Systematic reviews of literature relevant to individuals with work-related injuries and illnesses are important to the practice of occupational therapy. This article describes the four questions that served as the focus for the systematic reviews of the effectiveness of occupational therapy interventions for individuals with work-related injuries and illnesses of the low back; hand, wrist, and forearm; elbow; and shoulder. The article includes the background for the reviews; the process followed for each question, including search terms and search strategy; the databases searched; and the methods used to summarize and critically appraise the literature. The final number of articles included in each systematic review; a summary of the results; the strengths and limitations of the findings; and the implications for practice, education, and research are presented.


Spurred on by the demands of payers, regulators, and consumers, occupational therapists and occupational therapy assistants, like many other health care professionals, must increasingly demonstrate clinical effectiveness. In addition, they are eager to provide services that are client centered, supported by evidence, and delivered in an efficient and cost-effective manner. Over the past 20 yr, the use of evidence-based practice (EBP) has been widely advocated as one approach to effective health care delivery.

Since 1998, the American Occupational Therapy Association (AOTA) has instituted a series of EBP projects to assist members in meeting the challenge of finding and reviewing the literature to identify evidence and, in turn, use those findings to inform practice (Lieberman & Scheer, 2002). Following the evidence-based philosophy of Sackett, Rosenberg, Gray, Haynes, and Richardson (1996), AOTA’s projects are based on the principle that the EBP of occupational therapy relies on the integration of information from three sources: (1) clinical experience and reasoning, (2) preferences of clients and their families, and (3) findings from the best available research.

A major focus of AOTA’s EBP projects is an ongoing program of systematic reviews of multidisciplinary scientific literature, which uses focused questions and standardized procedures to identify practice-relevant evidence and discuss its implications for practice, education, and research. Systematic reviews of literature relevant to individuals with work-related injuries and illnesses strengthen our understanding of the foundations of this important area of practice.

**Background**

According to the U.S. Bureau of Labor Statistics (2008), more than 4 million recordable cases of nonfatal work-related injuries occurred in 2007, resulting in
a median of 7 days away from work for the injured workers. Sprains, strains, and tears were the most frequent injuries and illnesses; these were often closely associated with falls. More than 200,000 cases were also related to back injuries.

Despite an economic slowdown and a decrease in the number of injuries reported, medical care costs in most states workers’ compensation systems have been growing steadily. In 2008, medical care accounted for 58% of total workers’ compensation claim costs, compared with 42% for lost income payments. In 1987, the medical component represented only 46% of total costs (California Medical Association, 2005).

With steady increases in medical care costs over the past few years, many states have instituted legislative, regulatory, and policy reforms in an attempt to control the increase in workers’ compensation medical claims. Reforms include developing fee schedules, limiting the number of therapy visits, and developing or requiring the use of EBP guidelines. The California Division of Workers’ Compensation reform policy is a prime example of an attempt to curtail medical costs that resulted in restricting workers’ access to timely care (California Medical Association, 2005). One of the California requirements was that medical and therapy practices must adhere to one specific evidence-based set of guidelines published by the American College of Occupational and Environmental Medicine (ACOEM, 2004). The guidelines included little information about occupational therapy, leading to delayed authorizations for services and inappropriate denials. One provision of the California law provided that the Division of Workers’ Compensation could consider the use of other guidelines that met strict evidence-based criteria. At that time, AOTA did not have a specific practice guideline that met those criteria.

