentary
Constant	Intermittent	Transient

2. What kind of things *relieve* your pain?

3. What kind of things *increase* your pain?

Part 4. How Strong Is Your Pain?

People agree that the following 5 words represent pain of increasing intensity. They are:

1	2	3	4	5
Mild	Discomforting	Distressing	Horrible	Excruciating

To answer each question below, write the number of the most appropriate word in the space beside the question.

1. Which word describes your pain right now? _____
2. Which word describes it at its worst? _____
3. Which word describes it when it is least? _____
4. Which word describes the worst toothache you ever had? _____
5. Which word describes the worst headache you ever had? _____
6. Which word describes the worst stomachache you ever had? _____

Fig. 2.4 McGill-Melzack Pain Questionnaire. (Redrawn from Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. *Pain*. 1975;1:277. In: Clayton BD, ed. *Basic Pharmacology for Nurses*. 15th ed. St Louis: Mosby; 2010.)

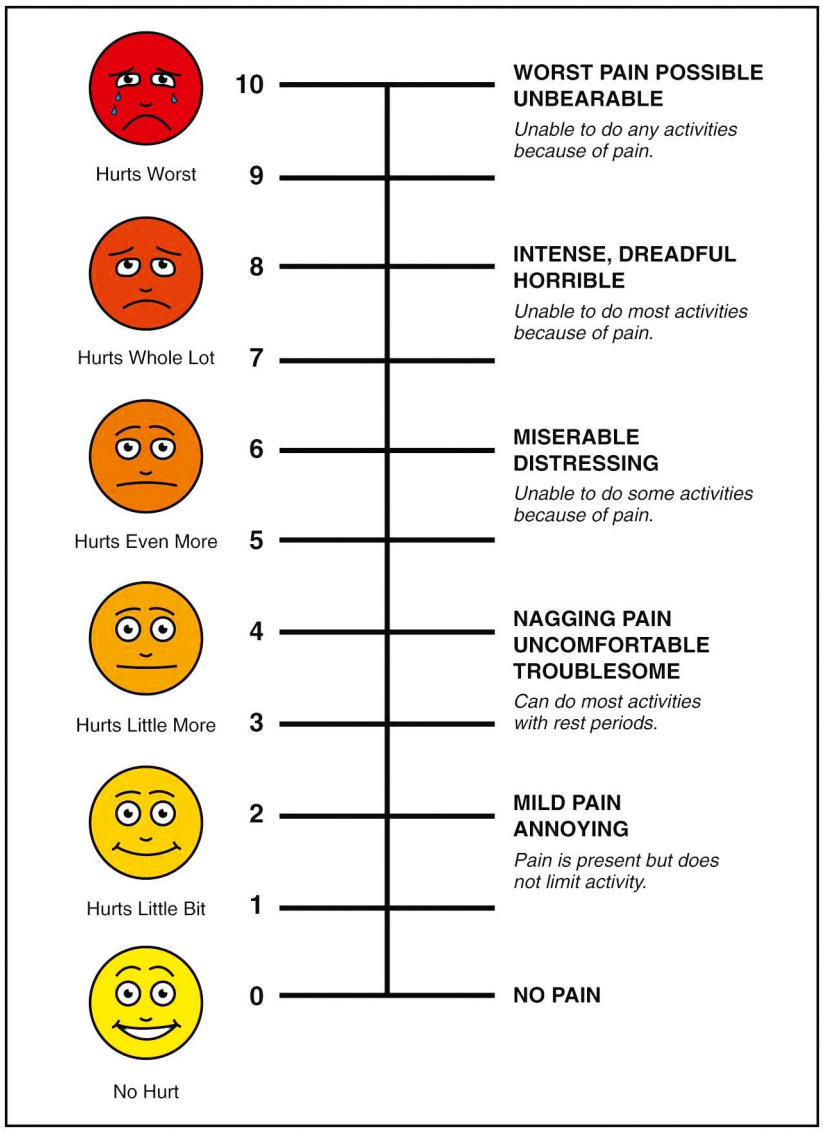


Fig. 2.5 Wong-Baker FACES Pain Rating Scale. (From Hockenberry MJ, Wilson D. *Wong's Essentials of Pediatric Nursing.* 8th ed. St Louis: Mosby; 2009.)

patient is exhibiting signs and symptoms of chronic pain, further diagnostic work-up may be indicated by the supervising PT because the presence of chronic pain may signal involvement of systems or factors other than musculoskeletal structures (e.g., depression).

Certain changes that occur in complaints of pain in response to therapeutic interventions are expected. **Peripheralization** may indicate a worsening or progressive condition. A typical example of this occurs with a progressively herniating spinal disk, indicating increasing compression of the associated nerve root. **Centralization** of pain symptoms may indicate improvement of the condition, such as in the case of decreasing compression on a nerve root as a disk herniation is reduced.

The PTA must establish the location of pain when the patient reports changes in pain symptoms associated with certain positions or movements. For example, a patient with a primary diagnosis of low-back pain secondary to herniated nucleus pulposus may complain of pain when lying prone. The PTA must not assume that the pain is in the area of the disk lesion, which is a positive indication of centralization and a desired response. If, on further questioning, it is determined that the pain is referred to the lower extremity along the neural distribution for the involved spinal segment, this is a sign of peripheralization of the symptoms, indicating that the prone position is not appropriate at this time. The importance of understanding neuromuscular anatomy and function cannot be overlooked. The PTA student must become familiar with these anatomic relationships to understand fully the implications of data collected during pain assessment.

"Red Flag" Pain Symptoms

The PTA must also be keenly aware of pain that sends a "red flag" signal. In this case, the PTA should not proceed with any interventions or data collection techniques that are potentially contraindicated and should immediately report the findings to the supervising PT. Table 2.2 presents a summary of red flag or

potentially serious pain conditions and the possible associated pathology or body system.

In addition to knowing the red flag symptoms described here, the PTA working with any client must be alert to signs and symptoms of myocardial infarction (MI), or heart attack. Certain patterns of pain have been identified as early warning signs of a heart attack (Fig. 2.6). The PTA working with a patient exhibiting any of these patterns of pain should consult with the supervising PT right away for possible immediate medical referral. Concurrent symptoms of MI may include nausea, pallor, and profuse perspiration. MI may occur over a period of time and may be experienced while the patient is undergoing exertion or even at rest.

TABLE 2.2 "Red Flag" Pain Symptoms.

Pathology or Body System	Pain Complaint or Symptom
Cardiovascular	Pain or feeling of heaviness in the chest
	Pulsating pain anywhere in the body
	Constant and severe pain in lower leg (calf) or arm
	Discolored or painful feet
Cancer	Persistent pain at night
	Constant pain anywhere in the body
Gastrointestinal	Frequent or severe abdominal pain
Neurologic	Frequent or severe headaches with no history of injury

Adapted from Magee D, Manske RC. *Orthopedic Physical Assessment*. 7th ed. St Louis: Saunders; 2020; and Stith JS, Sahrmann SA, Dixon KK, Norton BJ. Curriculum to prepare diagnosticians in physical therapy. *J Phys Ther Educ*. 1995;9(2):46–53.

Intermittent Claudication

Intermittent claudication is another distinct pattern or type of pain that may manifest coincidentally with musculoskeletal symptoms or conditions; the term *intermittent claudication* is used to describe activity-related discomfort associated with peripheral arterial disease (PAD). Intermittent claudication of vascular origin is typically described as a "burning," "cramping," or "sharp" pain that is localized in the region affected by the impaired circulation.[13] Because it involves a systemic condition, it typically manifests bilaterally and usually involves the calves, thighs, hips, buttocks, or feet, areas that are often symptomatic with musculoskeletal pathologies.[13] When the aggravating activity is discontinued, it is characteristic for the symptoms of claudication (burning, cramping, or sharp pain) to improve rapidly.

The assessment for intermittent claudication consists of determining what is referred to as *claudication time*. The basic protocols involve assessing maximal treadmill walking time, pain-free walking time, and walking time to severe claudication.[25] As with other standardized tests and measures, the data collection technique employed by the PTA must be the same technique used by the supervising PT.

The PTA may be the first clinician to recognize the symptoms associated with undiagnosed peripheral arterial occlusive vascular disease in terms of the nature, characteristics, and

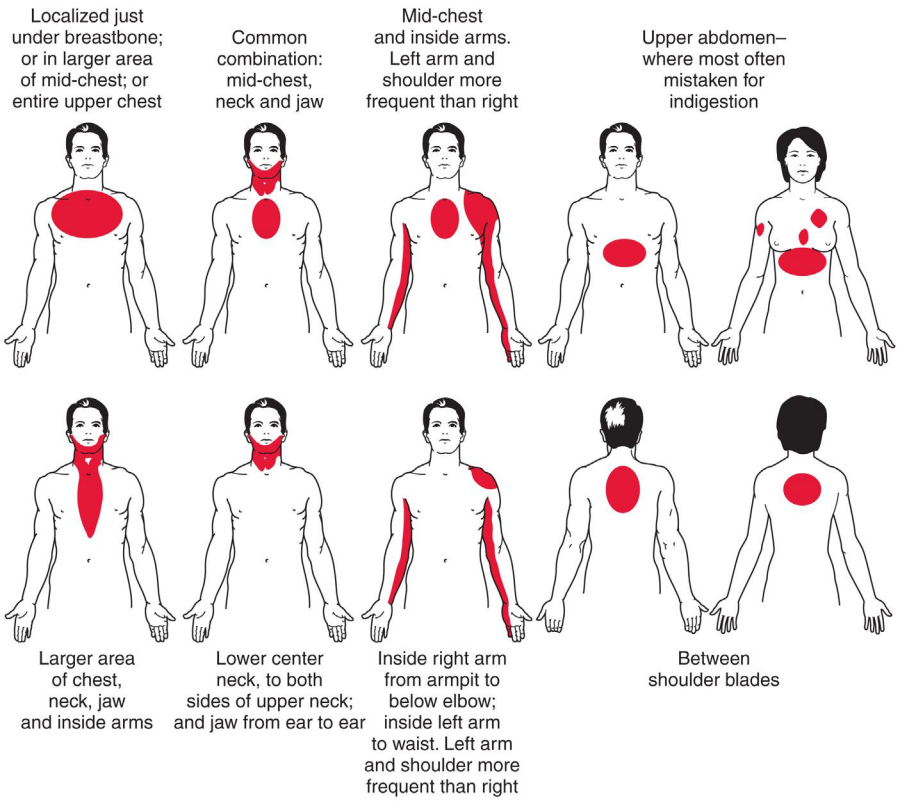


Fig. 2.6 Early Warning Signs of a Heart Attack. (From Goodman CC, Fuller K. *Pathology: Implications for the Physical Therapist*. 3rd ed. St Louis: Saunders; 2009.)

location of symptoms as described. Other signs and symptoms that are consistent with PAD include pallor, decrease in peripheral pulses, sensory changes, and weakness of the involved area (distal to the site of blocked circulation).[13] Diabetes mellitus and nonhealing wounds on the feet also are frequently associated with PAD.[13] Observation of the signs of undiagnosed PAD should be reported to the supervising PT immediately.

