

# Review for librarians of evidence-based practice in nursing and the allied health professions in the United States

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**Objective:** This paper provides an overview of the state of evidence-based practice (EBP) in nursing and selected allied health professions and a synopsis of current trends in incorporating EBP into clinical education and practice in these fields. This overview is intended to better equip librarians with a general understanding of the fields and relevant information resources.

**Included Professions:** Professions are athletic training, audiology, health education and promotion, nursing, occupational therapy, physical therapy, physician assisting, respiratory care, and speech-language pathology.

**Approach:** Each section provides a description of a profession, highlighting changes that increase the

importance of clinicians' access to and use of the profession's knowledgebase, and a review of each profession's efforts to support EBP. The paper concludes with a discussion of the librarian's role in providing EBP support to the profession.

**Conclusions:** EBP is in varying stages of growth among these fields. The evolution of EBP is evidenced by developments in preservice training, growth of the literature and resources, and increased research funding. Obstacles to EBP include competing job tasks, the need for additional training, and prevalent attitudes and behaviors toward research among practitioners. Librarians' skills in searching, organizing, and evaluating information can contribute to furthering the development of EBP in a given profession.

## Highlights

- Evidence-based practice (EBP) is in the early stages of evolution for most allied health professions.
- Each profession is devoting a growing amount of attention to developing training and other strategies to facilitate implementing EBP among its constituents.

## Implications


- Librarians can provide expertise in selecting resources, using effective search strategies for finding evidence, and evaluating information to promote the effective integration of EBP into allied health.
- Librarians can also play an important role in continuing education activities, updating nursing and allied health professionals on the evolution of resources and practices in EBP in a given field.
- Given the need for access to information resources to support EBP, librarians may be change agents by educating professors, researchers, and publishers about the need for broader access to EBP resources.

## INTRODUCTION

In the early 1990s, evidence-based medicine (EBM) was introduced as a framework for research and practice and as a methodological approach to enable physicians to more effectively access clinically relevant research [1]. EBM has conceptually evolved into evidence-based practice (EBP) in recognition of the movement's inclusion of related domains including nursing, physical therapy, and others [1].

The rapid emergence of the Web, including freely accessible MEDLINE and other databases as well as full-text electronic journals and the current intense engagement with its resources, has had a significant impact on access to and use of the medical knowledgebase [2]. Buried in the large volume of digital information is "actionable information," the information most pertinent to a clinical decision or course of action. Given the ongoing explosion of available health information, access to evidence-based, actionable information is a prime concern for clinicians and health information professionals [1].

Concomitant with these advances and challenges is the expectation that information should be used by clinicians to inform judgment and decisions [3]. To accomplish this goal, clinicians have to find a path

 Supplemental Table 1 is available with the online version of this journal.

through the knowledgebase to the highest quality and most useful information. Further, information delivery at the point of care may facilitate its incorporation into clinical decision making.

While professionals move toward adopting the EBP model of clinical care, each of the health professions is at a different place in developing and implementing the model for their specific disciplines. Based on one author's (Kronenfeld) experience with teaching EBP skills, implementation of EBP may be viewed as including the following components:

- commitment of the profession to an EBP model
- integration of an EBP model into professional education curricula
- identification or development of an evidence knowledgebase capable of supporting EBP for clinicians in the profession
- development of EBP resources to effectively support clinicians to enable efficient use of relevant evidence in their practice

This paper presents a brief overview of the progress that a number of health professions have made in adopting an EBP model. The sections on each profession are arranged in alphabetical order: athletic training, audiology, health education and promotion, nursing, occupational therapy, physical therapy, physician assisting, respiratory care, and speech-language pathology. An online supplement provides expanded information on relevant databases and other resources for supporting evidence-based research in the nursing and allied health disciplines (Table 1 online).

## EVIDENCE-BASED PRACTICE IN ATHLETIC TRAINING

The profession of athletic training is relatively young and can be traced back to the evolution of professional football in the United States after World War II and athletic trainers' provision of on-site health care services to the athletes. Athletic trainers soon began to work with all forms of competitive athletes at the professional, college, and high school levels. The profession continues to evolve into emerging areas of practice that include positions in outpatient clinical settings, industrial and corporate health care, government, physician offices, and hospitals. Currently, more than 25,000 athletic trainers practice in the United States [4].

Athletic trainers in the United States are licensed health care providers certified by an independent national organization, the National Athletic Trainers' Association (NATA) Board of Certification (BOC). Eligibility for national certification requires that an applicant must complete an accredited professional athletic training education program at the bachelor's or master's degree level and pass a certification examination.

Athletic training education has undergone significant reform over the past decade to normalize and enhance the professional preparation of athletic trainers for their evolving role as health care providers. Currently, athletic training education programs are accredited by the Commission on Accreditation of Athletic

Training Education (CAATE) through an independent body known as the Joint Review Committee on Educational Programs in Athletic Training (JRCAT). Using a model based on medical education, programs educate athletic training students to serve as physician extenders by emphasizing clinical reasoning skills. Athletic training education uses a competency-based approach in both the classroom and clinical settings. Athletic trainers are educated, trained, and evaluated in six major practice domains: prevention; recognition, evaluation, and assessment; immediate care; treatment, rehabilitation, and reconditioning; organization and administration; and professional development [5].

