= CHAPTER 15 =

Evidence-Based Practice in Physical Therapy

Nadine decided to write her paper on the effectiveness of magnet therapy, an alternative technique for pain relief that is gaining considerable exposure in the medical literature. She collected

articles and thought, "So many people believe that it works, yet there is insufficient evidence to show that it does."

Critical Thinking and Clinical Problem Solving

Physical therapists engage in critical thinking processes. *Critical thinking* involves the discipline, ability, and willingness to assess evidence and claims; to seek contradictory, as well as confirmatory information; and to make objective judgments on the basis of well-supported reasons as a guide to belief and action.[1]

Critical thinking is often used by individuals and organizations when trying to solve complex problems. Critical thinking requires a clear identification of questions and problems and is a process of collecting relevant informa-

tion and thoughtful interpretation of that information to reach conclusions and solutions. When engaged in critical thinking, one identifies assumptions, tests ideas against established criteria and standards (such as policies, clinical guidelines, or established protocols), and recognizes the implications and consequences of decisions. Finally, the process requires clear communication with other team members.[2]

Physical therapist assistants work closely with physical therapists in *clinical problem solving* in the work environment, within the context of the direction and supervision provided by the physical therapist while carrying out the established plan of care. Problem-solving activities involve recognition and identification of the problem, description of the problem, identification of possible solutions, and the consequences of those solutions. The physical therapist assistant seeks assistance and

consultation as needed prior to implementation of a solution.[3]

Both critical thinking and clinical problem solving require an active awareness of the thinking process. *Metacognition* is the process of monitoring and considering one's thoughts while in the thinking process. Awareness of choices and active involvement in determining the best way to make choices are key parts of the metacognitive process.[1]

Critical thinking requires the thinker to use a process characterized by clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness. In contrast, clinical problem solving exists within a carefully defined context and within the limits of role and environmental constraints.

Remember that physical therapist assistants implement clinical problem solving and make clinical decisions *within the physical therapist's (PT) estab-*

opinions of "authorities."[4] Evidence-based practice requires the critical analysis of evidence.

Physical therapists who use evidence-based practice blend their individual clinical expertise and judgment with the best available external evidence. Thus, evidence might involve information about the following:

- The accuracy and precision of diagnostic tests and screening examinations (including clinical observations)
- The prediction of outcomes from various clinical findings
- The efficacy and safety of therapeutic and preventive interventions[5,6]

The demand for "evidence" comes from growing consumer-driven cost-consciousness, combined with increased accountability across the health care professions. Consumers and third-party payers have largely driven this movement, as information has become

more widely available across the Internet and through television and print media.

TABLE 15-1

CLINICAL PROBLEM SOLVING FOR THE PHYSICAL THERAPIST ASSISTANT[4]

- 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 (eg, chart review, patient, caregivers, team members, observation) to determine a 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 progression 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 (ie, goals have been met).
- Demonstrates the ability to perform appropriately during an emergency situation to include notification of appropriate staff.

Reprinted with permission from American Physical Therapist Association. *Physical Therapist Assistant Clinical Per-*

lished plan of care and *within the context of the direction and supervision provided by the physical therapist.*

Read the competency of clinical problem solving in Table 15-1, defined in the *Physical Therapist Assistant Clinical Performance Instrument* and identify the various elements of the process. You may recall that this instrument was first discussed in Chapter 6.

Evidence-Based Practice

Evidence is information that tends to support something or show that something is true, such as clinical research or objective changes in function. Evidence-based practice involves the use of current best evidence in making decisions about the care of individual patients.[5]

Evidence-based practice deemphasizes intuition, unsystematic observations of clinical experience, and the

formance Instrument 2009. Alexandria, VA; American Physical Therapist Association; 2007.