Referred Pain

Referred pain is defined as pain that is "felt in an area far from the site of the lesion, but supplied by the same or adjacent neural segments."[13] Referred pain can originate from any cutaneous, somatic, or visceral source and is commonly associated with problems of the musculoskeletal system. It is usually well localized but with indistinct boundaries, tends to be felt deeply, and radiates segmentally without crossing the midline.[16] No objective sensory deficits (paresthesia, numbness, or weakness) are associated with referred pain.[13,16]

Visceral Pain

The term **visceral pain** refers to pain that originates from a body organ. The primary concerns for the PTA related to this type of pain are for the PTA to be aware of how visceral pain may manifest and to report suspicious pain symptoms to the supervising PT. Often disease processes involving specific or multiple organs reveal themselves through various symptoms and not just pain. However, it is possible for a patient to have more than one pathologic condition at the same time. In other words, a patient with a confirmed diagnosis of herniated disk in the lumbar spine also could have some type of developing abdominal pathology. Pain of a visceral origin may manifest as musculoskeletal symptoms because of the innervation pattern of the involved organ. Visceral pain is not well localized secondary to viscera innervation being multisegmental. Additionally, isolation of visceral pain is difficult because of its correspondence to dermatomes from which the problem organ receives its innervation. Fig. 2.7 provides a visual representation of innervation to major internal organs in terms of spinal levels of nerve supply. The organs are supplied via plexuses or ganglia, resulting in innervation from multiple segmental levels. For this reason, organ pain may be diffuse and difficult for the patient to localize, appearing as nonspecific musculoskeletal discomfort. Fig. 2.8 illustrates common visceral pain referral sites to aid the PTA further in recognizing the challenges in differentiating between visceral and nonspecific musculoskeletal pain. In the case of disease processes that develop over time, the PTA must be alert to changes in the patient's complaints of pain and reports from the patient of patterns that are not consistent with musculoskeletal conditions.

Trigger Points

"**Trigger points** are small, localized tender areas found within skeletal muscles, fascia, tendons, ligaments, periosteum, and pericapsular areas."[26] Trigger points are associated with musculoskeletal conditions such as temporomandibular joint dysfunction, cervical strain, fibromyalgia, and myofascial pain syndrome. The pain produced by trigger points is characterized

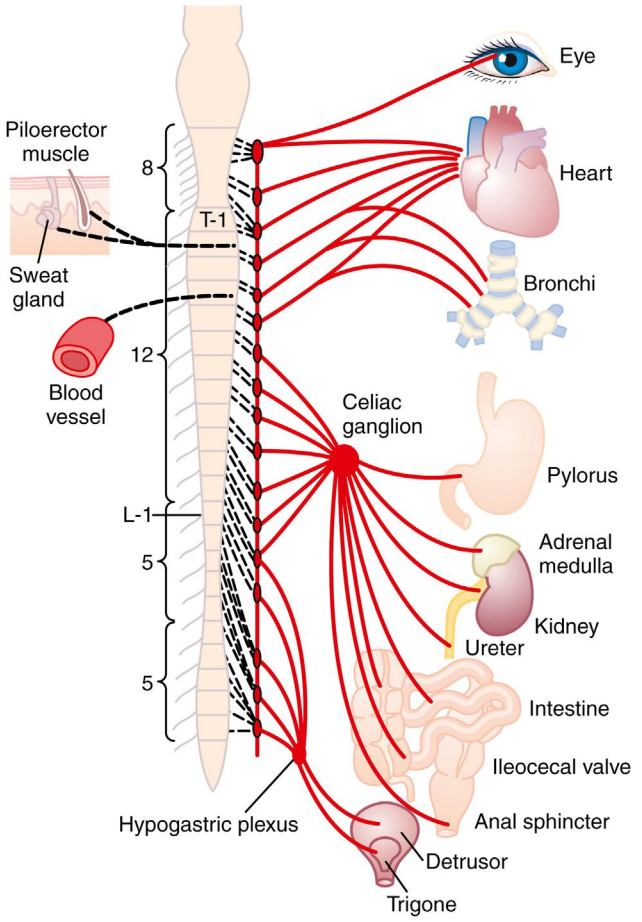


Fig. 2.7 Diagram of the Autonomic Nervous System. The visceral afferent fibers mediating pain travel with the sympathetic nerves except for the fibers from the pelvic organs, which follow the parasympathetics of the pelvic nerve. Level's of Spinal nerves: 8 Cervical, 12 Thoracic, 5 Lumbar AND 5 Sacral. (From Guyton AC, Hall JE. *Textbook of Medical Physiology.* 9th ed. Philadelphia: Saunders; 1996.)

by tenderness and a referred pattern of pain to palpation, usually in upper quarter or pelvic girdle muscles. According to an article in *American Family Physician*,[27] "Palpation of a hypersensitive bundle or nodule of muscle fiber of harder than normal consistency is the physical finding typically associated with a trigger point. Palpation of the trigger point will elicit pain directly over the affected area or cause radiation of pain toward a zone of reference and a local twitch response." During the process of applying hands-on soft tissue interventions or passive exercises, if the PTA notices signs and symptoms of possible trigger points that have not been previously documented, these findings should be documented and reported to the supervising PT.

Pain: A Final Note

The PTA occasionally may encounter a patient whose complaints of pain do not match observed behaviors of the patient. In this case, it is not the role of the PTA to judge the patient and conclude that the patient is malingering or "faking" the condition. Instead the PTA should objectively document their observations and discuss them with the supervising PT.

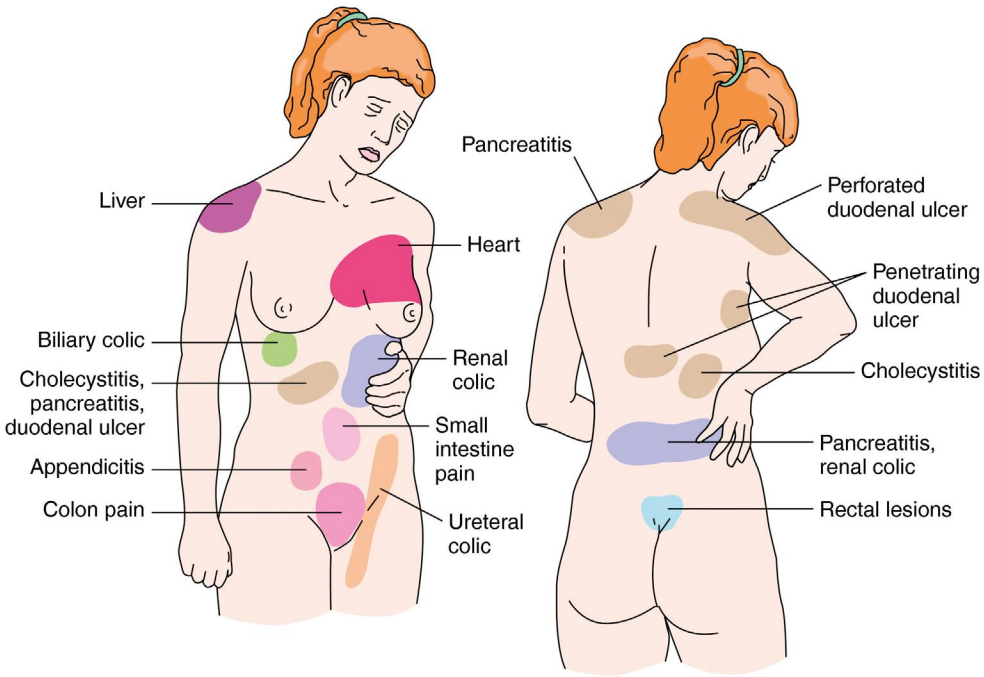


Fig. 2.8 Diagram of Common Sites of Visceral Referred Pain. (From Nugent PM, Green JS, Hellmer Saul MA, Pelikan PK. *Mosby's Comprehensive Review of Nursing for NCLEX-RN Examination*. 20th ed. St Louis: Mosby; 2013.)

VITAL SIGNS

An objective measure of physiologic status, particularly as related to cardiopulmonary function, can be obtained quickly through measurement and assessment of vital signs. Body temperature is discussed in the section on **inflammation**; heart rate, blood pressure, respiration, and pulse oximetry are discussed here. It may be observed that vital signs are not routinely assessed in the outpatient clinic that serves mainly patients with orthopedic diagnoses. However, as the profession of physical therapy strives toward achieving the status of a recognized point of entry for the health care consumer, we must shift our perception of routine procedures to include a more thorough and comprehensive assessment of the patient's overall health status and responses to our treatments.

The PTA student is encouraged to become proficient with effective assessment of vital signs through repeated practice on a variety of subjects and on subjects in different positions (supine, sitting, and standing) and performing different activities (e.g., activities of daily living and exercise).

! IMPORTANT CONCEPTS

The PTA should employ the same technique the PT uses during the initial evaluation for assessment procedures to enhance consistency and determine better any deviation from the baseline measure.

It is not within the scope of this text to discuss or review detailed physiology related to cardiopulmonary function or pathology. General guidelines for collecting vital sign data and determining when modification to planned interventions is warranted are discussed.

Pulse (Heart Rate)

Heart rate should be measured at the time of evaluation to establish a baseline rate and subsequently when beginning any exercise program or new activity. There are eight possible sites from which heart rate can be measured (Fig. 2.9), but the most common and easily accessible sites are the radial and carotid arteries.[28] Accepted values for normal heart rate in adults range from 60 to 100 beats per minute (bpm).[13,14,29] Factors that influence heart rate include age, gender, emotional state, medications, exercise or conditioning level, and systemic or local heat.[14]

In addition to the quantitative measure, the quality of the pulse should be noted. Often in a setting where the PTA is working primarily with healthy clients (e.g., trained or conditioned athletes), it may be sufficient to perform a 10-second beat count and multiply by six to determine quickly the cardiovascular response to an activity. However, it is important to consider that the margin of error is plus or minus each multiplied value, meaning that if the pulse is counted for 10 seconds and multiplied by 6, the margin of error for the data collected is ±6 bpm.[28] Ultimately, if the PTA perceives any abnormal quality to the pulse, such as an irregular rhythm, the heart rate should be monitored for a full minute.[14] In such a case, if the abnormality has not previously been noted, this finding should be reported to the supervising PT immediately. Otherwise, as in the case with other assessment procedures, the PTA should employ the same technique the PT uses during the initial evaluation to enhance consistency and determine any deviation from the baseline measure.