Several key professional issues highlight the demand for EBP information for athletic trainers. First, as a profession, athletic training is pursuing regulation in the form of licensure in all states to protect the public from unqualified individuals practicing athletic training and to recognize and protect the profession. Second, an increasing number of athletic trainers are seeking third-party reimbursement for the health care services they provide. Access to current evidence-based information is an integral component in establishing statutory regulation and obtaining third-party reimbursement for services [6].

In addition to accessing EBP information, a profession must develop and disseminate its own unique body of knowledge. Therefore, it is imperative for athletic trainers to not only engage in EBP, but to also contribute to the evidence base by conducting research aimed at quantifying the effectiveness of athletic training interventions [7]. Evaluation and demonstration of outcomes is an integral component of EBP and will soon become a prerequisite to third-party reimbursement [6]. Finally, as the financial burden of spiraling health care costs continues, it will be increasingly important for athletic trainers to demonstrate cost-effective care.

The professional organizations of athletic training are working to introduce the concepts of EBP to all certified athletic trainers and athletic training students. In January 2006, for example, the NATA Research and Education Foundation hosted a one-day EBM summit for athletic trainers, "Infusing Evidence-based Medicine into Athletic Training and Clinical Practice." Additionally, NATA funds research grant proposals that address the issue of EBP in athletic training.

The NATA Pronouncements Committee has adopted changes to the format of the association's position statements that will utilize the Cochrane evidence-based grading scale to identify the strength of evidence from which the recommendations are made and help guide future research and clinical practice.

The NATA Post-Professional Education Committee is currently proposing and formulating guidelines for specialty certification and accreditation of residency programs to advance the clinical practice of the profession. An integral portion of the proposed revisions to the certification exam is the addition of questions regarding EBP concepts and their application in practice settings. Proposed standards and guidelines for residency program accreditation are heavily built on a

foundation of EBP and clinical outcomes research that evaluates the effectiveness of athletic training practice.

Analysis of the citation patterns of three core athletic training journals (*Journal of Athletic Training*, *Journal of Sport Rehabilitation*, and *Athletic Therapy Today*) noted that the field relies heavily on the journal literature (81% of citations), with just 6 titles accounting for a third of the journal references [8]. The small number of frequently cited titles came from sports medicine, physical therapy, orthopedics, and physiology. The *Journal of Athletic Training*, the primary journal in the field, has introduced a regular column on EBP that includes editorials discussing clinical education reform and EBP guidelines [6], research training for clinicians [7], and research integration into athletic training education [9]. Topics are reviewed based on relevance to real clinical questions and provide clinicians with key messages from published reviews for application in practice. This journal publishes a relatively high percentage of research articles: 77% for 2003–2005, including 7 systematic reviews [10].

Overall, EBP's penetration into athletic training is in its initial steps. There has been a recent push to implement EBP in athletic training education and clinical practice; however, work still needs to be done to increase the body of athletic training evidence. Future areas for growth include a movement to include clinical outcomes research that will provide patient-oriented evidence and studies to guide clinical decision making [11].

## EVIDENCE-BASED PRACTICE IN AUDIOLOGY

Audiology is a fast-changing profession heavily impacted by rapidly advancing technology. Areas of practice include identifying hearing and balance problems; assessing, diagnosing, and treating individuals with impairment of auditory and vestibular function; preventing hearing loss; and conducting research in normal and disordered auditory and vestibular function [12]. The body of practicing audiologists, together with the Academy of Dispensing Audiologists and the Audiology Foundation of America, recently led a movement to advance the terminal degree for a practicing audiologist to a clinical doctoral degree (AuD). Today, many US universities have already converted entry-level clinical audiology degree requirements to address this mandate. As a component of this shift to advanced training, many US universities with AuD programs have also developed EBP courses and integrated them into their AuD curriculum.

With the move toward doctoral training in the United States has also come a growing interest in developing a body of audiology research and EBP. In 1999, Robinson reviewed the implications of EBM for audiology with two case studies involving nonlinear hearing aids and cochlear implantation. He recommended that systematic reviews and clinical practice guidelines should be a high priority for audiologists and that audiologists should organize research projects to promote their development [13].

Increasing numbers of US audiologists are seeking

to integrate the needs of their patients with the best current research evidence to improve their own clinical expertise in making clinical decisions and to reduce overall health care costs. The American Speech-Language-Hearing Association (ASHA) published a position statement on EBP in 2005 [14], and EBP was the theme for its national meeting that same year. The *Journal of the American Academy of Audiology* (JAAA) released a special issue on EBP in audiology in 2005, including topics as far-reaching as fitting of hearing aids, provision of amplification, aural rehabilitation programs, individual auditory training, signal processing strategies for pediatrics, and cochlear implants.

The literature on EBP in audiology demonstrates a variety of audiologists' perspectives. Logemann notes that while randomized clinical trials are considered the gold standard of treatment efficacy research and EBP, few such trials have been completed in audiology. Logemann connects this lack of RCTs to a belief by many investigators and clinicians that clinical trials are not possible in audiology due to potential risks for patients in experimental trials [15].

Similar to other health care professions, another barrier to EBP is audiologists' lack of time for research activities in their practices. ASHA conducted a knowledge-attitude-practices (KAP) survey on EBP among its members in 2005, which revealed that most members thought that EBP was a good idea but did not have time to actually participate in such studies [16]. "Insufficient time" was cited as a major or moderate potential barrier to EBP by over 70% of respondents, more than any other barrier, and "lack of available evidence" was cited by 48% of audiology faculty [16]. Reiterating this potential gap between desired and actual evidence-based practices in audiology, research by Wiley revealed that many audiologists use assessment tests and procedures that are not supported by the available evidence [17].