Types of Evidence

In describing evidence-based practice approaches, some authors have suggested several types of evidence.[1]

Empirical Evidence

Empirical evidence is obtained by objective observation, rather than reasoning or feeling. This is the type of evidence provided by research studies that meets currently accepted standards of design, execution, and analysis. Strong empirical evidence is derived from the outcomes of experiments using rigorous controls and having clear, unequivocal outcomes.

Analogical Evidence

Analogical evidence involves comparing known similarities between 2 systems and hypothesizing that a relationship shown to exist in one system but unknown in the other also exists in the other. For example, this type of evidence might apply to the findings of animal studies to justify interventions with humans. This type of evidence is considered weaker than empirical evidence because effects are hypothesized but not tested.

Anecdotal Evidence

An *anecdote* describes an experience in an individual or situation. A *case report* is an example of anecdotal evidence. Anecdotal evidence is considered the weakest of the 3 types of evidence because it is difficult to repeat and diffi-

cult to draw any conclusions regarding the cause of an outcome. Even multiple case studies do not substantially add to the strength of anecdotal evidence.

Reviewing Scientific Merit

Research articles can be evaluated for their scientific merit.[7] Not everything that is written should be accepted as evidence. Researchers and clinicians can evaluate an article by examining the supporting theories and the design of studies that test a particular interventional approach.

Researchers are constantly challenged to meet stringent criteria. Not many studies of complex human phenomena, such as education or rehabilitation, are able to meet these criteria. When researchers design studies to test "real-life" conditions, they often must live with the constraints and the ambiguities that everyday life presents. This

is quite different than working with animals in a laboratory setting.

TABLE 15-2

SEARCHABLE DATABASES FOR EVIDENCE SUPPORTING PHYSICAL THERAPY INTERVENTION

SOURCE	*URL*
Cochrane Library: A collection of 6 databases that contain different types of high-quality, independent evidence to inform health care decision making	http://www.thecochranelibrary.com
Physiotherapy Evidence Database (PEDro): Details and abstracts of randomized controlled trials, systematic reviews, and evidence-based clinical practice guidelines in physiotherapy that are rated based on quality	http://www.pedro.org.au
Hooked on Evidence: Sponsored by the	http://www.hookedonevidence.org

American Physical Therapy Association (APTA), provides reviews of articles that relate to the effectiveness of physical therapy interventions	

Further, the base of knowledge of what underlies the practice of physical therapy is vast and has been drawn from multiple disciplines over time. Theories are often contradictory and confusing. In addition, there is the problem of how to measure and what is measurable and what is not.

Qualitative researchers argue that there are other types of research that have scientific merit besides the randomized controlled clinical study.[8] Others contend that the complexity of the human condition is impossible to document with the requisite scientific rigor. Even if we believe it exists, we lack the tools at this point in time to measure energy flow, emotional discharge,

or subtle changes in subjective well-being.[8,9]

The answer may lie in the approach that we take to thinking, decision making, and problem solving. Training in critical thinking and making good decisions is as important as understanding the mechanisms of physiology or pathology, which underlie the approaches that we choose to take.

Evidence in Physical Therapy

Many authors in the physical therapy field have written about evidence-based practice over the past 20 years. Pamela Duncan was one of the first to write about evidence-based practice in physical therapy:

"Advances in physical therapy will be possible only if we critically

evaluate our assumptions and shift our paradigm. Although scientifically based models for interventions do exist in physical therapy, the current paradigm for practice is based, for the most part, on expert opinion and clinical experience. It is driven by many assumptions that guide education, clinical practice, and research."[10]

Over the past 20 years, the physical therapy profession has made great strides in developing databases of studies that support physical therapy and rehabilitation care. Each source shown in Table 15-2 offers a searchable database that provides scientific evidence for the foundational clinical sciences and practice of physical therapy.

Evidence-based practice is characterized by several elements that distinguish it from more historically traditional practices.

Recasting the Role of Authority

Evidence-based practice places a much lower value on "authority." Opinions offered by experts can be evaluated using available evidence. Some argue that the knowledge and skill one gains from experience can never be measured in randomized controlled studies. The key here is that the importance of what authorities offer must be appraised and evaluated in the context of underlying evidence.