In 2005, at the behest of a group of occupational therapists in California, the AOTA Representative Assembly passed a motion that, in part, directed AOTA to develop evidence-based occupational therapy treatment guidelines with an emphasis on the most prominent clinical conditions treated by occupational therapy practitioners and reimbursed by workers’ compensation payers. This practice guideline was intended to assist occupational therapy practitioners and AOTA with advocacy efforts in states that have proposed including EBP in their workers’ compensation reforms. The first step of this project involved the development of an evidence-based literature review focusing on occupational therapy’s role in the return to work of individuals with work-related diagnoses or clinical conditions of the shoulder; elbow; forearm, wrist, and hand; and low back and, more specifically, the identification of the questions for documenting the evidence to support current and future practice. The Occupational Therapy Practice Guideline for Individuals With Work-Related Injuries and Illnesses (Kaskutas & Snodgrass, 2009) was published in 2009 and introduced at AOTA’s Annual Conference & Expo. Readers are encouraged to refer to this publication for further information about the process and steps involved in developing an EBP guideline. More recently, in addition to the development of the occupational therapy practice guidelines discussed in this article, AOTA has assisted ACOEM in the review and update of individual chapters of its practice guidelines by coordinating the participation of occupational therapists with experience in this area of practice.

### Method

According to Law and Baum (1998), evidence-based occupational therapy practice “uses research evidence together with clinical knowledge and reasoning to make decisions about interventions that are effective for a specific client” (p. 131). An evidence-based perspective is based on the assumption that scientific evidence of the effectiveness of an occupational therapy intervention can be judged to be more or less strong and valid according to a hierarchy of research designs and an assessment of the quality of the research. AOTA uses standards of evidence modeled from standards developed in evidence-based medicine. This model standardizes and ranks the value of scientific evidence for biomedical practice using the

<table>
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<th>Table 1. Levels of Evidence for Occupational Therapy Outcomes Research</th>
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<td><strong>Level of Evidence</strong></td>
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<tr>
<td>Level I</td>
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<td>Level IV</td>
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grading system presented in Table 1. In this system, the highest levels of evidence include systematic reviews of the literature, meta-analyses, and randomized controlled trials (RCTs). In RCTs, the outcomes of an intervention are compared with the outcomes of a control group, and participation in either group is determined randomly. The evidence-based literature review presented here includes Level I RCTs; Level II studies, in which assignment to a treatment or a control group is not randomized (cohort study); and Level III studies, which do not have a control group.

An advisory group of content experts determined the priority clinical conditions that would serve as the focus of the systematic review. The advisory group consisted of members from within and outside of occupational therapy. The group also provided information on the top diagnoses in each area and the corresponding codes from the International Classification of Diseases—Clinical Modification (American Medical Association, 2008). As a result of this collaboration, the advisory group developed four focused questions and search terms, and project staff subsequently recruited Jeff Snodgrass, Deborah Amini, Paula Bohr, and Rebecca L. von der Hyde to serve as review authors for the individual questions. All four are occupational therapists with content expertise in the area of people with work-related injuries (workers’ compensation). In addition, they have experience in reviewing the research literature from an evidence-based perspective.

The review authors and an AOTA consultant, in conjunction with a medical librarian with experience in evidence-based reviews, searched the literature, selected research studies of relevance to occupational therapy, analyzed and critically appraised the studies, and summarized and synthesized the information with an emphasis on implications for occupational therapy practice. Jeff Snodgrass conducted the review of low back interventions as an academic partnership with AOTA. This partnership involved selected students at Milligan College who were involved in the systematic review in partial fulfillment of requirements for their master’s degree, following the same criteria and methods for the review as the three other review authors.

These four research questions guided selection of research studies for the reviews and the interpretation of the findings:
1. What occupational therapy interventions are effective in the rehabilitation of individuals with work-related low back injuries and illnesses?
2. What occupational therapy interventions are effective in the rehabilitation of individuals with work-related elbow injuries and illnesses?
3. What occupational therapy interventions are effective in the rehabilitation of individuals with work-related injuries and illnesses of the forearm, wrist, and hand?
4. What occupational therapy interventions are effective in the rehabilitation of individuals with work-related shoulder injuries and illnesses?