Given these key developments, EBP is emerging as a dominant force in the practice of audiology in the United States. Professional and educational institutions have developed a growing focus on EBP in recent years and have committed to the importance of using evidence in clinical practice.

## EVIDENCE-BASED PRACTICE IN HEALTH EDUCATION AND PROMOTION

Health education focuses on the process by which individuals and groups of people learn to behave in a manner conducive to promoting, maintaining, or restoring health [18]. Health education practitioners work in a variety of settings, from hospitals and medical practices to community-based organizations and advocacy organizations. The US health education field provides a clearly defined set of responsibilities and competencies, a process for approving programs, and a set of core criteria on which to base its credentialing examination, delivered through the National Commission for Health Education Credentialing (NCHEC) [19]. Entry-level competencies and credentialing processes have been in place since 1986, but advanced or

graduate-level competencies for professional practice needed strengthening. In the 1990s, research methods courses were required less than 60% of the time in US graduate health education programs. In 1992, NCHEC determined that higher cognitive processes of analysis, synthesis, and evaluation were essential for graduate-level preparation [19].

Several studies have considered educational preparation, job responsibilities, and continuing education in regard to health education competencies. Price et al. found that 19% of responding health educators reported a need for continuing education focused on applying appropriate research principles [20]. Looking more specifically at sub-competencies, 14% reported needing considerably more training in conducting thorough reviews of the literature, while 58% reported being well versed in reviewing literature [20].

Wiggers and Sanson-Fisher define evidence-based health promotion as "the appraisal or collection of research data being systematically integrated into and directed by the health promotion decision-making process" [21]. To use the outcomes of applied research, health educators must first understand how research and practice inform each other. Olson suggests they must be able to "judge the value and applicability of the research for solutions to their problems, talk and negotiate with researchers whose studies may affect their work, and think independently and critically when reading research reports" [22]. The Staged Approach model is one tool to aid in evaluating health promotion research and has been used by health educators to incorporate research findings into practice [23].

The literature on EBP in health education and promotion does not always describe evidence using the structure and terms of evidence-based medicine. Studies appear to use some basic tenets of EBP but couch them in different terminology [21, 24, 25]. For example, "best practices evaluation" describes health education practices that have been successful in the field and could be replicated in other programs [24]. Another model, which uses quality assurance methods to develop standards that delineate levels of professional performance and compliance with standards, is employed to characterize a high-quality program [19].

In 1984, Kling commented that the leaders in the field of health education must ensure that health educators have access to the growing body of meaningful research in the literature to enable its use [26]. Others note that relevant literature in health education is scattered across a wide variety of journals [24, 27]. Rimer et al. emphasize the idea that journals should not be the only outlet for evidence to support health education, suggesting that health education researchers must create user-friendly processes and products for synthesizing evidence to ensure EBP is not exclusively the province of academics. Practitioners and health care organizations should view communication about interventions and results as an important professional responsibility [28].

Health education practitioners have been found to value the concept of EBP and to understand how im-

portant it is to transfer research evidence into practice [29]. Though efforts have been made to increase the dissemination of evidence, current limitations in the evidence base and methods used to advance that dissemination have curtailed that ability. Because of the mismatch between the language of EBP theory and practice, the fact that systematic reviews are the gold standard for disseminating evidence-based research, and the challenges in disseminating that evidence, those health education and promotion practitioners who seek evidence to inform their practice experience a constant struggle in determining the availability, quality, and relevance of that evidence to their particular practice setting.

Overall, EBP's penetration into health education and promotion is in its infancy. Many factors affect how health educators use evidence to inform health promotion practice. Research training and exposure to EBP during academic preparation, access to information resources in the practice setting, quality of the available literature addressing the information need, and the time and energy available to devote to investigation all play a role. Relevant information for health educators is dispersed among the literature in a wide variety of disciplines, including studies of various levels of methodological rigor using diverse evaluation techniques. Broad dissemination of this collected evidence via the Web and health education professional organizations, through programs as well as professional publications, could ultimately influence the movement of that evidence from the research literature to practice. Practitioner knowledge needs to be captured and recognized alongside knowledge collected through literature reviews and conference proceedings. Educators in basic and continuing health education programs need to teach how to build collaborative networks, as much of the evidence in health education resides in the minds and files of program personnel and individual health educators rather than in the published literature. Collaborative networks would bring this knowledge to light, where it could then be applied to health education problems in other settings. Substantial efforts in both education and dissemination are likely necessary to improve access to and use of evidence by health education practitioners.

## EVIDENCE-BASED PRACTICE IN NURSING

Although Florence Nightingale based her nursing reforms on research she conducted during the Crimean War and noted nursing leaders such as Virginia Henderson promoted using knowledge as a basis for practice, the nursing profession largely developed as a tradition- and procedure-based profession, rather than a research-based one [30]. The development of research-based practice did not begin until the 1960s, with the transition of nursing education from predominately hospital-based diploma schools to institutions of higher learning [30]. The profession remains steeped in traditions, many of which have not been examined experimentally [31]. Examining these time-honored traditions is further complicated by the variety of edu-

cational options for entry into the profession, ranging from one year of vocational training after high school for licensed professional nurses to doctoral education for researchers and clinicians. Historically, research issues have been taught at the bachelor of science in nursing (BSN) level and above; thus, the majority of practicing nurses have not taken courses in research.

