CHAPTER
2

CHAPTER OVERVIEW

This chapter contains several essays on research from several healthcare professionals. In no way does this list represent all the healthcare professions; the selected professions provide but a sample.

Essays on Research in the Health Professions

George B. Kudolo, PhD, FACB, *Clinical Laboratory Sciences*
Bridgett Piernik-Yoder, PhD, OTR, *Occupational Therapy*
Vasco Deon Kidd, Dr.HS, PA-C, *Physician Assistant*
Donna D. Gardner, MSHP, RRT, FAARC, *Respiratory Care*
Catherine Ortega, EdD, PT, ATC, OCS, *Physical Therapy*

RESEARCH IN THE CLINICAL CHEMISTRY LABORATORY

The Importance of Research in the Clinical Chemistry Laboratory

George B. Kudolo, PhD, FACB

Clinical laboratory sciences (CLS) is one of the least recognized of the healthcare professions, primarily because it involves very little direct contact with patients. Yet, clinical laboratory scientists play a very crucial role in patient care. There are several disciplines within CLS, including clinical chemistry, microbiology, and hematology. CLS professionals work with blood, urine, and other body fluids as well as microorganisms. CLS is estimated to provide more than seventy percent of the objective data used by healthcare providers in the diagnosis and treatment of patients.[1] In cases of national emergencies, such as a bioterrorist attack (e.g., anthrax or ricin) or epidemic disease outbreak (e.g., the swine flu, H1N1), CLS professionals play leading roles in the identification of the causative organisms or insulting chemicals. Clinical chemistry scientists may also specialize in the area of forensic toxicology, providing data from postmortem toxicology. Research is very important in all these areas. Research reveals the best test procedures with the highest diagnostic

specificity (i.e., to test negative when the patient has no disease) and diagnostic sensitivity (i.e., to test positive when a disease is present in the patient).

Scientific research involves systematic investigation. Research often involves grouping facts (data) so that conclusions can be drawn regarding disease processes, for example, how they are acquired and how they can be detected and treated. The primary objective of most of the research in CLS is to discover new data that may improve the diagnosis of disease. For example, diabetes mellitus is a debilitating disease affecting approximately 25 million people in the United States. Because of its morbidity and mortality, we must understand how best to diagnose and manage this disease. Laboratory evaluation is key to management of the disease and its sequellae. Clinical laboratory scientists play a major role in this arena. More investigation of blood and body fluid markers for diabetes are needed. We need to understand what changes occur in this disease process, and this is the type of research undertaken by the CLS. For the test results to be meaningful to the patient, healthcare providers must interpret the results correctly. In many instances, interferences complicate the interpretation of results.[2] The role of the clinical laboratory scientist is to research those interfering factors and provide clear results. For example, the CLS professional may help the healthcare provider prescribe drugs that are adjusted to the patient's biochemistry. From CLS research, additional tests may be developed that help to monitor drug toxicity and efficacy.[3]

One important area in which CLS research continues to make significant strides is forensic investigation, which includes workplace drug testing and the justice system. CLS research provides the basis for much of the forensic evidence that is so important in today's crime scene and other investigations.[4]

In conclusion, CLS research produces data and information on which clinical decisions are made. Research ensures that the results are reliable and reproducible. CLS research can influence life-and-death decisions. CLS research can show who is innocent and who is guilty. Every CLS professional must understand what research means and how to use it effectively.

REFERENCES

1. Forsman RW. Why is the laboratory an afterthought for managed care organizations? *Clinical Chemistry.* 1996;42(5): 813–816.
2. Dasgupta A. The effects of adulterants and selected ingested compounds on drugs-of-abuse testing in urine. *Am J Clin Pathol.* 2007;128(3):491–503.
3. Kaldy J. Personalized medicine: Genetic component to providing quality care. *Consult Pharm.* 2011;26(9):618–627.
4. Flanagan RJ, Connally G. Interpretation of analytical toxicology results in life and at postmortem. *Toxicol Rev.* 2005; 24(1):51–62.