Peer-reviewed medical journals in many disciplines and specialty areas publish studies that provide such evidence. Physical therapists must look to the literature and to other disciplines in many cases for evidence supporting their practice.

Looking at the Context in Which Evidence Exists

Just as a physical effect may be dependent on ambient conditions of temperature, light, and humidity, the mechanisms of response to a physical therapy intervention may be dependent on complex *biopsychosocial* phenomena that are more difficult to measure than objective physical phenomena.

The *biopsychosocial* model integrates theory from biology, psychology, anthropology, and sociology as an explanatory theme for health and health care. This model includes issues of health and wellness; spirituality; psychoneuroimmunology; methods of coping with disability, illness or injury; ways to reduce stress; and smoking cessation.[12]

For example, many physical therapists would predict a better outcome for a

Practicing by the "Guide"

In the absence of strong empirical evidence, we can refer to clinical practice guidelines. *Clinical practice guidelines*, such as those published in the *Guide to Physical Therapist Practice*,[11] are written to assist practitioner and patient decisions about appropriate care for specific clinical circumstances. These guidelines were developed by consensus of teams of clinicians and educators without an interest in a specific physical therapy intervention approach.[11] Practice guidelines assist in defining the boundaries of practice and provide an external reference when there is disagreement regarding the selection of various interventions.

patient with a strong social support system (such as a family) to provide care. Most physical therapists would also rate a patient's prognosis more favorably if he or she was functioning independently prior to an illness or injury. How are these factors measured or even considered in choosing the duration of a physical therapy intervention or a discharge destination?

We cannot draw conclusions about the consequences of the physical therapist's decisions or the effects of physical therapy intervention without also considering evidence that describes the factors that may influence those outcomes. Valid, reliable, standardized assessment tools provide the best hope of quantifying the many factors that interact to influence an outcome.

Comparing the Costs to the Benefits of Intervention

How much change in a condition can be expected? How much time and effort will it take to achieve and/or sustain that change? How expensive is the physical therapy intervention compared with the potential benefit that the patient will gain? Medicine is often accused of applying technology because it exists and has some small chance of changing an outcome. It often feels better to do "something" than to do nothing.

Timing It Right

The cost-benefit issue applies on an even larger scale when it comes to prevention. It is often far less costly to provide an intervention that *prevents* a disability than to treat that disability when

dence-based care.[13] See Chapter 1 for the full statement.

> *"Guided by integrity, life-long learning, and a commitment to comprehensive and accessible health programs for all people, physical therapists and physical therapist assistants will render evidence-based service throughout the continuum of care and improve quality of life for society."*

Later, the APTA embraced the use of evidence-based practice in the position statement:

> *"To promote improved quality of care and patient/client outcomes, the American Physical Therapy Association supports and promotes the development and utilization of evidence-based practice that includes the integration of best available research, clinical expertise, and patient*

values and circumstances related to patient/client management, practice management, and health policy decision making."[14]

Evidence and Physical Therapy Clinical Management

In what instances do physical therapists and physical therapist assistants apply evidence to solve clinical problems? What evidence underlies the decisions that they make?

Chapter 8 discussed information processing and ways to improve your attention to and understanding of the wealth of information available in the clinical environment. The things to which you pay attention may make a tremendous difference in sifting

through and processing information. Let's look at the following tasks.

Setting Goals

Adam listened as his instructor said, "The physical therapist sets goals that are functional, realistic, measurable, and achievable within time and resource constraints." He thought to himself, "How do the patient's goals affect intervention planning?"

A *goal* "belongs" to a person who has an active interest in achieving it. Often, this is the patient or client; perhaps we could also include the larger circle of family and caregivers in the group of people who care about achieving the goal.[15,16] Goals are more easily achieved when the patient and family are involved in the goal-setting process.