The majority of nurses practicing in the United States today are registered nurses (RNs), who were initially prepared at the associate degree level. The nursing workforce is aging; a survey in 2004 showed the average age of RNs to be 46.8 years [32]. Many of these nurses were educated at a time or in programs that did not include research in their curricula [33]. Another obstacle faced by nurses is their working environment. Today, most nurses are employed in hospitals, working in teams and providing 24-hour patient care. For bedside nurses to effectively perform as evidence-based practitioners, they must have institutional support, resources, skills, time, cooperation, and peer buy-in, which cannot be accomplished in isolation. Nurses in community settings such as home health care agencies and public health services face even more obstacles to EBP [34].

The EBP movement in nursing is more advanced in Australia, Canada, and England, as evidenced by the number of centers for evidence-based nursing and EBP resources produced there [35–37]. The roots of EBM are in these countries and have been nourished by the centralization and support of national health services in these countries [38]. The Centre for Evidenced Based Nursing at the University of York, for example, was responsible for a key report to the UK National Health Service (NHS) to improve nurses' utilization of research information [39]. The Joanna Briggs Institute in Australia began in 1996 with a focus on EBP in nursing and the allied health professions [36, 40], and its model emphasizes the multidisciplinary nature of health care [40]. These countries have also taken the lead in some aspects of publishing related to EBP. *Evidence Based Nursing* publishes critical appraisals of research for nursing; and has its editorial offices at McMaster University in Canada and the Centre for Evidence Based Nursing in the United Kingdom [37].

Nurse-managed EBP centers are also developing in the United States. Active centers managed by leaders in the field include the Academic Center for Evidence Based Practice at the University of Texas Health Science Center at San Antonio, the evidence-based practice program at the University of Iowa Hospitals and Clinics, and the Center for the Advancement of Evidence-Based Practice at Arizona State University [41–46]. These centers work to advance EBP by educating nurses and other clinicians through workshops or through formal courses to practice in an evidence-based manner, conduct original research and systematic reviews, and disseminate research findings to nurses.

Along with this nascent growth of EBP at US centers, nursing education programs, especially at the bachelor's level and above, are also beginning to include the term "evidence-based practice" in their curricula,

but many nurses and nursing faculty interpret the concept as a new term for "research utilization" [47, 48], a related concept that was developed in an attempt to move the profession of nursing away from ritual and to encourage the application of research findings in practice settings [49]. Though research utilization is one part of EBP, the terms are not synonymous. Research utilization does not recognize all the forms of evidence needed to support clinical decisions [40, 50]. In addition to research evidence, EBP draws on expert knowledge, theory, and consumer preferences, using the holistic approach valued by the nursing profession [51]. The change from research utilization to EBP is perhaps best illustrated by reviewing the Iowa Model of Evidence-Based Practice, a revision of the Iowa Model of Research Utilization that reflects this evolution in perspective [52–54].

Curricular interest in tying together critical thinking, information literacy, applied informatics, research, and competencies into an EBP model for nursing has increased. US accreditation standards are also beginning to address these issues [55]. Accreditation agencies require a research base for nursing education, including outcomes-based evaluation, while nursing faculty in accredited programs are required to have masters' degrees and tenure usually requires a doctoral degree, thus increasing the proportion of faculty with training or experience in conducting and evaluating research.

Similarly, nurse practitioners, nurse midwives, and nurse anesthetists are currently master's prepared, with many programs transitioning to the doctoral level. Nurse practitioners, by their scope of practice, function as direct care providers and approach EBP in a manner similar to physicians [56, 57]. These nurses monitor individual patients over time and are able to make diagnoses and therapy decisions using many of the same information resources developed for physicians.

Despite these related advances, the implementation of EBP is not without challenges for nurses. Due to the nature of the working environment in a hospital, nurses are usually unable to leave their work areas to seek information in the library, even if their institution provides access to library services [58, 59]. When they do find time to seek information, they are often not confident of their ability to locate the information that they need and, when they find it, they may not be comfortable in evaluating it for validity or reliability [33, 39, 60]. Finally, once they locate relevant information that answers their clinical question, they must obtain support from superiors and buy-in from coworkers to introduce changed procedures in their institutions [33]. Because hospitals and health care centers utilize systems of standardized policies and procedures, any changes might need to be written into the correct policy format and then approved and signed by the required committees and individuals prior to taking effect. Clearly, the integration of evidence in nursing practice is a more involved endeavor than most independent health care professionals face as evidence-based practitioners.

Nurse managers and clinical nurse specialists with advanced education are the change agents in health systems working to improve nursing care via EBP [61]. The research leading to the American Nurses Credentialing Center (ANCC) Magnet Program documented that EBP programs help attract and retain competent nurses and improve care [62]. Thus, the growing interest in hospitals' obtaining Magnet status validates the interest of nurses and health care systems in improving patient outcomes, reducing errors, and increasing nurses' satisfaction with their profession. EBP will likely be one valuable method for achieving these goals.