RESEARCH IN OCCUPATIONAL THERAPY

The Importance of Research to Occupational Therapy

Bridgett Piernik-Yoder, PhD, OTR

Like other healthcare professions, occupational therapy (OT) has the obligation to provide evidence that the services provided for clients have a benefit. While the notion of this responsibility is readily accepted, it is often stated that the OT profession has not always been as aggressive as it should be in demonstrating the efficacy and efficiency of OT treatments through empirical evidence.[1] Occupational therapy is a healthcare profession that uses a holistic approach to understand and address how people with and without disabilities live their daily lives in the context of their environments.[2] In examining research activity in OT, it is important to understand the current status of research in the field, barriers to the production and utilization of research, and opportunities for growth in OT research.

The Status of Occupational Therapy Research

In March 1917, when OT was formalized as a profession, the founders recognized the need to disseminate knowledge about the therapeutic effect of OT. The profession's first scientific journal, *Archives of Occupational Therapy,* was published in 1922.[3] More than 80 years later, in preparation for the profession's 100th anniversary in 2017, the American Occupational Therapy Association developed the Centennial Vision. The Centennial Vision, intended to be vision statement for the profession as well as a call to action, states that by 2017, "occupational therapy is a *powerful, widely recognized, science-driven,* and *evidence-based* profession . . ."[4] This expression is a clear mandate to the profession to not only continue but to increase its research efforts.

Gutman, editor of the *American Journal of Occupational Therapy* (*AJOT*), outlined the publication priorities of the journal. Occupational therapy—like other health

professions—has not fully answered questions regarding treatment efficacy and efficiency.[5] Consequently, third-party payers have been placed in the decision-making role regarding many aspects of treatments, including who receives services, for how long, and even what treatments are denied.[5] In an effort to build the evidence needed to respond to these external challenges, the publication goals of *AJOT* were aligned to match the research needs of the profession. The stated publication priorities of *AJOT* include the following: high-quality effectiveness studies; efficiency studies including cost and time efficiency, patient satisfaction, safety, and patient compliance; studies addressing the psychometric properties of occupational therapy assessment measures; studies demonstrating the relationship between participation in occupation and health indicators; and analyses of current professional issues.

With regard to research methodology, it has been stated that *AJOT*'s publication preference is not based on a specific study design but rather on the appropriateness of the study design selection to answer the research question. For instance, quantitative study designs are the most appropriate to answer research questions about intervention efficacy, cost, and time efficiency. Qualitative study designs best answer research questions related to needs of patients and their caregivers from novel populations or in areas where OT services are emerging. Additionally, mixed-method study designs provide answers about patient satisfaction, compliance, and safety.[5]

Barriers to Occupational Therapy Research

While the research priorities for the profession have been clearly articulated, it is important to consider the barriers that exist in both the production and the utilization of evidence in OT. With regard to the production of resources, challenges that face the OT profession are similar to those encountered in many other healthcare professions. First, the paucity of advanced, research-intensive degrees available in the field lead to occupational therapists pursuing advanced degrees in non-OT fields.[6] While cross-disciplinary study does provide many benefits, the result is that most research conducted by occupational therapists at the doctoral level is outside the OT field.

Most occupational therapy academicians come to the educational setting after a number of years in clinical practice. While a strong clinical background is extremely important to teaching future practitioners, this background does not typically include an established line of research.[6]

It has been suggested that occupational therapists must be prepared to critically evaluate the evidence-based literature and apply it to their practice. Some recommendations include incorporating evidence-based practice into the OT educational curriculum. Thus, occupational therapists entering the profession have a strong foundation in an evidence-based approach.[7]

Growth Opportunities

As resources in healthcare and education settings become increasingly competitive, it is critical that the benefit of OT services to individual, families, and societies be unequivocally demonstrated. Given the importance of this task, opportunities must be explored to not only expand the research capacity within the field but also to produce clinically relevant research.

Although it will always be necessary to address the support needed to build career scientists in the profession, it is also important to consider building partnerships between researchers and clinicians.[2] This important endeavor will provide an opportunity for researchers and clinicians to collaborate on clinical questions that will have true utility for the OT and other clinicians, while providing the researcher access to an applied setting in which to collect data.

As Keilhofner aptly stated, "the existence of occupational therapy depends on societal support."[8] While much as been accomplished over the past decade with regard to increasing the amount of evidence available in occupational therapy, we must embrace the obligation to demonstrate the benefit of our services in order to maintain a strong place in the health and education settings.