Textbooks commonly used by PTA educational programs offer specific guidelines for setting exercise intensity using heart rate as a determinant.[11,14,29] An increase in the pulse of more

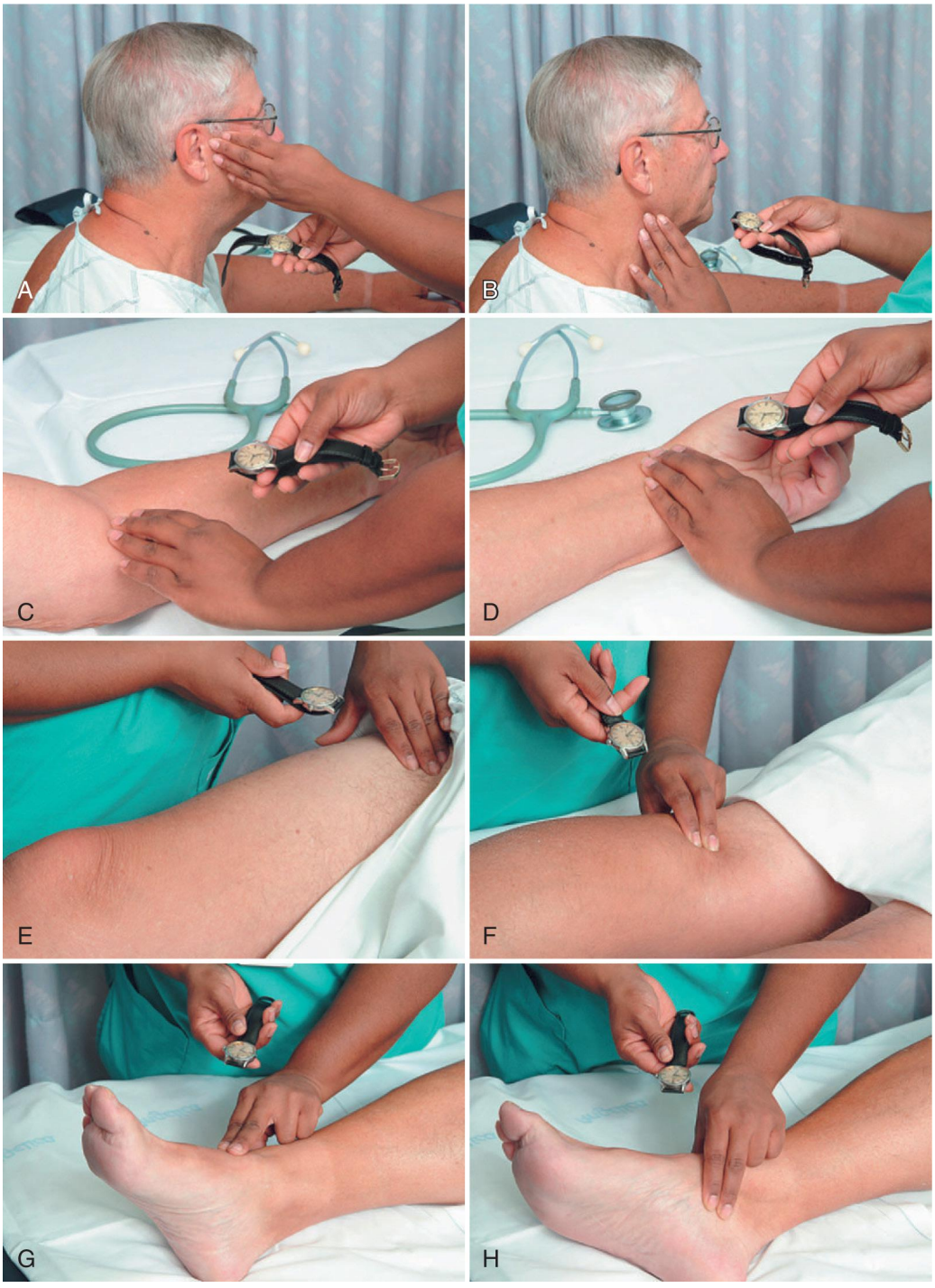


Fig. 2.9 Pulse Measurement Sites. (A) Temporal. (B) Carotid. (C) Brachial. (D) Radial. (E) Femoral. (F) Popliteal. (G) Dorsal pedal. (H) Posterior tibial. (From Fairchild S. *Pierson and Fairchild's Principles and Techniques of Patient Care*. 5th ed. St Louis: Saunders; 2013.)

than 20 bpm with activity that lasts for more than 3 minutes after rest or after changing positions should be reported to the supervising PT.[13]

Respiration

As with pulse, respirations should be assessed for both rate and quality. In a healthy adult, normal respiratory rate ranges from 12 to 20 breaths per minute.[13,14] Variations in the range of normal respiration rate are expected among age groups. Other factors influencing respirations include age, body size, stature, exercise, body position, environment, emotions and stress, and pharmacologic agents.[14]

At rest, respiration should be smooth and steady, with uniform chest movement. Observe for excessive use of accessory breathing muscles (anterior upper quarter, anterolateral shoulder, and cervical muscles), which may indicate ventilatory

compromise (e.g., chronic obstructive pulmonary disease, asthma, chronic bronchitis caused by smoking, or other pathologic conditions). Also observe to ensure that chest expansion is symmetric bilaterally. Because respiration includes voluntary control, it is best to assess respiration discreetly in conjunction with heart rate to avoid the patient inadvertently altering breathing pattern or rate in response to feeling self-conscious if they are aware that the PTA is observing the rise and fall of the chest. The rate is counted for 30 seconds and multiplied by two; if irregularities are noted, a full 60-second count is preferred. Refer to the section of this chapter on **fatigue** for information relating specifically to the assessment of pulmonary response to exercise and activity.

Blood Pressure

Assessment of blood pressure provides an objective measurement of vascular resistance to blood flow at a given time. In a healthy adult, the normal blood pressure systolic value should be less than 120 millimeters of mercury (mm Hg), and the normal diastolic value should be less than 80 mm Hg.[14] The pressure exerted by blood is influenced by various factors and conditions, including age and cardiac output, both of which are directly proportional to systolic blood pressure.[14] Age is a nonmodifiable factor, so an increase in systolic blood pressure of elderly patients may not indicate an active pathologic process. As always, these findings should be noted in relation to the baseline measurement obtained by the supervising PT during the initial examination.

The PTA working with patients who have musculoskeletal dysfunction or impairment is most concerned with noting responses in blood pressure as new therapeutic activities are introduced or advanced during progression through the established plan of care. Most notably, blood pressure is affected by exercise and activity level in the following ways. Cardiac output increases proportionally to increased physical activity.[21] An even greater and potentially dangerous increase in blood pressure also may occur if the patient holds their breath during periods of exertion with exercise. Patients may do this subconsciously in an effort to increase the weight-bearing function of the abdominal cavity, which becomes more stable with an attempt at strong exhalation against a closed glottis, nose, and mouth.[14] As noted in the discussion about pain, the PTA must be alert to the patient's total response to interventions and data collection techniques. When the observant PTA notices that the patient is holding their breath during exertion, the patient should be educated in techniques to avoid this behavior. The PTA also may want to reassess blood pressure at this time, although the effect on blood pressure from this activity, known as the *Valsalva maneuver,* is transient. It is particularly critical that the Valsalva maneuver be avoided by patients with a known history of hypertension or cardiac disease.[21]

Another important blood pressure response that may occur during a physical therapy session is a sudden drop in blood pressure, called *orthostatic hypotension.* This rapid decrease in blood pressure is associated with a sudden change in the patient's position. It is most frequently the result of the patient being immobile or recumbent for prolonged periods, and baseline measurements should be determined before the initiation of upright activities. Signs of orthostatic hypotension include a decrease in blood pressure, increase in pulse, lightheadedness, weakness, dizziness, syncope, mental or visual blurring, or diaphoresis.[13] If not addressed (by returning the patient to at least a semireclined position), the patient may lose consciousness. Because of the rapid change in blood pressure, the PTA must be prepared to assess the blood pressure immediately on the change in position. The blood pressure response is critical to obtain, record, and report because the symptoms associated with orthostatic hypotension can also be caused by other serious medical conditions.

Three final points should be noted by the student PTA. First, the PTA should check to be sure of any precautions or contraindications for the assessment of blood pressure that may be present. If the patient has a history of circulatory or lymphatic drainage compromise in one upper extremity, blood pressure must be assessed in the contralateral upper extremity, and if both upper extremities are compromised, blood pressure should be taken from the femoral artery.[14] Second, as mentioned in relation to assessment of other vital signs, the PTA student should practice taking and monitoring blood pressure on a variety of healthy individuals to reinforce a sense of values and ranges considered normal. To prevent unnecessary pressure from being applied, the safest technique to use is inflating the cuff only 15 to 20 mm Hg above the patient's documented normal systolic value.[28] Finally, the psychomotor skills involved with applying and securing the blood pressure cuff and attached sphygmomanometer, applying and holding the stethoscope diaphragm, pumping air into the bulb, releasing pressure from the cuff, and reading the meter while listening for the blood pressure sounds (called *Korotkoff sounds*) take coordination and skill. Although the process is basic and consistent, practice reinforces efficient application in actual patient care situations.

Pulse Oximetry

In addition to the measurement of vital signs described, pulse oximetry is a tool used to provide instant information about a subject's cardiopulmonary status. Specifically, the pulse oximeter is a noninvasive probe (in the form of a clip-on device placed on the ear, finger, foot, or nose) that provides a digital readout of oxyhemoglobin saturation. Most commonly, this device is used to identify hypoxemia, to monitor the patient's tolerance to activity, and to evaluate patient response to treatment.[14] However, for a patient in the hospital setting who has coexisting cardiopulmonary and musculoskeletal involvement, pulse oximetry is a viable tool for establishing goals to address tolerance to progressive activities.

The standard normal value for oxygen saturation ranges from 95% to 100%; this value is not expected to change with activity or exercise in a healthy individual.[13] This level noticeably decreases in patients with chronic respiratory disease, and the PTA must be aware of normal ranges for a given individual in this case. Caution should be taken if the value of oxygen saturation drops below 90% during activity, and if it drops below 88%, activity should be discontinued.[21] If the referring physician has indicated any other specific level of oxygen saturation to use

as a guideline for a given patient, the PTA must be aware of this level so that exercise tolerance is not exceeded. PTAs should also assess other vital signs, skin and nail bed color, tissue perfusion, mental status, breath sounds, and respiratory pattern in patients with whom they use pulse oximetry.[13] As a general rule, if your patient cannot talk easily while at rest, their oxygen saturation level is likely to be inadequate.