The group undertook a broad search to identify research literature for the review. Databases and sites searched included Medline, CINAHL, Ergonomics Abstracts, PsycInfo, OT Seeker, Pedro, TRIP, REHABDATA, BIOSIS Preview, Science Citation Index, Social Work Abstracts, Healthstar, and NIOSHTIC-2. In addition, the search included consolidated information sources, such as the Cochrane Database of Systematic Reviews and the Campbell Collaboration. These databases consist of peer-reviewed summaries of journal articles and provide a system for clinicians and scientists to conduct evidence-based reviews of selected clinical questions and topics. In addition, the group checked reference lists from articles included in the systematic review for potential articles and hand searched the Journal of Hand Therapy.

The review authors and AOTA staff developed search terms for review by the advisory group. Terms used in the search are listed in Table 2. In addition, a filter based on one developed by McMaster University (www.urmc.rochester.edu/hslt/miner/digital_library/evidence_based_resources.cfm) was used to narrow the search to research studies. Each review author and the AOTA consultant reviewed the articles according to their quality (e.g., scientific rigor, lack of bias) and level of evidence. Guidelines for reviewing quantitative studies were based on those developed by Law and colleagues (1998) to ensure that the evidence was ranked according to uniform definitions of research design elements. For all questions, occupational therapy intervention approaches to be searched included restore, maintain, and modify.

Articles were included in the review if they provided evidence for an intervention approach used in the rehabilitation of work-related injuries and illnesses of the low back, elbow, forearm, wrist, hand, and shoulder; had been peer reviewed; were published after 1986; and addressed an intervention approach within the domain of occupational therapy. Only studies determined to fit Level I, Level II, and Level III criteria were included. Research studies were excluded if they were judged to be outside occupational therapy’s scope of practice, were published before 1986, met Level IV or V criteria, used qualitative methods to the exclusion of quantitative methods, or were not published in the peer-reviewed literature. Figure 1 describes the flow of the process used to select the 92 articles included in the review. The review authors, the
AOTA consultant, and AOTA staff made the final selection of articles to be reviewed. The review authors critically appraised the 92 studies meeting inclusion criteria using structured categories, including study level, study design, number of participants, types of interventions and outcome measures, summary of results, and study limitations. All authors abstracted and synthesized this information into an evidence table, and each question was then summarized into a critically appraised topic (CAT). AOTA staff and an AOTA consultant reviewed the evidence tables and CATs. The evidence tables were also reviewed by content experts in conjunction with the external review of the Occupational Therapy Practice Guideline for Individuals With Work-Related Injuries and Illnesses (Kaskutas & Snodgrass, 2009). Twenty-three articles were included in the low back review; 11 were included in the elbow review; 22 were included in the shoulder review; and 36 were included in the hand, wrist, and forearm review. Seventy-nine articles were Level I, 3 were Level II, and 10 were Level III. The evidence tables for each review are available online at www.ajot.ajotpress.net [navigate to the specific article, and click on “supplemental materials”].

Summary of the Review

The results of the systematic reviews published in this issue of the American Journal of Occupational Therapy provide important information for practitioners working with clients with work-related injuries and illnesses. By reviewing the scientific literature broadly and appraising and synthesizing specific studies, the authors have been able to provide up-to-date answers to critical questions that may previously have been informed only on the basis of clinical expertise. Results of the systematic reviews of interventions