## EVIDENCE-BASED PRACTICE IN OCCUPATIONAL THERAPY

The history of occupational therapy as a formal profession in the United States began in 1917 with the creation of the National Society for the Promotion of Occupational Therapy, predecessor to the American Occupational Therapy Association (AOTA). The goal of the early members was to find meaningful "occupations" to help rehabilitate the growing number of war veterans and others facing the problems of severe physical and mental disabilities [63].

AOTA was the first allied health profession to affiliate with the American Medical Association for accreditation of its training programs in 1933, and the first standards for accreditation of AOTA training programs were published in 1935. In 1949, a university degree became the minimum educational requirement for occupational therapists in the United States [64]. In 1999, AOTA moved to make a postbaccalaureate degree the minimum requirement for the profession beginning in 2007. As of mid-2006, 152 programs in the United States were accredited by the Accreditation Council for Occupational Therapy Education (ACOTE) [65]. Four programs now offer entry-level doctoral degrees. For post-professional training, twelve programs offer doctoral degrees and eight provide a more clinically focused doctorate of occupational therapy (OTD) [66].

Occupational therapists have been early adopters of the concept of EBP, especially in Australia, Canada, and the United Kingdom. The language of EBP and references to research are replete in AOTA's current standards [67], ACOTE's draft standards for the doctoral degree [68], and the standards for occupational therapy program accreditation [69]. In a 1986 presentation to AOTA, Ottenbacher spoke of the importance of research to the survival of the profession, noting that educators should teach students both to conduct research as well as to value its contributions to the profession [64]. Occupational therapy literature today reflects that influence. Reed's citation analysis of occupational therapy journal literature found that journal references accounted for 61% of the references cited in source journals. The study also identified a high percentage of citations to tests and other assessment instruments, reflecting researchers' reliance on evaluation and outcomes measurement [70].

All areas of health care have changed the way they conduct business, and today's patients now expect to be active participants in their care [71]. In addition, as costs increase, health care professionals are under scrutiny to be more efficient and reduce costs. In line with these changes, occupational therapists need to be able to document that the therapy they provide a given patient is the most appropriate and has the highest likelihood of success. As early as 1985, Llorens and Gillette discussed the effectiveness of OT intervention [72].

Overall, EBP in the field of occupational therapy has been strong in terms of developing bibliographic databases and evidence-based tools to support and disseminate research. Various OT professional groups have supported the development of EBP and research-based practice by developing standards for OT training programs and their accreditation, as well as supporting advanced academic training for practitioners and faculty in the discipline. Future development in this area will likely focus on the profession's need for a larger body of research based on clinical studies to inform OT practice.

## EVIDENCE-BASED PRACTICE IN PHYSICAL THERAPY

Physical therapists are rehabilitation professionals who "diagnose and manage movement dysfunction and enhance physical and functional abilities; restore, maintain, and promote not only optimal physical function but optimal wellness and fitness and optimal quality of life as it relates to movement and health; prevent the onset, symptoms, and progression of impairments, functional limitations and disabilities that may result from diseases, disorders, conditions, or injury" [73]. Physical therapists practice in a variety of settings, including hospitals, subacute facilities, rehabilitation hospitals, outpatient clinics, and wellness settings. They also provide care to patients across the lifespan and a variety of specialty areas.

As early as 1969, leading physical therapists noted support for using evidence in the care of patients [74]. However, in the 1970s, researchers noted that the science behind PT practice was not as strong as the tradition [75]. Turner and Whitfield noted that education is the key to overcoming the lack of reliance on evidence-based information resources [76]. Integration of EBP in PT is evidenced by the emphasis on EBP in the professional education of therapists [77], the expansion of the length of the PT curriculum, and the transition to the doctor of physical therapy (DPT) degree. Data from the Commission on Accreditation of Physical Therapy Education (CAPTE) indicate that over 80% of PT programs have already undergone this shift, and this figure is expected to be 90% by 2011 [78].

The recent evolution of PT education and the advent of the DPT degree have occurred in response to changing expectations for graduates. National data have indicated that common and substantial curricular additions for programs converting to the DPT have included several changes in educational processes such as

EBP, case-based activities, and emphasis on clinical decision making [79, 80]. In line with the changes accompanying this conversion, special issues of PT journals have been devoted to methods for teaching EBP [81] and the *Evaluative Criteria for Accreditation of Education Programs for the Preparation of Physical Therapy Education* now includes expanded accreditation requirements for EBP [82]. Specific search methods and strategies have been described to increase access to and retrieval of evidence-based resources for students and physical therapists [83].

As in most health professions, journals are the most important source of evidence in PT, but studies have shown that much of the discipline's research is found in journals that are outside the PT field [84]. Furthermore, a 1990 study indicated that physical therapists were unfamiliar with the journals in which their professional research was published and that they relied on a variety of sources for patient-related information [85], while another study found that physical therapists seldom consult research in journals outside their discipline [76]. The volume of professional development reading might also be lacking. Jette reported that 17% of surveyed physical therapists read fewer than 2 articles in a typical month and 65% performed fewer than 2 database searches in a typical month [86]. The increase in the knowledgebase of the discipline has likely made it even more difficult for PTs to keep current in practice techniques.

Research by Turner and Whitfield indicated that the top bases for physical therapists' choices of patient care treatment included techniques learned during their training, suggestions from colleagues, experience with previous patients, and practice-related courses [87]. Use of information from journal articles was reported by less than 30% of the respondents. A recent study similarly indicated that many practicing physical therapists were not seeking current EBP-related materials [88]. Jette noted that the reason many surveyed PTs did not usually rely on evidence-based literature was that they did not believe that the interventions in the research were applicable to their practice. Jette concluded that more research was needed in support of PT practice [86]. Nieuwboer commented that lack of time and access were 2 major reasons that physical therapists did not rely on evidence and further noted that, for some areas of PT, the evidence simply did not exist [89].