Vital Signs and Exercise

As the profession of physical therapy evolves, with the pursuit of uniform direct access throughout the United States, PTs will more often be the "point of entry" for the health care consumer. With this increased autonomy and recognition, physical therapy providers, including PTAs, have increased responsibilities to assess and monitor the patient's general health status, making decisions and judgments accordingly. For the PTA working with orthopedically involved patients, this responsibility includes being aware of normal and expected vital signs, values, and responses and monitoring for the unexpected.

Certain responses in vital signs are expected with exercise. In a "Scientific Statement" published by the American Heart Association,[30] detailed guidelines for exercise testing and training are provided, taking into consideration the cardiovascular health status of the patient. Abnormal blood pressure responses include the absence of an increase in systolic pressure or a decrease in systolic pressure with exercise; a normal response is an increase that correlates to the rate and intensity of exercise initiation.[11] If the patient's systolic blood pressure exceeds 200 mm Hg or if the diastolic pressure exceeds 100 mm Hg during exercise, the activity should be reduced or discontinued.[13] The systolic pressure should not increase more than 20 mm Hg with minimal to moderate exercise or more than 40 to 50 mm Hg with intensive exercise.[13] Diastolic blood pressure is not expected to increase or decrease more than 10 mm Hg with exercise in a healthy adult.[13] Box 2.3 summarizes abnormal responses of vital signs to exercise.

Fatigue

In general, the PTA is expected to be competent in performing data collection techniques and selected interventions such that they can make appropriate modifications based on patient responses.[9] In relation to fatigue, this competency may involve observing and reporting abnormal responses to activity and making modifications to the interventions within the context of the PT's plan of care. Fatigue may be specific to an individual muscle or muscle group, or it may affect the entire body, manifesting as cardiopulmonary (also called *cardiorespiratory* or *general*) fatigue.[11] Frequently, associated symptoms such as dyspnea, chest pain, palpitations, or headache are associated with cardiopulmonary fatigue.[13]

A muscle in a state of fatigue is unable to generate a normal contraction, which may manifest by decreased force, ROM, or quality of the contraction. The patient may complain of discomfort or cramping in the muscle being exercised.[11] When a muscle is fatigued, the patient may compensate by consciously or subconsciously substituting with another muscle or muscle group that performs the same or similar action. For this reason, it is important for the PTA to be particularly familiar with muscle actions and potential substitutions and observe patients during exercise activities. In terms of quality of motion, fatigue may result in tremulous or jerky motions, instead of a smooth contraction through the ROM.[11]

Generalized fatigue is apparent when the patient is experiencing dyspnea or inability to breathe normally with activity, indicating a decreased ability of the body to use oxygen efficiently.[11] One tool that has been determined to be a good indicator of a patient's pulmonary tolerance to exercise is a standardized scale referred to as the *Borg scale,* or the *Rate of Perceived Exertion scale.*[21] This instrument calls for the patient to place an objective grade on the amount of exertion they perceive with exertion, making a subjective report more measurable. A similar instrument, the Dyspnea Scale, is used for rating the level of shortness of breath, or dyspnea.[21] As with all standardized instruments, the PTA uses the form, instrument, or technique consistent with that of the supervising PT. If the PT chose to use a standardized instrument to document examination data related to the patient's tolerance to activity, it is likely that a goal addressing that impairment is included in the plan of care, with the outcome to be measured using the same instrument.

BOX 2.3 Abnormal Responses to Exercise

- Heart rate increases more than 20 to 30 bpm above resting heart rate
- Heart rate decreases below resting heart rate
- Systolic blood pressure increases more than 20 to 30 mm Hg above resting level
- Systolic blood pressure decreases more than 10 mm Hg below resting level
- Oxygen saturation drops below prescribed level
- Patient becomes short of breath or respiratory rate increases to level not tolerated by the patient
- Electrocardiogram changes

From Hillegass EA. *Essentials of Cardiopulmonary Physical Therapy.* 3rd ed. St Louis: Saunders; 2011:586.

ASSESSMENT OF MUSCULOSKELETAL STRUCTURES

Detailed reviews of anatomy and function of specific structures are not presented here because the scope of this chapter is limited to the PTA's role in assessment. This section provides information relating to entry-level data collection techniques and assessment procedures pertaining to structures involved with musculoskeletal diagnoses commonly encountered by the PTA.

End-Feel

The term *end-feel* describes the barrier encountered that prevents further motion at the end of passive ROM in a joint. Because different types of tissue have different characteristics and qualities, there are associated normal (physiologic) and abnormal (pathologic) end-feels for each tissue. Normal end-feels are described for simplicity as soft, firm, or hard. Abnormal end-feels may be classified as soft, firm, hard, or empty.[31] With similar terms being used to describe both normal and abnormal end-feels, the PTA student must become familiar with the

normal or expected end-feel for each joint and identify when an end-feel that is not expected for that joint is observed. A common end-feel the PTA will observe with patients after injury is the empty end-feel when no real end-feel is noted because pain prevents the examiner from reaching the end of ROM.[31] End-feels will be discussed in more depth in Chapter 15, with Table 15.2 summarizing the various types of end-feels. The PTA student is encouraged to practice assessing the different normal end-feels on a variety of subjects because the exact perception varies depending on the structure and build of each individual tested. As always, when the PTA recognizes any abnormal circumstances, these findings must be documented and reported to the evaluating PT.

TABLE 2.3 Sample Format for Recording Muscle Strength.

Joint/Motion	MUSCLE TEST GRADE[a]		Other
Shoulder	Right	Left	Responses[b]
Flexion	4−/5	2+/5	
Extension	4/5	3/5	
Internal rotation	4/5	3−/5	
External rotation	4+/5	3−/5	

[a]Measurements represent example of ascending 0-to-5 scale.
[b]Other responses could include notation regarding the presence of pain.

Skeletal Muscle Tissue

Skeletal muscle tissue has various characteristics that allow it to function as it does. More specifics about muscle contractions and functions will be explored in Chapters 5 and 16. The PTA's role in assessment involving skeletal muscle tissue may include strength testing, stretching, palpation, and flexibility. As with all assessments, the PTA must ensure they assess skeletal muscle tissue using the same technique chosen by the evaluating PT.

Strength Testing

It is beyond the scope of this text to provide detailed instruction in the performance of techniques used to measure strength of specific muscles. However, because specific strength increases are frequently included as physical therapy goals, the PTA must be competent with measuring strength through use of both specific and gross testing techniques. Procedures for assessing muscle strength to determine changes or unexpected findings are discussed here.

When the plan of care includes goals related to increase in specific muscle grades, the PTA must use the same technique for assessing the muscle strength as the evaluating PT used at the time of the initial examination and evaluation. In general, specific manual muscle testing considers the precise attachments, action, and position of a muscle during movements or isometric contractions against gravity. Scales for specific muscle grades are also precise, based on word/letter or number scales with strict definitions for each. A table is an organized and convenient way to record data relating to muscle strength testing; an example of a table format is provided in Table 2.3.

In contrast to specific manual muscle testing, gross manual muscle testing techniques are used to determine quickly a nonprecise, yet objective measurement of functional strength. This technique might be used as an efficient method to determine a patient's readiness to progress with exercise or gait activities. This method also may be used to gather data about any changes in the patient's status since the initial examination or last therapy session. In general, movements should be resisted bilaterally and, when possible, simultaneously on both sides for easy comparison. Positions or test movements do not take gravity into account but focus more on functional positions and movements, such as shaking hands, grasping the therapist's fingers, or lowering and rising to and from a squatting or seated position. In addition to gross strength, the PTA should be alert for any signs of pain or discomfort with resisted muscle testing. When conducting gross manual muscle tests, the PTA is not attempting to obtain a precise measurement of strength, but rather is gathering data relevant to the patient's progress toward goals, readiness to progress through the established plan of care, and status in terms of changes in condition. The PTA must document and report any unexpected changes or previously undocumented data related to muscle strength to the supervising PT.

Another indication of muscle weakness or the possibility of undiagnosed musculoskeletal or neuromuscular pathology is change in muscle mass or tone. Changes in mass may manifest as either atrophy (muscle wasting) or hypertrophy (excessive mass). The PTA should be able to recognize changes in mass and make observations about any pattern of these manifestations, such as the involvement of a specific muscle versus a muscle group; the involvement of muscles innervated by common nerve segments; and the involvement of unilateral, asymmetric muscles or groups versus bilateral, symmetric involvement.

Tone refers to the resistance of muscle tissue to passive elongation or stretch and is determined through observation of movements for quality of motion and control of motion (including grading and coordination) and through palpation.[14] True changes in muscle tone should also be noted in the context of patterns of involvement such as previously described and should be differentiated from a local muscle guarding or splinting response.

Palpation

The PTA needs to be proficient with palpation techniques as an assessment tool to use during patient supervision. In addition to pain at end of ROM, muscle and tendon tissue that is in a state of inflammation or injury is tender to palpation over the involved area. Trigger points also may be noted on palpation (see previous discussion of **trigger points**). When increased tightness or spasm is noted on palpation, modifications to the level of activity or exercise could be warranted within the parameters of the established plan of care.

Muscle tenderness or soreness to palpation is not by itself an accurate indicator of the tissues involved because referred pain can also manifest as tenderness. However, the PTA should note and document the location and degree of tenderness or soreness for purposes of comparison with initial examination

findings and possibly as a measure of progress toward goals, if the supervising PT addressed this area in the plan of care. A previously unnoticed pattern of tenderness revealed while the PTA is working with the patient should also be documented and reported to the supervising PT because patterns of the distribution of tender points represent the hallmark characteristic of conditions such as fibromyalgia. The core features of fibromyalgia syndrome include widespread pain lasting more than 3 months and widespread local tender points that are described as painful on palpation.[13]

Flexibility

The loss of the ability of the muscle or tendon unit to obtain full length results in decreased flexibility. Decreased flexibility may be differentiated from decreased joint ROM or loss of accessory motions, which may result from involvement of intra-articular structures (discussed in the section on joints).