The next question is, "What do you want to be able to do differently?" This may be sleeping through the night, being able to work an 8-hour day, being able to get on and off the toilet, or getting in and out of the shower independently.

Goal-setting determines where you are going. Just as it would be difficult to take a trip without having a destination, a goal defines a target for the physical therapy intervention.

How does the physical therapist set goals, especially in projecting realistic time frames for the achievement of these goals?

To set goals, the physical therapist considers some of the following factors, in conjunction with the assessment of the patient or client.

Prior Level of Function

Function is defined as one's ability to perform daily activities such as self-

care, walking, climbing stairs, shopping, cooking, and working outside the home.[17] Various scales are available that measure function.

Most evidence indicates that a higher premorbid (before injury or illness) level of function is predictive of the achievement of a higher level of function post-intervention.[17] Thus, physical therapists are more likely to have higher expectations of function for a patient who functioned independently prior to the current injury or illness.

Social Support

Social support is a key factor in quality of life and speed of recovery from illness or injury. The presence of caregivers in the home is a critical factor that influences physical therapists' decision making regarding discharge destination.[18]

Comorbidity

Many patients and clients have multiple medical disorders that coexist as chronic illnesses. These may change a patient's prognosis in that a disorder such as diabetes may slow wound healing time or that heart or kidney disease may influence tolerance for activities. Physical therapists always take comorbidity into account when determining the patient or client's prognosis.

Discharge Plan

Recommending a discharge plan is a key part of the physical therapist's decision-making process. The physical therapist assistant plays a role in communicating closely with the physical therapist while delivering the established plan of care.

Discharge destination may be a function of the efficacy of physical therapy services and may largely determine future access to physical therapy services.[17] Patient safety, judgment, and cognition are often just as important as the patient's physical function. Of course, social support plays a key role in discharge planning decisions.

Outcomes Assessment

Evaluating outcomes is a key activity to gather evidence of the efficacy of physical therapy intervention. Physical therapist assistants often collect data to assist the physical therapist in monitoring the *outcomes* of physical therapy intervention.

On the simplest level, outcomes are the measure of how far you have progressed toward reaching a goal. *Measurement tools* provide a way to assess outcomes. A measurement tool can be

a physical assessment process, such as goniometry or manual muscle testing, or a written assessment that the patient completes.

The accuracy of the tool or assessment procedure is assessed by 2 measurement properties[18,19]:

1. *Reliability:* The extent by which an experiment, test, or measuring tool yields the same results on repeated trials. If you perform the same test within a few minutes, will you get similar results? Will other testers get similar results?
2. *Validity:* The extent to which an assessment measures what it is intended to measure. For example, a questionnaire to measure the patient's perception of knee pain during functional activities is not likely to be an accurate measure of blood pressure or vision.

Although not all assessments used in physical therapy have been studied for their reliability and validity, increasing emphasis on these measurement properties motivate physical therapists to choose valid, reliable tools to measure outcomes.

Online resources for instruments and tools that can be used in physical therapy practice are available. For example, the *Rehabilitation Measures Database*[20] (http://www.rehabmeasures.org) is a comprehensive website offering links to a multitude of sources of measurement tools and assessment procedures.

Clinical Applications

With the current emphasis on accountability and cost effectiveness, the premium is on achieving outcomes in the shortest time and with the fewest resources. A shorter hospital stay will

save time and thousands of dollars for the patient, the patient's family, and inpatient care providers.

Physical therapist assistants add value to support the physical therapist's clinical judgment by contributing their skills and observations and gathering and communicating information.

Evaluating the outcomes of the interventions we provide are keys to understanding the best choices we can make. We must make some hard decisions regarding the best use of limited time and resources to provide health care. Physical therapists make daily decisions to maximize time and staff resources.

We use *evidence* to support our intervention decisions. Various clinical tools provide quantifiable measures of function, balance, strength, or quality of life. We can easily measure the duration or frequency of a physical therapy intervention and its associated costs.