Despite these challenges, the growing emphasis on EBP in PT is evidenced by an ever-expanding professional research agenda [90] and acknowledgment by physical therapists of the importance of EBP. The American Physical Therapy Association (APTA) increasingly emphasizes EBP in practice [91], including the association's designation of EBP as one of five key areas for achieving its vision for autonomous practice by 2020 [92]. In March of 2001, the APTA Board defined autonomous practice as "practice characterized by independent, self-determined, professional judgment and action" [93]. Further evidence of the important place of EBP in PT is seen in the development of databases to catalog the growing collection of evi-

dence-based journal articles [94]. As with other professions, the changes in physical therapy clinical practice will come gradually and with education, including EBP instruction in formal education venues for current students and continuing education for practicing PTs. As the leading organization in this field, APTA's emphasis will likely greatly assist this change as the profession develops its knowledge of EBP and its evidence base.

## EVIDENCE-BASED PRACTICE FOR PHYSICIAN ASSISTANTING

The emergence of the physician assistant (PA) profession grew as a potential solution to a shortage of primary care physicians and limitations to accessible health care in the 1960s [95]. From these early origins, PAs have been seen as physician extenders who work closely with physicians in their clinical practices. In this physician-PA relationship in clinical settings, PAs often have considerable autonomy in making medical decisions and can provide a broad range of diagnostic and therapeutic services [96].

The PA educational model was originally based on attaining a certain level of competency, rather than being awarded a particular academic degree. Hence, a large amount of variability existed among early PA programs in terms of the kind of document or terminal degree granted upon successful completion of the curriculum, as some programs awarded bachelor degrees and others issued certificates. Today, many PA programs have moved to the graduate level, and more than half of the 132 PA programs in the United States award a master of health sciences or master of science degree. This trend began in the mid-1980s and led to restructuring numerous programs. One explanation for this shift lies in the acceptance of EBP [96]. A graduate-level education provides the rigorous coursework that enables PA students to develop critical thinking skills, analyze and evaluate clinical data, and establish methods for finding the best evidence that supports their practice and care of their patients.

The PA profession has supported the concept of EBP in a variety of ways, starting with the training of PA students. The Accreditation Review Commission on Education for the Physician Assistant (ARC-PA) is the accrediting agency that defines standards for PA education and evaluates PA educational programs in the United States. The ARC-PA standards emphasize the importance of evidence-based skills for new PAs, including the ability to search, interpret, and apply new medical findings [97]. All PA programs must effectively demonstrate how they meet this standard in their curricula. Many programs address this criterion with a specific course on EBM practices, while others integrate EBM principles into existing courses in the curriculum (e.g., endocrinology, cardiology, or dermatology) that involve clinical problem solving [98, 99].

While EBP concepts are initially introduced and taught in student training, PAs also continue to receive further support afterward. Each month, the *Journal of*

the American Academy of Physician Assistants (JAAPA) publishes a patient-oriented evidence that matters (POEM), using clinical research findings to answer patient management questions that frequently develop at the point of care [100]. The American Academy of Physician Assistants (AAPA) has published several position statements asserting its belief in the value of EBM. In a 2005 publication, AAPA noted the important role of scientific evidence for quality practice, emphasizing the need for valid scientific evidence both for providing quality care to the individual patient and for developing effective public policy based on valid scientific evidence [101]. In line with curriculum restructuring, many master's level PA programs require students to produce papers using EBM techniques, as well as capstone projects that typically involve a literature review. The AAPA strategic plan emphasizes the important role of lifelong learning for its members, stating that "a commitment to continuous life-long learning is a way for PAs to enhance the value they bring to the physician practices as well as the health system at large" [102].

In clinical settings, PAs have EBP needs similar to those of primary care physicians. With large patient caseloads and the generalist focus of their practices, PAs need to quickly locate evidence-based answers to clinical questions. As primary care clinicians, they also face an array of conditions and need to base their clinical practice on the most current evidence because the medical knowledgebase is so rapidly changing.

Overall, PA programs across the country continue to implement EBM courses and activities into their curricula. The evidence base for PAs is the same as for primary care physicians and is well developed. Thus, the profession can focus on building a foundation of EBP principles to promote lifelong learning practices for graduate PAs and help ensure that the best and most relevant health care is delivered to patients.

## EVIDENCE-BASED PRACTICE IN RESPIRATORY CARE

Respiratory care (RC), also known as respiratory therapy, focuses primarily on preventing, identifying, and treating acute and chronic problems affecting the cardiopulmonary system [103]. Respiratory care practitioners (RCPs) have diverse roles and responsibilities and can be found in almost every aspect of modern health care. Specialties in the profession include critical care, pediatrics, rehabilitation, sleep studies, and pulmonary function testing.

The professional evolution of RC is intricately tied to the explosion of medical technology in the twentieth century. This growth in new technologies made it necessary to train specialized orderlies in maintaining and using much of this equipment; these "oxygen orderlies" soon became the equipment experts [104]. By the early 1960s, a formal education system as well as professional credentialing had been established. Today, the National Board for Respiratory Care requires an associate degree as the minimum academic requirement for credentialing in the United States [105].