The end-feel associated with a loss of muscle or tendon flexibility secondary to increased tension in a muscle is described as *muscular* end-feel, and *muscle-spasm* end-feel relates to when joint movement is stopped abruptly with some rebound secondary to muscles contracting reflexively to prevent further joint movement.[32]

In terms of assessment, the PTA should use a technique consistent with that used by the evaluating PT. Because a loss of flexibility is a problem that may have a significant impact on function, it is an area frequently addressed in the physical therapy plan of care. Examination techniques and subsequent goals may be addressed in terms of specific quantitative outcomes or be more functionally based. An example of a quantitative measurement is the use of goniometric measurements. As with manual muscle testing, detailed instruction in goniometry techniques is beyond the scope of this text. The most important elements of goniometric measurement are accuracy and consistency among testers and testing techniques. To be effective with the assessment or data collection techniques such as goniometry, the student is strongly encouraged to ensure that they possess a solid foundational knowledge base in human anatomy. In addition to a solid grasp of skeletal and superficial anatomic landmarks, the student must learn other principles associated with goniometric testing, such as the differences among passive, active, and active-assisted ROM. It is common for the novice to document goniometric measurements as an indicator of flexibility, failing to indicate whether the data represent the patient's ability to actively move through the range or whether passive overpressure was applied to obtain the measurement. The functional implications relating to this concept are significant. Similarly, it is equally important to report the position the patient is in when the assessment or data collection technique was applied. Complete documentation of a patient's flexibility includes the type of ROM performed (passive, active, active-assist), the position the patient was in for the measurement (supine, prone, side lying, sitting, standing), the side of the body measured (right, left), and a measurement of the uninvolved side to serve as a point of reference of normal ROM of that joint for that patient.

Another technique that may be used to obtain and document information related to flexibility is a functional measurement, such as measuring the landmark the patient's fingertip reaches when performing external shoulder rotation while reaching behind one's head. Although this technique may have specific functional implications, many factors may confound the results and make it less specific to the area of focus. For example, external shoulder ROM performed in this manner may be limited by loss of mobility in the scapula, not the glenohumeral joint. For purposes of data collection to ensure an accurate assessment of the patient's progress, the PTA must employ the same technique as the supervising PT for each patient case. There should be consistency among PTs and PTAs within a practice setting to ensure continuity of care for the patient and valid outcome measurements.

BONES

Of primary importance to the physical therapy clinician is the need to rule out conditions or disease processes that are beyond the professional scope of physical therapy, warranting medical diagnosis and treatment. Even without the advent of direct access to physical therapy care, it is possible that a patient may be referred to physical therapy in error for treatment of a condition that requires strict medical attention. The main consideration with bone tissue is fracture. The potential exists for the fracture to be missed on initial examination (medical or physical therapy). An existing fracture also may progress, in terms of malalignment, in the case of a hairline or crack fracture, in which case referral for immobilization may be indicated. It is critical for the PTA to understand the signs and symptoms of fracture (Box 2.4), regardless of the severity. Common signs and symptoms include pain and local tenderness, deformity, edema, ecchymosis, and a loss of overall function and mobility.[22]

If the patient exhibits exquisite point tenderness over a localized site other than a ligament or other supportive structure, a fracture may be indicated versus other musculoskeletal involvement (e.g., a ligamentous sprain).[13] The PTA should also be aware that fractures can occur as a result of relatively minor trauma, such as sneezing, coughing, or leaning over to tie one's shoe. Fractures from minor trauma can occur in patients who have osteoporosis.[22] Because of the high prevalence and risk of osteoporosis, the astute PTA must recognize the possibility of vertebral compression fractures in a patient with complaints of mid-back or low-back pain. Although sudden impact fractures are the most common type of fracture, the PTA must also be aware of the possibility of stress and pathologic fractures.

BOX 2.4 Signs and Symptoms of Bone Fractures

- Pain and localized tenderness
- Deformity
- Edema
- Ecchymosis
- Loss of overall function and mobility

Adapted from Boissonnault WG. *Primary Care for the Physical Therapist Examination and Triage*. 2nd ed. St Louis: Saunders; 2011.

A stress fracture is a microscopic disruption or break in a bone that is not displaced and produces pain that is described as a localized tenderness or deep aching pain that increases with activity and improves with rest.[13] Pathologic fractures occur in bones that are weakened by disease or tumors and frequently occur spontaneously with very little or no stress. They can be local to the cause, such as with infections, cysts, or tumors, or generalized, as in osteoporosis, Paget disease, or disseminated tumors.[33]

JOINTS AND LIGAMENTS

Accessory Joint Motions

As a component of evaluation, the PT assesses ligamentous integrity and accessory joint motions for the purposes of differential diagnosis and making decisions on which to base the plan of care. It is the position of the APTA that spinal and peripheral joint mobilization techniques are interventions performed exclusively by the PT.[34] Although the PTA is not responsible for these elements of physical therapy patient care, it is nonetheless important that he or she understands the implications of assessment procedures that may reveal problems with structures that contribute to joint integrity. Joint movements are explored in Chapter 15 in detail. Pertaining to the PTA's assessment of these accessory joint motions, it is important that abnormal findings such as decreased joint ROM, a capsular end-feel during stretching techniques, and substitution or compensatory attempts by the patient to obtain full motion all be thoroughly documented and reported to the supervising PT.

Distraction and Compression

Distraction (a manual separating of adjacent joint surfaces) and *compression* (a manual approximation of joint surfaces) are assessment techniques that can provide information about the involvement of tissues or structures that serve to provide support to the joint (ligaments), that lie between the joint surfaces (cartilage), or that are directly affected by joint mechanics (bursae). In the presence of mechanical or structural problems that result in impingement on structures located within or near a joint, distracting the joint may produce a relief of symptoms such as pain (radiating or local) or dysesthesia. The PTA's role in this case is to report and document any previously undocumented findings that may provide information regarding the nature of the patient's problem.

Likewise, if the PTA notices an increase in the patient's symptoms such as pain or signs such as crepitus (joint noise resulting from changes—usually increased coarseness or roughening—of the joint surfaces) during approximation or weight-bearing activities, they should suspect degenerative or inflammatory conditions and should document these findings and report them to the supervising PT.

Bursae are fluid-filled sacs that are located near tendinous insertions to reduce friction with motion. Bursae also may develop as an adaptive mechanism in the presence of excessive friction. An inflamed bursa sometimes is visible near a joint as a small, soft, encapsulated protrusion that is tender to touch. With bursitis, movement of the nearby joint is painful or motion may be restricted in a noncapsular pattern.[32] Any signs of a pathologic or inflamed bursa should be documented and reported to the supervising PT. Changes in exercise programs or functional activities should be incorporated into the plan of care. If a patient presents with a lump under the skin, joint pain and swelling, fever, chills, malaise, and redness, the patient may be exhibiting signs of gout and requires referral for further medical work-up if this condition has not been diagnosed previously.[13]

Ligamentous Integrity

During the course of administering components of the physical therapy plan of care for a patient with a history or diagnosis of ligament sprain, the PTA must be able to assess the patient's readiness to progress with interventions that will increase stresses to the healing tissue. Ligamentous laxity or improper healing results in decreased joint stability, which may manifest as complaints from the patient that the joint or weight-bearing extremity feels as if it may "give." In this case, the PTA should consult with the supervising PT before initiating progressive activities; failure to modify interventions in this case may result in impaired healing, regression of healing, or permanent tissue damage.

If the PTA notices the sudden onset of increased edema, heat to touch, and extremely painful and limited mobility during the course of treatment of a patient with a ligament sprain, the supervising PT must be consulted to seek medical referral to rule out hemarthrosis (bleeding inside the joint capsule).[11]

GAIT

For the PTA to be proficient with assessment of gait, he or she must first have a solid understanding of the normal mechanics of walking. Chapter 14 provides great detail of the fundamentals of normal and abnormal gait. The PTA must learn to be observant and note deviations observed in a patient's gait. As with all assessment procedures, the PTA must ensure that the techniques they employ are consistent with techniques used by the supervising PT. Gait assessment should be performed on flat surfaces as well as uneven surfaces (e.g., carpet or gravel) when indicated and with the patient wearing and not wearing shoes. The shoes also can be examined for signs of abnormal wear, such as scuff marks on the toe of one shoe or flattening of one side of the shoe sole or shoe heel.

Deviations in gait primarily occur as a result of pain, weakness, or other imbalance between muscle strength and flexibility. Typically, the short-term goals in the plan of care address the specific cause of the deviation, with the long-term goal or outcome addressing the overall quality or function of gait. The PTA is responsible for assessing the components of gait that have been specifically addressed in the plan of care. For example, a patient exhibiting an uncompensated Trendelenburg gait during the initial evaluation may have a goal addressing increased gluteus medius strength on the involved side. In this case, the PTA observes the patient's gait to assess for changes in the Trendelenburg pattern and measure strength of the gluteus medius for comparison with initial evaluation data.

The PTA also has a role in determining if a patient is ready to progress to gait training activities with a lesser assistive device. To make appropriate recommendations, the PTA must be familiar with advantages and disadvantages of various assistive devices and must understand purposes and limitations of each. The PTA should keep in mind that ultimately the patient will be best served by the assistive device that allows for maximum safety, independence, and the most normal gait pattern.

BALANCE

According to the Normative Model,[9] the PTA is to be competent in performing balance, coordination, and agility training. Three physiologic systems linked to balance control include somatosensory (musculoskeletal and neuromuscular components), visual, and vestibular. The vestibular system involves the structures and organs of the inner ear, which play a key role in maintaining upright posture, equilibrium, and orientation, which are all components of balance. Although the application of interventions designed to correct vestibular problems is beyond the skill of an entry-level PTA, they must be aware that patients who report symptoms of vertigo, dizziness, balance problems, coordination problems, trouble focusing or tracking objects, hearing loss, tinnitus, nausea, vomiting, motion sickness, ear pain, headaches, or a sensation of fullness in the ears may need further physical therapy or medical assessment to rule out or confirm involvement of vestibular conditions. (Detailed information about vestibular disorders can be found on the website of the Vestibular Disorders Association at https://vestibular.org.)

! IMPORTANT CONCEPTS

Three physiologic systems are linked to balance control:
- Somatosensory (musculoskeletal and neuromuscular components)
- Visual
- Vestibular

A patient who constantly or frequently looks at the floor during ambulation or other activities that challenge balance is likely depending excessively on visual input to compensate for somatosensory impairment (e.g., weakness, loss of sensation, or limited joint mobility). In this case, ongoing assessment should include these components or musculoskeletal or neuromuscular integrity according to the plan of care as established by the evaluating PT. Data collection and documentation must relate changes in the patient's musculoskeletal and neuromuscular function (e.g., ROM, loss of sensation, or weakness) to balance.

Likewise, a patient with visual impairment may depend heavily on musculoskeletal and neuromuscular control to compensate for this deficit. In this case, the PTA may notice that the patient reaches for props or ambulates with a wide base of support.