REFERENCES

1. Gutman S. State of the journal, 2010. *Am J Occup Ther*. 2010; 64(6):832–840.
2. Clark F. High-definition occupational therapy: HD OT. *Am J Occup Ther*. 2010;64(6):848–854.
3. Punwar A, Peloquin S. *Occupational Therapy: Principles and Practice*. Baltimore, MD: Lippincott, Williams & Wilkins; 2000.
4. American Occupational Therapy Association. *The Road to the Centennial Vision*. Published in 2006. http://www.aota.org/News/Centennial/Background/36516.aspx?FT=.pdf. Accessed on August 26, 2011.
5. Gutman S. AJOT publication priorities. *Am J Occup Ther*. 2010;64(5):679–681.

6. Gutman S. Why haven't we generated sufficient evidence? Part I: Barriers to applied research. *Am J Occup Ther.* 2009; 63(3):235–237.
7. Lin SH, Murphy SL, Robinson JC. The issue is—facilitating evidence-based practice: Process, strategies, and resources. *Am J Occup Ther.* 2010;64(1):164–171.
8. Keilhofner G. *Research in Occupational Therapy: Methods of Inquiry for Enhancing Practice.* Philadelphia, PA: FA Davis; 2006.

RESEARCH IN THE PHYSICIAN ASSISTANT PROFESSION

Why Is Research Important to the Physician Assistant Profession?

Vasco Deon Kidd, Dr.HS, PA-C

Research is as important to the physician assistant (PA) profession as it is to all healthcare disciplines. Research is vital to our efforts in improving patient care, clinical guidelines, healthcare policies, and expanding the PA scope of practice. However, a crucial challenge facing the PA profession is the lack of PA clinical, educational, and bench researchers whose research interests revolve around PA issues.

Historically, most educational institutions are focused on fulfilling the mandate of producing quality, competent, primary care clinicians. Therefore, PA training programs did not teach research in the didactic curriculum. However, the trend is changing; many PA programs have placed a greater emphasis on educating students about research methodology, data collection, and critically appraising research findings. In addition, more PA faculty are becoming involved in clinical, educational, and workforce research. This increase in faculty expertise will translate to improved PA student understanding.

As new PA programs open and existing programs are expanded, formulating best practices in teaching and learning derived from educational research will become increasingly important. Therefore, it is imperative that PA educators advance PA education to address the needs of the twenty-first century adult learner.

For students and practicing PAs, having the requisite skills for appraising and conducting primary research is extremely important, especially in the era of evidence-based medicine and healthcare reform. Not only is it important for PAs to know how to formulate and answer research questions, but it is also important to understand the research priorities and the needs of the health service sector. For example, more research is needed on how the PA profession can reduce healthcare costs while providing quality care.

Unless PAs plug the data gaps surrounding the PA profession and the care PAs deliver, it will be difficult if not impossible for policy makers to understand the value that PAs bring to the table. Evidence-based medicine will be used to guide educational policies and practices that influence all healthcare disciplines. Those healthcare professions that have data to support their practice decisions will be able to shape policy and garner resources most effectively.

Another benefit of research is that it opens up opportunities that were not readily available to PAs a decade ago. These opportunities include being a primary investigator for clinical trials, director of research, working for a think tank, acting as a policy and content expert, etc. For those PAs that are effective clinicians and researchers, the opportunity to carve out a niche in the PA profession is tremendous.

As important as it is for PAs to acquire research knowledge and to publish, at times conducting research can seem tedious, time-consuming, and monotonous. Many clinicians may not have the time to develop their research interests and may have no desire to publish for fear of being scrutinized. However, the sense of accomplishment an investigator feels after finishing and submitting a research manuscript for publication is an exhilarating experience.

More PA researchers are needed to answer the looming professional questions in order to garner the respect this unique profession deserves. PAs can no longer sit on the sidelines and allow non-PAs to determine their professional worth. PAs must take hold of the profession's destiny by answering critical questions through research.

RESEARCH IN RESPIRATORY CARE

Types of Research in Respiratory Care

Donna D. Gardner, MSHP, RRT, FAARC

First, very few respiratory therapists (RTs) are employed as researchers.[1] Many RT researchers are also clinicians, teachers, and managers.[1] Respiratory therapists and other healthcare providers must be able to read and understand scientific research even though they may not be directly involved in research.[2] Respiratory therapists

are primary investigators in research in a variety of settings and opportunities. Some RTs began their careers in bench, laboratory, clinical, educational, or management research. These types of research lead to changes in the practice of respiratory therapy. The one area of research in which RTs can participate is patient care. Research may occur anywhere RTs work. The research type and topic can be broad, from equipment to technological advances to disease management or education.