The important role of EBP in RC began in the 1970s. At that time, intermittent positive pressure breathing (IPPB) had become widely used even though need for it or measurement of its outcomes was rarely documented [106]. In 1974, the first "Conference on the Scientific Basis for Respiratory Therapy" reviewed the practice of IPPB [106], and it was largely replaced with other modes of therapy not long thereafter [107, 108]. The use of research-based knowledge in changing from the standard use of IPPB had a profound effect on the profession. As described by Burton,

This unfortunate experience confirmed that respiratory care must be founded in science. Furthermore, its practitioners must be diligent in performing only justified care, with appropriate (identified) outcomes and levels of care. Carrying out that approach requires both good information, plus a cooperative, organized, and thoughtful approach. The professional evolution requires that respiratory care practitioners and physicians cooperate in a process of defining care and in its ongoing clinical research. [107]

In line with the profession's focus on supporting practices through the use of evidence, the American Association for Respiratory Care (AARC) also stresses the importance of EBP in its definition of the field [103].

As health care evolves and becomes more complex, RCPs will need to increase their level of education to assume expanded roles, including management positions. A 2003 study documented hiring preferences for RC managers with graduate degrees [108], while in the same year, AARC published a white paper exploring the development of higher education opportunities for respiratory therapists [109].

In 1991, AARC published its first clinical practice guidelines in *Respiratory Care*, the major journal in the field. This journal began publication in 1956, and it includes the majority of published articles focusing on the integration of EBP into RC. New guidelines appear in the journal regularly [110], and the AARC Website maintains updates on respiratory care protocols [111]. AARC also supports research through restricted grants with the goal of sponsoring research initiatives documenting the clinical and economic impact of RCPs [112].

Because most RCPs are graduates of a two-year associate degree program, they have had little time to learn anything outside the clinical sphere. Therefore, they have a real need to learn about searching the literature and using evidence-based resources, topics not always supplied by the curriculum [113]. To support such efforts, Hess describes search strategies and resources for identifying information relevant to the professional practice issues of RC [114].

Respiratory care is unique among allied health professions in that it has a history of embracing EBP, as evidenced by the scientific investigation of the indiscriminate use of IPPB in 1974 and the publication of the first RC clinical practice guidelines in 1991. With the expansion of education to the graduate-degree level, several areas for future growth include methods for teaching EBP to students and professionals, including



literature searching, evaluation of resources, and strategies for employing EBP concepts and techniques to develop evidence-based, therapist-driven protocols.

## EVIDENCE-BASED PRACTICE IN SPEECH-LANGUAGE PATHOLOGY

The role of the speech-language pathologist is to assess and treat a range of communication impairments for children and adults, including articulation, fluency and voice, language impairment, and swallowing disorders (dysphagia) [115]. EBP is a newly emerging area in the field of speech-language pathology (SLP). The major impetus for formally addressing EBP was the development of new American Speech-Language-Hearing Association (ASHA) certification standards, implemented in January 2005 [116]. ASHA is the professional credentialing body for speech-language pathologists and audiologists in the United States, and standard III-F of the certification requirements states, "the applicant must demonstrate knowledge of the processes used in research and the integration of research principles into evidence-based clinical practice" [116]. For those in graduate training programs, competency may be documented through clinical experiences, independent study, and class or individual research projects. For those who received the ASHA certificate of clinical competency (CCC) prior to January 2005, knowledge and skills may be acquired through continuing education activities.

One of the critical issues facing the field of SLP is how one defines evidence, who defines it, and what kind of evidence is acceptable [117]. ASHA's Joint Coordinating Committee on Evidence-Based Practice defines EBP as "an approach in which current, high-quality research evidence is integrated with practitioner expertise and client preferences and values into the process of making clinical decisions" [118]. Thus, the goal is to integrate three areas: clinical expertise, best current evidence, and client values. Challenges include evaluating the evidence base for practices originating in other disciplines (e.g., clinical psychology), determining how existing EBP models and levels of evidence can be adapted to the specific nature of SLP, developing criteria for best evidence, and deciding how clinicians will be trained to implement EBP.

The National Center for Evidence Based Practice in Communication Disorders is the main coordinating body for EBP in ASHA. The Advisory Committee on Evidence-Based Practice was created in 2005 with these goals [119]:

- establish terminology and definitions related to EBP
- identify and prioritize clinical questions
- gather reviewers to conduct evidence reviews on clinical questions
- establish a process for conducting and disseminating evidence reviews
- advise the national office on members' needs relative to EBP

Special interest divisions are also engaging in EBP activities relevant to their areas. The members-only portion of the ASHA Website contains a growing col-

lection of documents to support EBP, such as introductory articles and Web-based tutorials, as well as ASHA documents and reports. A new peer-reviewed journal, *Evidence Based Communication Assessment and Intervention*, was launched in January 2007 through Taylor and Francis.

The Academy of Neurologic Communication Disorders and Sciences (ANCDS) is another professional organization for SLPs offering certification in the specialized area of neurologic communication disorders. Since 2001, it has established practice guidelines in the areas of dysarthria, aphasia, acquired apraxia of speech, cognitive-communication disorders related to traumatic brain injury, and cognitive-communication disorders related to dementia [120].