With this evidence and information, physical therapists can make informed decisions and can choose to compromise when needed, to slow down, or to alter the path to the goal.

Evaluating the Evidence

Nadine gave a class presentation on the results of an article on the use of static magnets for reducing pain that used a meta-analysis. She learned that a meta-analysis is a statistical analysis that includes results and data from separate but similar studies to test the combined effectiveness of the results.

She read the abstract and thought about the implications for all those patients who believed that their magnetic bracelets were very effective in controlling their arthritis pain.

Read the abstract in Table 15-3 and underline the key findings of this article.

Take a look at Figure 15-1, which is a forest plot that shows the results of the meta-analysis presented in this article. Each randomized controlled trial included in the meta-analysis is represented and shows varying results, with each study favoring either the effect of the magnet or the effect of the placebo. One study favors neither the magnet nor the placebo.

Nadine's classmates asked her: "What is a placebo controlled trial? Why is this type of study preferred over a simple measurement before and after treatment."

She answered, "A placebo controlled trial provides stronger evidence. The researchers needed to determine that the results were not caused by the research

participants experiencing a positive result just because they had participated in a study. Sometimes research participants will feel better because they expect a change. That is the 'placebo effect.'

So, the participants were assigned randomly to a group that either wore the 'real magnets' or a group that was really wearing a 'sham magnet,' a placebo specifically designed to have no real effect. In that way, these studies could measure the effect of either the magnet or the placebo on pain."

Nadine asked the class during her presentation: "What conclusions would you draw from looking at the forest plot? Is there strong evidence to support using magnets to treat pain?" Following her presentation, Dr. Jenkins praised Nadine for her thoughtful and

thorough analysis of the evidence supporting magnet therapy.

How would you evaluate the evidence presented in Figure 15-1? Some of the studies show the results favoring the placebo, whereas others show the results favoring the magnet. Therefore, the authors drew the conclusion that there is insufficient evidence to support the effectiveness of magnets in relieving pain.

Summary

Physical therapist assistants are involved in a variety of clinical problem-solving activities, including collecting data, identifying any changes in the patient's status, and notifying the physical therapist in a timely manner. Evidence-based practice requires a physical therapist's analysis of measurement

tools, intervention goals, and related outcomes. Using the literature to assess the evidence supporting various clinical interventions is an expectation of today's physical therapist. Comparison of the time and resources spent to achieve a physical therapy outcome allow us to choose the most effective, efficient, and least expensive interventions.

TABLE 15-3

EXAMPLE OF A RESEARCH ARTICLE REPORTING EVIDENCE ON THE CLINICAL BENEFITS OF STATIC MAGNETS IN REDUCING PAIN[21]

STATIC MAGNETS FOR REDUCING PAIN: SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED TRIALS

Abstract

it has developed. It may be even less costly to provide widespread screening to identify those at greatest risk for developing a disability and then provide individual physical therapy intervention to selected high-risk individuals.

The costs of providing care are usually calculated on an individual basis. The costs to society of *preventing* people from needing those services in the first place are largely unknown.

The Future

The future is clear—physical therapists must continue to seek evidence to justify the physical therapy interventions they recommend. Costly and time-consuming interventions without demonstrable effects are likely to be denied by third-party payers and refused by consumers.

In their *Vision 2020* statement, the APTA House of Delegates addressed evi-

Background

Static magnets are marketed with claims of effectiveness for reducing pain, although evidence of scientific principles or biological mechanisms to support such claims is limited. We performed a systematic review and meta-analysis to assess the clinical evidence from randomized trials of static magnets for treating pain.

Methods

Systematic literature searches were conducted from inception to March 2007 for the following data sources: MEDLINE, EMBASE, AMED (Allied and Complementary Medicine Database), CINAHL, Scopus, the Cochrane Library, and the National Research Register. All randomized clinical trials of static magnets for treating pain from any cause were considered. Trials were included only if they involved a placebo, control, or a weak magnet as the control, with pain as an outcome measure. The mean change in pain, as measured on a 100-mm visual analogue scale, was defined as the primary outcome and was used to assess

the difference between static magnets and placebo.