Because many RT tasks are equipment and technology based, evaluating new equipment is an area for research almost all RTs can do. This includes evaluating new medical equipment that is used to diagnose or support the patient. The question is this: "Is it better than what we have?" New products, modes of ventilation, medications, educational methods, and electronic medical records lend themselves to investigation. The RT must take the lead to make sure new equipment is necessary.[2]

Many RTs participate in industry research. In addition to understanding the scientific methods, RT investigators must be knowledgeable about regulatory and ethical standards. This means following the Institutional Review Board (IRB) protocols and legal and ethical policies to ensure safety and the protection of their subjects' rights.

Another avenue for research is respiratory therapy academic research, that is, keeping educators up to date with technology, treatment, and educational practices.[1] Respiratory therapy educators must ensure that new technology, medications, and equipment being introduced to the student are applicable for the profession and have met the scientific rigor required for patient care.[2] The RT academician must be knowledgeable about new and developing products and technologies. Respiratory therapy faculty must be able to evaluate and compare new and existing treatment modalities. Educators must be able to critically evaluate and interpret the research literature concerning respiratory therapy and educational practices. Many academicians are expected to conduct their own investigational research.[2]

The purpose of research is to advance the scientific knowledge of respiratory therapy. Some RTs participate in device and equipment evaluation; some participate in prospective and retrospective clinical trials. Respiratory therapy managers are involved in quality improvement activities, which can be valuable research projects.[1] Many RTs use survey research to investigate attitudes, knowledge, and interests in the various dynamics of respiratory therapy.[1] Many RTs use case reports to provide teaching lessons important to respiratory care practice.[1]

Research is the basis for making changes in respiratory care practices. Decision making regarding therapeutics, new technology, and approaches to patient problems must be based in research and, preferably, evidence-based practice.[3] Prospective clinical studies are the best tools for evidence-based clinical practice.[4] These types of investigations change the practice of respiratory therapy. Case reports are a great method for students to examine unusual or educational cases in terms of patient signs, symptoms, treatment, or a combination of these items.[5]

Respiratory therapy often requires processes that change existing modes of care or implement new processes to achieve the best patient care. Research helps determine the best method for delivering the care.[6] Quality assurance or quality improvement programs help RT managers and practitioners to improve practice. For example, misallocation of respiratory therapy services is a problem among many hospitals. This type of research can determine quality assurance and guide selection of indicated services.[6]

Although not all RTs are involved in research, there is no doubt that research is becoming a greater part of respiratory therapy practice. Each year, more research reports and abstracts are presented at the profession's international congress. This research that has been completed by RTs worldwide. Much of what RTs are doing becomes part of the evidence that supports RT practice. It is the duty of all RTs to move the respiratory therapy research agenda forward.

REFERENCES

1. Pearson DJ. Research and publication in respiratory care. *Respir Care*. 2004:49(10):1145–1146.
2. Chatburn RL. Overview of respiratory care research. *Respir Care*. 2004;49(10):1149–1157.
3. Fink J. Device and equipment evaluations. *Respir Care*. 2004;49(10):1158–1164.
4. Schwenzer KJ, Durbin CG. The spectrum of respiratory care research: Prospective clinical research. *Respir Care*. 2004;49(10):1165–1170.
5. Hess DR. Retrospective studies and chart reviews. *Respir Care*. 2004;49(10):1171–1174.
6. Stoller JK. Quality assurance research: Studying process of care. *Respir Care*. 2004:49(10)1175–1180. http://www.aarc.org/daz/rcjournal/rcjournal/x.RCJOURNAL.COM%2002.21.07/contents/10.04/10.04.1175.pdf. Accessed on August 29, 2011.
7. Rubenfeld GD. Surveys: An introduction. *Respir Care*. 2004;49(10):1181–1185. https://research.chm.msu.edu/

Resources/Surveys_an_introduction.pdf. Accessed on August 29, 2011.
8. Restrepo, RD. AARC clinical practice guidelines: From referenced-based to evidence-based. *Respir Care.* 2010;55(6):787–789. http://www.rcjournal.com/contents/06.10/06.10.0787.pdf. Accessed on August 29, 2011.