EBP is an emerging area in SLP. While the organizational structure is rapidly developing to address the new credentialing standard for EBP, there exists a paucity of literature in terms of systematic reviews, meta-analyses, and practice guidelines to assist clinicians in making evidence-based decisions in specific cases. Given the scattered nature of the relevant literature across a variety of disciplines (e.g., psychology, education, medicine), key skills for SLP students and clinicians include developing proficiency in finding the best evidence available, evaluating retrieved material, and providing ongoing skill development among those already practicing in the field.

## SUMMARY AND CONCLUSIONS

EBM, a term formally coined in the mid-1990s, focuses in part on supporting information needs in clinical medicine using newly emerging Web-based access to MEDLINE [1]. The continued transition of the evidence base from print to digital formats has facilitated the subsequent move to adopting evidence-based practices by nursing and individual allied health professions [1], which have been or are currently being adapted to better accommodate the specific needs of each profession. Factors such as the intention to minimize health care costs and, more importantly, to pursue diagnostic and treatment strategies that result in the most appropriate and most effective outcomes, as well as the adoption of EBP in accreditation and certification standards, all appear to be the driving forces behind the evolution of EBP in nursing and allied health fields.

EBP has been addressed in these various fields through preservice training, professional activities, provision of research support, and generation of relevant literature, databases, and other resources (Table 1 online). The growth of EBP in preservice training has been particularly influenced by changes in accreditation and competency standards with outcome-based measurements (e.g., nursing, speech-language pathology, physical therapy, physician assistant) or the inclusion of EBP in certification exams (athletic training). Clearly, continuing growth of EBP in these fields will be supported by integration into curricula, continuing education offerings, and requirements that encourage

clinicians' adoption of an evidence-based model of practice.

Ongoing professional support is essential as well; examples in the allied health professions vary widely, such as hosting a summit (athletic training) or including EBP workshops at conferences (physician assisting). The need for a sufficient body of literature providing evidence is supported in some fields by providing research grants to support proposals addressing EBP in clinical practice (athletic training, respiratory care). The various fields have also produced a variety of publications to support the education of practitioners as well as provide an evidence base for clinical cases. The simultaneous growth of EBP across so many allied health fields and across countries offers tremendous potential for sharing strategies to further its development. US allied health professionals, for example, can draw on the experiences of the early adopters of EBP in Australia, Canada, and England.

While EBP serves as a worthy ideal, a number of obstacles are apparent in the practical implementation of EBP, including the realities of clinical practice and other responsibilities, required skills for EBP, and attitudes or behaviors of practitioners. Many practitioners in nursing and allied health have heavy caseloads or are otherwise restricted by the amount of work they have to accomplish in a day, leaving them little time for consulting the literature. Many working in hospitals and other health care facilities are restricted by policies and procedures that require recommendations for procedure changes be carefully reviewed by various committees and administrative officials, making change a slow process. Literature may also be scattered across many journals as well as databases, and access may be complicated by practice settings that lack access to purchased database subscriptions or professional journals. Furthermore, even when literature is available, there may be an "evidence-practice gap" in which the evidence may not seem directly relevant to the practitioner's needs or the field may lack sufficient evidence in the literature that is relevant to a particular case.

In addition to the need for developing a stronger evidence base in these fields, practitioners need to receive training in identifying, reviewing, and evaluating the literature as it applies to their clinical cases. Education will likely play an important role in changing less desirable attitudes and behaviors of practitioners, such as not reading the journal literature or basing health care decisions on information other than research evidence (e.g., colleagues' opinions, experience, previous training). Training and education are essential to the success of EBP in these fields.

Librarians can play a key role in advancing EBP in nursing and allied health. In the preservice arena, librarians can provide outreach to faculty, collaborating with instructors to integrate EBP into courses and the curriculum. In more applied settings, librarians can become part of teams or committees that address EBP issues.

To facilitate collaboration, librarians should be aware

of research and resources relevant to EBP, share their expertise in searching and evaluating the literature, and provide access to resources (audiovisual, print, and online) that support the EBP needs of nursing and allied health professionals. For example, research by the Task Forces to Map the Literature of Allied Health (1993 to date) and the Literature of Nursing (1999 to date) of the Medical Library Association's Nursing and Allied Health Resources Section offers collection development and database selection guidance, based on the literature cited in core journals for most of these disciplines, as well as information on some of the allied health professions not covered in this review [121]. The project Web pages note publications and presentations, as well as work in progress.

The rapid growth in EBP provides librarians with opportunities to develop a variety of interventions to aid practitioners: creating resources such as online tutorials, developing resource portals, and conducting EBP workshops. Finally, librarians can use their expertise by becoming stronger advocates of the open access movement and convince professors, researchers, and publishers of the value in making evidence (e.g., systematic reviews, meta-analyses, practice guidelines, clinical trials) available to all students and practitioners.

In the Institute of Medicine's 2003 report *Health Professions Education: A Bridge to Quality*, EBP is identified as one of the five core competencies all health clinicians need to meet in order to provide quality health care in the twenty-first century [122]. Librarians are ideally situated to assist in developing competency in EBP in nursing and allied health fields. Collaboration with educators and clinicians to further an EBP model of practice in these areas will work to ensure the continued success of medical librarianship as a profession by fostering awareness and use of librarians' expertise in identifying and evaluating information. Even more importantly, it will also likely enable health sciences librarians to employ their expertise to truly impact the quality of patient care in their institutions and beyond.

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