Results

Twenty-nine potentially relevant trials were identified. Nine randomized placebo-controlled trials assessing pain with a visual analogue scale were included in the main meta-analysis; analysis of these trials suggested no significant difference in pain reduction (weighted mean difference [on a 100-mm visual analogue scale] 2.1 mm, 95% confidence interval, -1.8 to 5.9 mm, p = .29). This result was corroborated by sensitivity analyses, excluding trials of acute effects and conditions other than musculoskeletal conditions. Analysis of trials that assessed pain with different scales suggested significant heterogeneity among the trials, which means that pooling these data is unreliable.

Interpretation

The evidence does not support the use of static magnets for pain relief, and therefore magnets cannot be recommended as an effective treatment. For osteoarthritis, the evidence is insufficient to exclude a clinically im-

portant benefit, which creates an opportunity for further investigation.

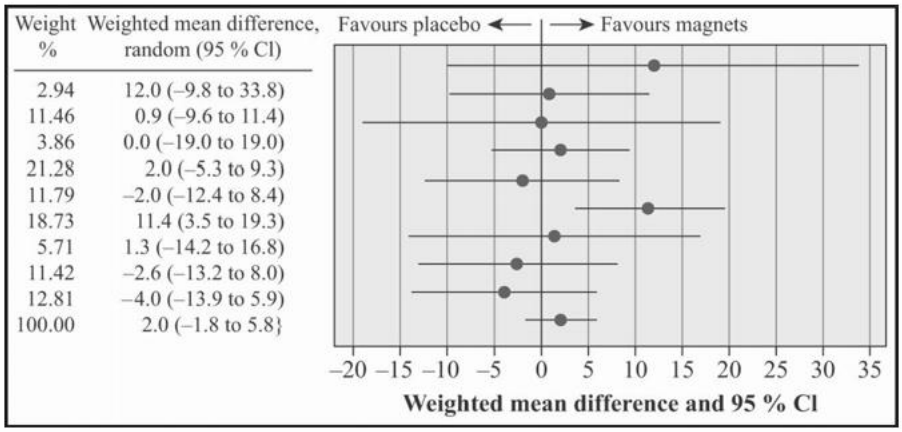

Figure 15-1. A forest plot displaying the results of the meta-analysis demonstrates insufficient evidence to support the effect of magnets on pain. Effects of static magnets for treating pain. The outcome is the weighted

mean difference in pain reduction (relative to baseline) on a 100-mm visual analogue scale, with 95% confidence intervals (CIs). The vertical line represents no difference between magnets and placebo. SD = standard deviation. (Reprinted from Pittler MH, Brown EM, Ernst E. Static magnets for reducing pain : systematic review and meta-analysis of randomized trials : figure 2. Canadian Medical Association Journal, 2007, volume 177, issue 7, p. 741. © Canadian Medical Association (2007). This work is protected by copyright and the making of this copy was with the permission of the Canadian Medical Association Journal (www.cmaj.ca) and Access Copyright. Any alteration of its content or further copying in any form whatsoever is strictly prohibited unless otherwise permitted by law.21)

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Putting It Into Practice

1. Review a few pages of one of your current textbooks. What statements provide evidence to support a proposed intervention or recommended technique? Refer to the author, title, and page of the book you use.

2. Actively consider the problem-solving approaches you take to everyday decisions. Give an example of a way in which you use evidence or data to make an everyday decision.

3. Download information from the Rehabilitation Measures Database (http://www.rehabmeasures.org/rehabweb/allmeasures.aspx?PageView=Shared) on the 6-Minute Walk Test.

4. Visit the APTA site, Hooked on Evidence (http://www.hookedonevidence.com) and look up "6-minute walk test." How many articles did you find?