An outcome measurement tool often used in the assessment of balance in patients is the Berg Balance Scale.[35] It also offers insight into the functional mobility of an individual. Patients evaluated to have a score of less than 45 indicates they may be at greater risk of falling.[36] The following 14 items are scored on a five-point ordinal scale ranging from 0 to 4. "0" indicates the lowest level of function and "4" the highest level of function. The PTA should use a technique consistent with that used by the evaluating PT when assessing each item.

- Sitting to standing
- Standing unsupported
- Sitting unsupported
- Standing to sitting
- Transfers
- Standing with eyes closed
- Standing with feet together
- Reaching forward with outstretched arm
- Retrieving object from floor
- Turning to look behind
- Turning 360 degrees
- Placing alternate foot on stool
- Standing with one foot in front
- Standing on one foot[35]

DOCUMENTATION

Documentation is a critical element of the patient's physical therapy experience. In the present health care environment, the focus of documentation often emphasizes reimbursement for services at the cost of cutting short other important purposes of effective record keeping. In addition to serving as a permanent record of the patient's physical therapy episode of care, documentation is used as a communication tool among members of the health care team; it also may be an effective tool for quality assurance or management within a service or department to measure consistency between providers, set standards for assessment and interventions, and measure effectiveness of outcomes.

The *Physical Therapist Assistant Clinical Performance Instrument*[34] lists the following essential skills associated with documentation (criterion #13):

- "Selects relevant information to document the delivery of physical therapy care."
- "Documents all aspects of physical therapy care provided, including interventions, patient response to interventions (e.g., vital signs, pain, observation), selected data collection measurements, and communication with family and others involved in the delivery of care."
- "Produces documentation that is accurate, concise, timely, legible, grammatically and technically correct (e.g., abbreviations, terminology, etc.)."
- "Produces documentation (e.g., electronic, dictation, chart) consistent with guidelines, format, and requirements of the facility, regulatory agencies, and third-party payers."[8]

This discussion focuses on the PTA's role in documenting assessment. Early in their educational experience, the PTA student learns to recognize the standard elements of patient treatment notes. Two formats of documentation are most commonly used in the field of physical therapy, the subjective objective assessment plan (SOAP) format or the Patient/Client Management format. The SOAP format is effective as a tool to

organize one's thoughts and the content of a treatment note in a problem-oriented method.[37] The Patient/Client Management format resulted from the *Guide to Physical Therapist Practice* and corresponds to the framework of practice outlined in the *Guide*. The Patient/Client Management format includes the components of History, Systems Review, Tests and Measures, Evaluation, Diagnosis, Prognosis, and Plan of Care.[1] Familiarity with both formats will allow the PTA student to apply their documentation knowledge at any facility, even if the standard format used does not exactly follow the SOAP or Patient/Client Management formats.

In the subjective section of the SOAP note or the history section of the Patient/Client note, the PTA would document any patient reports related to functional status or disability, including patient reports of pain. In the objective section of the SOAP note or the Tests and Measures section of the Patient/Client note, the PTA would document treatment performed, including frequency, duration, and intensity; patient education; equipment provided; and changes in patient's status including observed changes during or after treatment and any measurements taken during the treatment.[38] In the plan section of the SOAP note or the Plan of Care section of the Patient/Client note, the PTA would indicate the intervention or interventions for the next patient visit, what the patient is to be doing between treatments, and steps that will be taken to reach the established goals.[39]

How does assessment fit into the PTA's documentation? The assessment is the key portion of documentation that links subjective and objective data to the physical therapy goals, outcomes, and plan. The assessment justifies or explains "why" the patient exhibits the subjective and objective facts. In the assessment section of the SOAP note or the Evaluation section of the Patient/Client note, "…the PTA summarizes the information in the S and O sections and reports the progress being made toward accomplishing the goals."[39] Box 2.5 provides a sample SOAP note that is an example of an effectively documented assessment by a PTA.

BOX 2.5 Sample SOAP Document

S: Pt. c/o UEs feeling tired with parallel bars and pregait activities. Pt. reports 6/10 pain in UEs.

O: Before gait training, GMMT reveals overall strength WFL, with the exception of poor hip clearance with wc. push-up. 50% of attempts, pt. required specific instructions and tactile guidance with proper hand placement with sit-to-stand and stand-to-sit; otherwise carries out this task properly. In parallel bars, pt. took 3 steps forward and back + mod. assist; stand with trunk and (L) LE flexed and does not push adequately with UEs.

A: Concerns re: difficulty maintaining NWB status (R) LE with pre-amb. activities because of insufficient shoulder depression strength; as a result, pt. is not ready to begin gait training with walker. Pt. will benefit from ex. to increase shoulder depression strength to enhance use of assistive device for NWB (R) LE.

P: Include push-up blocks with ther. ex. next visit; progress with gait training with walker, NWB (R) LE as indicated.

Signature, PTA.

SUMMARY

This chapter began with reference to the rapid changes occurring in the physical therapy profession today. It is imperative for PTAs just entering the profession to possess an awareness and understanding of the issues surrounding the dynamics of this evolution. As PTA students gain an understanding of the foundational principles and core documents that affect their clinical and professional roles and function, they will be better equipped to be active participants in these discussions. This chapter was designed with this outcome in mind and focused on the PTA's role in the performance and documentation of assessment procedures used in the care of patients with musculoskeletal disorders.

GLOSSARY

Assessment: "The measurement or quantification of a variable or the placement of a value on something."[1]

Centralization: The increase of signs and symptoms in the immediate area of the lesion.

Evaluation: The specific process reserved solely for the PT, in which clinical judgments are made based on the data obtained during the examination.

Examination: The preliminary gathering of data and performing various screens, tests, and measures to obtain a comprehensive base from which to make decisions about physical therapy needs for each individual patient, including the possibility of referral to another health care provider.

Peripheralization: The spread of pain to areas outside of or distant from the immediate area of involvement.

Referred pain: Pain that is "felt in an area far from the site of the lesion but supplied by the same or adjacent neural segments."[13]

Trigger points: "Small, localized tender areas found within skeletal muscles, fascia, tendons, ligaments, periosteum, and pericapsular areas."[26]

Visceral pain: Pain that originates from a body organ.

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REVIEW QUESTIONS

Multiple Choice

1. Signs of a deep venous thrombosis include:
   - **a.** Pale skin, increased local temperature, edema, and pain
   - **b.** Pale skin, increased heart rate, increased respiratory rate, and pain
   - **c.** Venous distention, palpable cord, increased local temperature, and redness
   - **d.** Redness, decreased local temperature, edema, and pain
2. Which of the following documentation statements about ROM is the most complete?
   - **a.** Right knee ROM 6–110 degrees and left knee ROM 0–140 degrees
   - **b.** Left ankle AROM 10–80 degrees
   - **c.** Right shoulder PROM in supine 0–95 degrees and left shoulder PROM in supine 0–160 degrees
   - **d.** Elbow AAROM 0–45 degrees
3. When a PTA identifies a "red flag" symptom in a patient during treatment, the PTA should:
   - **a.** Immediately call 911
   - **b.** Continue with interventions or data collection techniques and be sure to document the symptoms and notify the supervising PT

c. Not proceed with any interventions or data collection techniques and should immediately report the findings to the supervising PT
d. Continue with current plan of care, but tell the patient to be sure to follow up with their physician

4. A 57-year-old man with a diagnosis of chronic low-back pain reports dizziness and a lightheaded feeling during exercise treatment. The patient is instructed to sit down, and his vital signs are measured. Respiration rate is 14 breaths per minute, pulse rate is 88 bpm, and blood pressure is 152/92 mm Hg. Which of the following statements is most accurate regarding these results?
a. His pulse rate and blood pressure are above normal limits
b. His vital signs are within normal limits
c. His blood pressure and respiration rate are below normal limits
d. His pulse rate and respiration rate are below normal limits
5. While gathering subjective data from a patient, you determine that their pain is referred to the lower extremity along a neural distribution for a specific spinal segment. This is an indication of:
a. Trigger points
b. Centralization of pain
c. Visceral pain
d. Peripheralization of pain
6. When collecting data about a patient's edema, to ensure the data are reliable and reproducible and that there is a level of consistency:
a. Only bony landmarks should be used.
b. The tape measure should be pulled as taut as possible around the limb.
c. Only the affected limb should be measured.
d. Precisely identifiable landmarks should be documented with data measurements.
7. When edema is identified in a patient's bilateral lower extremities, this typically indicates:
a. The patient is experiencing sympathetic pain symptoms in the noninjured lower extremity
b. A systemic pathologic condition such as CHF
c. The patient did not tolerate the therapy activity progression well and activities should be modified
d. A musculoskeletal pathologic condition affecting the synovial joints
8. Which of the following is a potentially serious condition involving edema that is a result of increased fluids in an area tightly bound by fascia?
a. Compartment syndrome
b. CHF
c. Pitting edema
d. Intermittent claudication
9. It is important for the PTA to be able to recognize potential muscular substitutions and to identify when this occurs during patient exercise activities to detect the onset of which of the following?
a. Intermittent claudication
b. Muscle fatigue
c. Abnormal vital signs
d. Bone fracture
10. When the PTA needs to assess a patient's readiness to progress through the established plan of care, they might perform what type of strength testing?
a. Gross manual muscle testing
b. Specific manual muscle testing
c. Unilateral manual muscle testing
d. Gradual manual muscle testing
11. The loss of the ability of the muscle or tendon unit to obtain full length results in decreased:
a. Pain
b. Strength
c. Flexibility
d. Circulation
12. What is the term used to describe increasing pain symptoms in the immediate area of the lesion (as opposed to spreading pain)?
a. Trigger point
b. Centralization of pain
c. Visceral pain
d. Peripheralization of pain
13. What are the three systems linked with balance control?
a. Heart rate, respiratory rate, and blood pressure
b. Somatosensory, visual, and vestibular
c. Range of motion, strength, and gait
d. Central, peripheral, and autonomic
14. The assessment portion of documentation is crucial because it links subjective and objective data to:
a. The physical therapy goals
b. The outcomes
c. The plan
d. All of the above
15. What is a distinct pattern or type of pain that may manifest simultaneously with musculoskeletal symptoms that is caused by activity-related discomfort and typically reported by patients as aching or cramping in a localized region bilaterally?
a. Compartment syndrome
b. CHF
c. Pitting edema
d. Intermittent claudication

Short Answer

16. List typical signs and symptoms of MI (heart attack) that may occur concurrently with the pattern of pain identified as early warning signs of a heart attack.
17. What technique should be employed by the PTA when performing standardized tests and measures and data collection?
18. List five factors that affect respiration rate.
19. What is the term used to describe joint noise that results from degenerative joint changes?
20. What are two potential long-term complications of chronic, unresolved inflammation?