RESEARCH IN PHYSICAL THERAPY

The Relevance of Research to the Profession of Physical Therapy

Catherine Ortega, EdD, PT, ATC, OCS

The physical therapy profession was founded in response to a national need during World War I.[1] Early practitioners provided care with interventions derived from deduction, empirical evidence, and clinical experience. The height of the polio epidemic and increased numbers of injured veterans from World War II combined to increase the demand for physical therapy and thus provide impetus for the establishment of curricula and formal education in the profession.[1,2] Even with this increased demand for patient care, much of the intervention was passive and based on clinical expertise.

Though exercise as an intervention was added to the profession during the 1960s and in subsequent years, much of physical therapy clinical practice continued to be supported by experiential evidence and minimal research. With the advent and development of evidence-based medicine, it became clear that physical therapy had to demonstrate therapy outcomes. Evidence-based practice has three primary components: (1) patient preference, (2) research evidence, and (3) clinical expertise.[3] The profession of physical therapy, similar to other branches of medicine, is challenged to provide systematic reasoning and scientific investigations to support interventions.

The initial trend in evidence-based practice was to search for research evidence and, where it was not available, to regard interventions with skepticism. Research was initially given more merit than patient preference and clinical expertise. This dearth of research evidence in the field of physical therapy provided rationale for the elevation of the entry-level degree from a bachelor's to a master's degree. Physical therapy programs across the country transitioned to the master's degree level and added research components to physical therapy curricula.[2] All students were encouraged to perform research as they progressed through the master's level programs. It was proposed that all clinicians would then be able to contribute to the body of evidence to support interventions and promote patient care.

With the creation of the Vision 2020 statement from the American Physical Therapy Association (www.apta.org),[4] which included the component of physical therapy as a "doctoring profession," came an understanding that not all physical therapists should perform research. There was improved clarity with regard to the place of research as a component of evidence-based practice. Therefore, though research continues to be valued to support the high standards for patient care, the role of the physical therapist with regard to research and the place of research within the practice of physical therapy is more clear.

Specifically, physical therapists must understand research and be able to critically appraise the evidence. All physical therapy curricula now must contain activities that promote critical thinking with regard to the assessment of research. Activities and didactic content are included to promote an understanding of the application of statistical procedures, assessment of the validity of evidence, and the appropriate application of evidence to clinical practice.

Current physical therapy graduates enter the clinical setting with an understanding of research and are able to apply the steps of evidence-based practice. Their first step is to assemble a clinical question using the P-I-C-O (Patient, Intervention, Comparison, Outcome) format. This format defines a patient problem and allows for the search of the evidence for answers. Physical therapists then use the information gained to attain competence and assess the validity of each investigation found. By doing so, physical therapists can better apply research evidence to make the best choice with patient care. Though the performance of research is critical to provide evidence for interventions, the critical thinking and systematic steps of evidence-based practice give relevance to research in physical therapy.

The current state of health care in our country provides further support for the relevance of research to physical therapy. Insurance providers and governmental oversight mechanisms merit justifications for physical therapy. Often justification is required to approve physical therapy services, and even after approval, specific interventions require validation. The ability to apply the steps of evidence-based practice efficiently allow clinicians to provide patient care with less disruption of services due to lack of approval. Research in and of itself is relevant to physical therapy. Without data, without sound, rigorous

investigations and systematic conclusions, professionals will continue to perform trial-and-error interventions.

In summary, physical therapy professionals have progressed from using passive trial-and-error interventions to using critical thinking to assess evidence and apply the steps of evidence-based practice. Doctor of physical therapy programs include education to perform and assess research, always with the intent to apply the highest standard of care to patients. The current understanding of the relevance of research has placed this third leg of the evidenced-based practice stool in perspective for academicians, students, and clinicians alike.

REFERENCES

1. Moffat M. History of physical therapy practice in the United States. *The Journal of Physical Therapy Education,* Winter 2003.
2. Murphy W. Healing the Generations: A History of Physical Therapy and the American Physical Therapy Association. 1995. Lyme, CT: Greenwich Publishing Group.
3. Sackett D. Evidence-based medicine: What it is and what it isn't. *BMJ.* 1996; 312:71–72. http://www.bmj.com/cgi/content/full/312/7023/71. Accessed on September 12, 2011.
4. American Physical Therapy Association. www.apta.org. Accessed on September 12, 2011.
5. American Physical Therapy Association. *Guide to Physical Therapy Practice,* 2nd ed. Alexandria, VA: APTA, 1997.