Fill in the Blank

21. Enlarged and tender lymph nodes represent a _____ localized response to _____.

22. Examination of a patient's shoes may provide information about deviations in the patient's _____.

23. Inflammation is typically a reaction to tissue _____ or _____.

24. Fractures associated with osteoporosis may be _____ and diagnosed after healing during medical work-up for subsequent fractures.

25. A manual separating of adjacent joint surfaces is _____, whereas a manual approximation of joint surfaces is _____.

True/False

26. Assessment of patients' vital signs is unnecessary on a routine basis in the outpatient orthopedic clinical setting.

27. Fractures can occur as a result of relatively minor trauma, and they can occur spontaneously with little or no stress.

28. For accurate data collection related to gait, assessment should be performed only on level surfaces and only while the patient ambulates with shoes on.

29. It is the role of the PTA to judge the patient and conclude that the patient is malingering or "faking" the condition.

30. The patient does not play an active role in establishing the severity of general fatigue he or she may experience during activity.

3

Differential Diagnosis and Emergent Conditions

Daryl Menke, Jeromy Jones, and Robert C. Manske

LEARNING OBJECTIVES

1. Define and distinguish the purpose and process of differential diagnosis as it relates to the provision of physical therapy.
2. Discuss the indirect role of the physical therapist assistant as it relates to differential diagnosis.
3. Identify and assimilate key communication strategies and techniques used in client management.
4. Explain common potential complications and identifiers related to the musculoskeletal, neuromuscular, cardiopulmonary, integumentary, and other systems.
5. Identify critical elements to communicate to the primary physical therapist and appropriate documentation of findings.

CHAPTER OUTLINE

KEY TERMS

Assessment
Diagnosis
Differentiate
Evaluation
Examination
Infection
Intervention
Prognosis
Understanding

The landscape of health care has drastically changed from the early 1900's to present, and certainly more so since the 1980's. Secondary to continued escalating costs and the realization that quality matters, the concept of health care reform has come to the fore. In a statement released by the Institute of Medicine in 2001, "The committee envisions a system that uses the best knowledge, that is focused intensely on patients, and that works across health care providers and settings."[1] During a presentation to the Subcommittee on Health Care, Committee on Finance, US Senate in 2009 Carolyn Clancy stated "*Simply put, health care quality is getting the right care to the right patient at the right time—every time.*"[2]

Over the past few decades physical therapists have emerged as a health care practitioner of choice for individuals who have developed or continue to experience dysfunction with the bodies interrelated neuromusculoskeletal movement systems. The literature also supports the fact that physical therapy independently and in association with other providers is not only efficacious but aids in reducing the overall costs of health care in certain situations.[3,4] As the profession advances towards the role of the physical therapist as a primary care provider within the multidisciplinary and interdependent model for health care, this requires an integral involvement with and responsibility for developing standards of practice and health care policy related to ensuring the availability, accessibility, and optimal provision of physical therapy services. Supported by an evidence-based educational process, the professional scope of practice consists of patient and client management that includes: examination, evaluation, diagnosis, prognosis, and interventions designed to optimize physical

function, movement, performance, health, quality of life, and wellbeing across the lifespan.[5]

An integral aspect of the physical therapy profession's vision is the scope of practice that involves **diagnosis.** Multiple sources have defined the term *diagnosis* as that which includes the commonalities of providing a label for the recognition of specific signs and symptoms and correlating this to an identifiable disease or disorder.[6–8] The process of diagnosis is far more complex than this simplistic overview implies. The methods used to determine an appropriate diagnosis must involve the practice of differentiating the multitude of often similar signs and symptoms into a specific pattern that guides the practitioner's choice of **intervention** and the eventual outcome of the episode of care.

! IMPORTANT CONCEPTS

An integral aspect of the physical therapy profession's vision is the scope of practice that involves diagnosis.

Differential diagnosis is the process of carefully comparing and contrasting patient data points with the goal of appropriate exclusion and inclusion that terminates with the development of intervention strategies. This is a dynamic process that may result in minor alterations or significant shifts and revisions in the patient plan of care (POC).

! IMPORTANT CONCEPTS

Differential diagnosis is the process of carefully comparing and contrasting patient data points with the goal of appropriate exclusion and inclusion that terminates with the development of intervention strategies.

The development of a physical therapy differential diagnosis is solely within the scope of practice for the physical therapist. However, the physical therapy assistant (PTA) must have an identifiable role in this activity to fulfill the requirements of the patient POC.[9] The purpose of this chapter is to provide the PTA with information that explains the process of differential diagnosis, the role of the PTA in this process, and definitive identifiers the PTA can use when determining the need for referral to the physical therapist (PT).

PATIENT CARE MANAGEMENT

Physical therapy is a unique body of knowledge that is provided only by qualified, trained, and credentialed PTs and PTAs under the direction and supervision of a PT. Although some legal jurisdictions and payer sources continue to require proof of collaboration between the PT and medical practitioner using a referral, PTs are rapidly progressing as autonomous health care practitioners. Regardless of some of the arbitrary restrictions limiting the public's full and unrestricted access to all services, a physical therapist maintains the fiduciary responsibility of patient management including establishing a physical therapy diagnosis. The basis for the roles and responsibilities of a PT and PTA related to patient care is contained within the core documents of the American Physical Therapy Association (APTA), including, but not limited to, documents on standards of practice for physical therapy, criteria for standards of practice for physical therapy, code of ethics for PTs, and standards of ethical conduct for PTAs.

! IMPORTANT CONCEPTS

Physical therapy is a unique body of knowledge that is provided only by qualified, trained, and credentialed PTs and PTAs under the direction and supervision of a PT.

The practice of physical therapy encompasses various aspects of acute, rehabilitative, and chronic phases of patient care with the focus primarily on the musculoskeletal, neuromuscular, cardiopulmonary, and integumentary systems. Throughout most of the aforementioned settings, as a practicing clinician, you have the unique opportunity to spend 30 to 60 minutes with each of your patients during a visit. This is key when, in comparison, primary care physicians average 9 minutes of face-to-face time with patients during an office visit.[10] Despite advances in the modern health care system, there are unfortunately increased statistics of medical errors leading to patient injury and death. The primary cited reasons for these medical errors are: diagnostic errors, failure to rescue, or problems with communication between clinicians.[11] The PT and PTA have an integral role in primary, secondary, and tertiary care and prevention, and the promotion of health, wellness, and fitness. The process of patient management has been outlined in the APTA *Guide to Physical Therapist Practice* (Fig. 3.1). The ultimate objective is a positive outcome that affects not only the individual but also the public as a whole. The next few paragraphs will briefly summarize and highlight the essential features of the process known as the principles and elements of patient/client management.

! IMPORTANT CONCEPTS

The practice of physical therapy encompasses various aspects of acute, rehabilitative, and chronic phases of patient care with the focus primarily on the musculoskeletal, neuromuscular, cardiopulmonary, and integumentary systems.

Once the patient/client has chosen or has been referred to physical therapy, the PT begins with an **examination**, which has been described as a comprehensive screening that includes specific tests and measures.[6] The PT obtains a history using a communication cycle that attempts to procure data. The data collected lead the PT to formulate a postulate about the patient's potential impairment and associated activity and participation limitations. The information is obtained from a multitude of sources including the patient, family, care providers, other health care providers, medical records, and others (counselors, employers, case managers, etc.). A systems review that includes a screening of the anatomy and physiology of the appropriate systems (typically the cardiopulmonary, integumentary, musculoskeletal, and neuromuscular systems), and an **assessment**

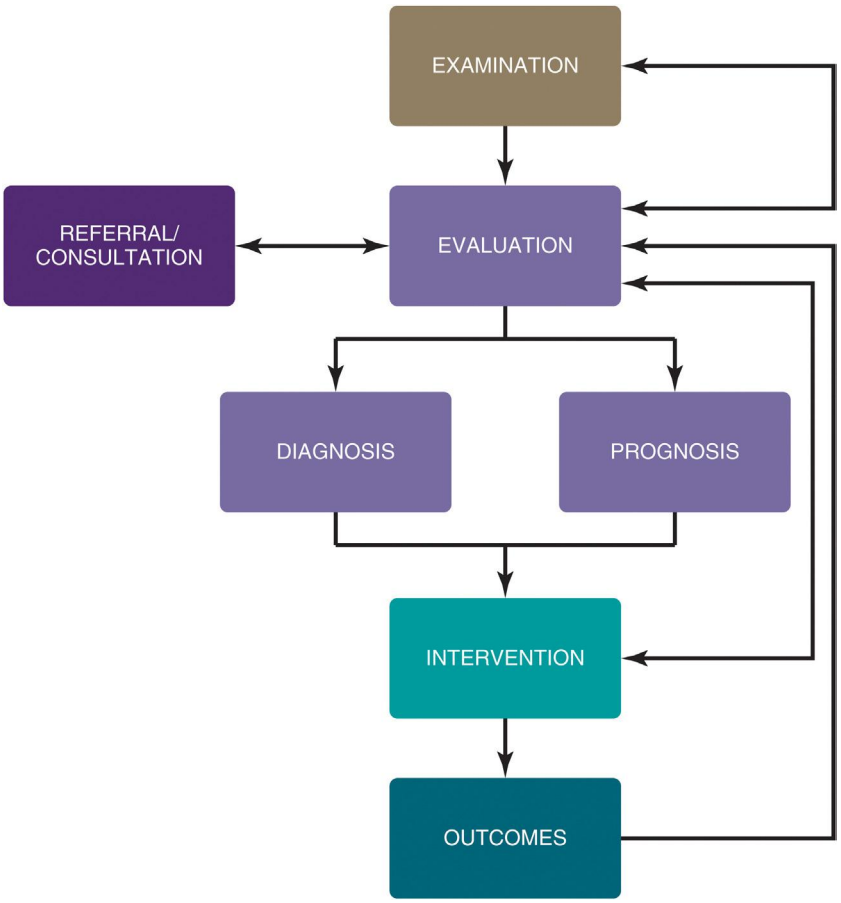

Fig. 3.1 The Process of Physical Therapist Patient and Client Management. (From *Guide to Physical Therapist Practice 3.0*. Alexandria, VA: American Physical Therapy Association; 2014. Available at: http://guidetoptpractice.apta.org/content/1/SEC2.body. Accessed June 12, 2018.)

BOX 3.1 Common Tests and Measures

- Aerobic capacity/endurance
- Anthropometric characteristics
- Assistive technology
- Balance
- Circulation (arterial, venous, lymphatic)
- Community, social, and civic life
- Cranial and peripheral nerve integrity
- Education life
- Environmental factors
- Gait
- Integumentary integrity
- Joint integrity and mobility
- Mental functions
- Mobility (including locomotion)
- Motor function
- Muscle performance (including strength, power, endurance, and length)
- Neuromotor development and sensory processing
- Pain
- Posture
- Range of motion
- Reflex integrity
- Self-care and domestic life
- Sensory integrity
- Skeletal integrity
- Ventilation and respiration
- Work life

Guide to Physical Therapist Practice 3.0. Alexandria, VA: American Physical Therapy Association; 2014. Available at: http://guidetoptpractice.apta.org/. Accessed June 12, 2018.

of the patient's communication abilities and certain mental capacities follow. The hands-on aspect of the examination involves specific tests and measures that are designed to assist in ruling in or ruling out the cause of the impairment or functional deficit. There are 26 common test and measure categories that have been identified in the *Guide to Physical Therapy Practice* (Box 3.1). It is imperative that the use of any tests or measures meets certain standards including high levels of reliability, validity, specificity, and sensitivity.

After the data have been collected, the PT must synthesize the information obtained during the examination and begin to develop clinical decisions in a process referred to as **evaluation**.

During this procedure, the PT accounts for influencing factors that include, but are not limited to:

1. Stability of condition,
2. Overall physical and mental health status,
3. Specific phase of healing (acute, subacute, or chronic),
4. Complexity and severity of pathology,
5. Involvement of singular or multiple sites or systems, and
6. Preexisting conditions or comorbidities.

The PT must also consider information and data from additional sources, such as laboratory reports, radiologic reports, and referral sources (advanced nurse practitioners, chiropractors, dentists, physicians, physician assistants, allied health professionals, and employers). This type of information often is not provided to PTs who practice in non–institution-based facilities (i.e., private practices, school systems, or industrial settings).

The end result of the examination and evaluation process is the determination of a diagnosis. As previously stated, this process involves providing a label for the recognition of specific signs and symptoms and correlating this to an identifiable disease or disorder. There is a distinct difference between a medical diagnosis and the diagnosis determined by the PT. Medical practitioners provide a diagnosis that labels a disease or disorder at the cellular, tissue, organ, or system level. Examples of medical diagnoses with which patients present to PTs include low-back pain, shoulder pain, rotator cuff tear, fracture, and cerebrovascular accident. The difficulty with this type of diagnostic labeling is that it is often nonspecific and provides no information related to a patient's overall functional status. The physical therapy diagnosis focuses on the influences of the disease or disorder on the patient's functional status at the system level and the interrelationship between the systems and the person as a whole.[12]

The basis of developing an accurate diagnosis targets the ability of the PT to **differentiate** the data into a specific pattern that guides the practitioner's choice of intervention. Differential diagnosis requires a global **understanding** of the functions of all systems and how each interacts with and influences the others. This understanding requires critical thinking skills that culminate in a calculated intervention decision. Delaune[12] stated, "Very simply, it is problem solving." Problem solving involves data collection, formulation of a solution, application of the intervention, and assessment of the outcome. If the desired outcome is achieved, the problem is often considered solved. However, if the desired outcome is not achieved, the process of problem solving must be repeated. The ability to problem-solve successfully involves the recognition of the need for a different solution or acknowledgment that the practitioner should reassess to determine if a different problem exists. The end result of the diagnostic procedure includes three potential solutions:

1. Specific evidence-based interventions for specific identified problems,
2. Short-term interventions to reduce symptoms to allow reexamination that produces a more definitive diagnosis, and
3. Referral to an appropriate health care provider or alternative sources.

! IMPORTANT CONCEPTS

Differential diagnosis requires a global understanding of the functions of all systems and how each system interacts with and influences the others.

The therapist assimilates all the information from the patient history, objective tests and measures, and diagnosis into a prediction of an optional level of improvement. The fourth element of patient management is known as **prognosis**, which involves the prediction of the outcome of the physical therapy episode of care. This prediction must be based on realistic patient capabilities and probability for achievement while avoiding what is known as the "halo effect" (false impressions leading to unrealistic expectations.) This culminates with the establishment of the **plan of care**. The POC is initiated with the development of patient-based goals that address the problems exposed during the examination and evaluation. Each goal concentrates on a specific problem, provides a prediction of the desired outcome, is objective and measurable, and contains a definitive time frame. The POC is also a collaborative activity that involves not only the patient/client, but all members of the health care team. **Interventions** are then chosen.

Interventions are actions taken by the PT or PTA under the direction and supervision of the PT to facilitate improvement or resolution of the specified problems. Application of these activities requires skillful integration of physical and mental processes used to achieve the predicted and desired outcome. Typical physical therapy interventions from the APTA Guide are listed in Box 3.2.

The intervention may involve collaboration with other health care providers or referral to a different health care provider or alternative sources. Consistent with all other processes of patient care management, interventions are dynamic in nature and require timely reexamination. Periodic reexaminations are performed to assess the changes produced by the interventions and the need to modify or redirect the POC. This process may reveal progress toward the predicted outcome, new clinical findings, or lack of progress that may require consultation with or referral to a different health care provider or alternative sources.

BOX 3.2 Typical Physical Therapy Interventions

- Patient or Client Instruction
- Airway Clearance Techniques
- Assistive Technology: Prescription, Application, and, as Appropriate, Fabrication or Modification
- Biophysical Agents
- Functional Training in Self-Care and in Domestic, Education, Work, Community, Social, and Civic Life
- Integumentary Repair and Protection Techniques
- Manual Therapy Techniques
- Motor Function Training
- Therapeutic Exercise

Guide to Physical Therapist Practice 3.0. Alexandria, VA: American Physical Therapy Association; 2014. Available at: http://guidetoptpractice.apta.org/content/1/SEC31.body. Accessed July 1, 2018.

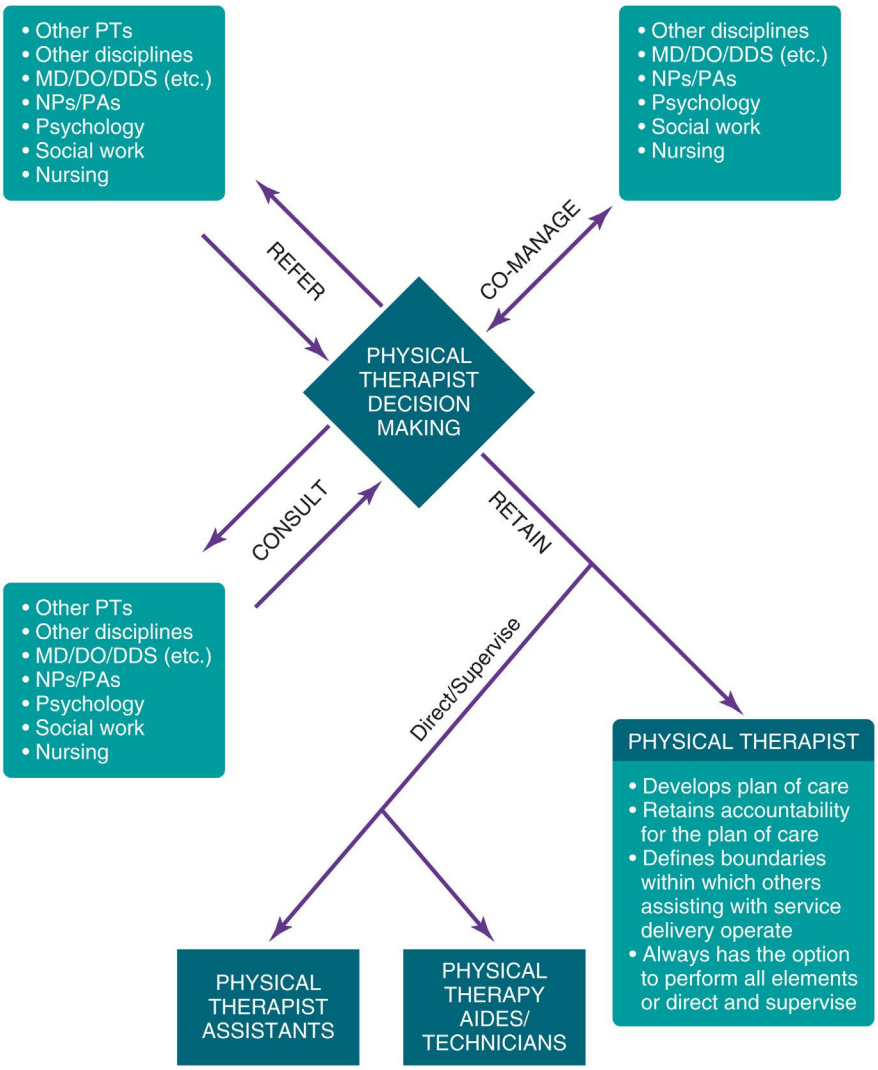

Fig. 3.2 Physical therapist decision making related to the involvement of other providers. *DDS*, Doctor of dental surgery; *DO*, doctor of osteopathy; *MD*, doctor of medicine; *NP*, nurse practitioner; *PA*, physician assistant; *PT*, physical therapist. (Principles of physical therapist patient and client management. *Guide to Physical Therapist Practice 3.0*. Alexandria, VA: American Physical Therapy Association; 2014. Available at: http://guidetoptpractice.apta.org/content/1/SEC2.body. Accessed June 12, 2018.)

Patient management is an ongoing process that is focused on the evolving needs of the patient/client. Fig. 3.2 depicts the various decision points a physical therapist encounters en route to the final determination of how the patient/client is best handled. Once the determination has been made that the patient/client is appropriate for physical therapy services, it typically concentrates on one of the following:

- Rehabilitation—regaining lost skills and/or function,
- Habilitation—developing skills and/or function not previously developed,
- Maintenance of health and function,
- Preventive actions and activities, and
- Performance enhancement.

Physical Therapist Assistant

Although the development of a physical therapy differential diagnosis is solely within the scope of practice of the PT, the PTA must possess a working knowledge of the methods and procedures of the diagnostic process and how this process directs the chosen interventions. Other chapters of this text discuss the basic role of the PTA in patient care that includes the provision of delegated interventions and monitoring the patient's responses. This role requires assessment skills that involve problem solving and clinical decision making that may result in appropriate immediate adaptations during a treatment session or collection of data that are reported to the primary PT resulting in the need for changes of the POC.

The definition of assessment includes the concepts of action or an instance of making a judgment about something.[13] The health care field clarifies this definition to include the methods of appraising the patient's condition, performing an interview, collection of objective data, and effectively communicating the information verbally and in writing. These skills are essential components of education and clinical training of the PTA and