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<th>Category</th>
<th>Key Search Terms</th>
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<td>Diagnoses, injuries, and clinical conditions—hand, wrist, forearm</td>
<td>Hand, hand injuries, wrist, wrist injuries, forearm, arthritis, degenerative joint disease, finger, finger injuries, digits, digital injuries, thumb, thumb injuries, amputations (below elbow, transradial, thumb, finger, with wrist disarticulation) focal hand dystonia, complex regional pain syndrome, reflex sympathetic dystrophy, carpal tunnel syndrome, cumulative trauma, trigger finger, DeQuervain’s tenosynovitis, tenosynovitis—hand and wrist, extensor tendon rupture, flexor tendon rupture, mallet finger, radial and ulnar fractures, Colles’ fracture (closed and open), multiple fractures—hand (closed and open), sprain and strain of wrist and hand, dislocated finger, lacerating tendon, crushing injury (wrist, hand, and finger), burn, ulnar nerve syndrome, radial tunnel syndrome, Kienbock’s disease, open wound (finger and hand)</td>
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<td>Diagnoses, injuries, and clinical conditions—elbow</td>
<td>Elbow, elbow joint, tennis elbow, athletic injuries, amputation—above elbow, brachial plexus injury, wounds and injuries—elbow, cubital tunnel syndrome, arthritis, bicipital tendinitis, medial epicondylitis, lateral epicondylitis, tenosynovitis—elbow, biceps tendon rupture, radial head fracture, dislocation, ulnar collateral ligament strain, sprain—elbow, sprain—radialhumeral joint</td>
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<td>Diagnoses, injuries, and clinical conditions—shoulder</td>
<td>Shoulder, shoulder pain, shoulder joint, axilla, glenohumeral joint, scapulothoracic articulation, brachial plexus injury, athletic injuries, and wounds and injuries—shoulder, degenerative joint/disease, adhesive capsulitis, rotator cuff syndrome, sprains and strains—rotator cuff, shoulder tendinitis, bicipital tendinitis, subacromial bursitis, shoulder impingement, rotator cuff tear, calcific shoulder, fracture anatomical head humerus, fracture greater tuberosity humerus—open, fracture humerus shaft—closed, dislocation—glenohumeral, shoulder strain, crushing injury—upper arm, complex regional pain syndrome, reflex sympathetic dystrophy</td>
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<td>Diagnoses, injuries, and clinical conditions—low back</td>
<td>Low back pain, low back injury, low back dysfunction, lumbar pain, lumbar injury, lumbar dysfunction, lumbar spine pain, lumbar spine injury, lumbar spine dysfunction, low back musculoskeletal injuries, lumbar musculoskeletal injuries, spinal nerve root injury, spinal nerve root dysfunction, lumbar nerve root injury, lumbar nerve root dysfunction, degenerative joint disease, herniated disc, lumbar HNP without myelopathy, lumbosacral muscle strain, sciatica, lumbar radiculopathy, back pain—unspecified, lumbosacral strain/spray, lumbar strain/spray, L-5 radiculopathy, laminecomity, lumbar spasm, lumbar intravertebral disc/myelopathy, herniated nucleus pulposus</td>
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<td>Intervention</td>
<td>Treatment, rehabilitation, interventions, therapy, occupational therapy, exercise, physical agent modalities, physical therapy, sports medicine, athletic training, body mechanics, ergonomics, relaxation techniques, biofeedback, prevention, functional training, activities of daily living, adaptive equipment, work hardening, work reconditioning/conditioning, industrial rehabilitation, occupational medicine, energy conservation, social skills training, cognitive behavior therapy, job coaching, job modification, job retraining, occupational rehabilitation, preprosthetic and prosthetic training, edema control, limb reshaping, therapeutic management, joint protection, scapulohumeral rhythm, artrokinematics</td>
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<td>Outcomes</td>
<td>Return to work, disability, level of independence (ADLs, IADLs), absenteeism, physical mobility, functional/work capacity, evaluation, quality of life, coping patterns, prosthetic use, pain, dysfunction/function, sickness, fatigue, endurance, strength, dynamometry, range of motion, EMG, NCV, pinch strength, grip strength, sensation, coordination, weakness, volumetric measurement for edema, circumferential measurement for edema, depression, anxiety, psychological distress, fear, symptom magnification, occupational stress</td>
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Note. ADLs = activities of daily living; HNP = herniated nucleus pulposus; IADLs = instrumental activities of daily living; EMG = electromyography; NCV = nerve conduction velocity.
for the low back, for example, support a biopsychosocial and multidisciplinary approach that includes graded functional activity, environmental modifications, client education, cognitive–behavioral strategies, and therapist-directed and therapist-supervised therapeutic exercises targeting the client’s symptoms.

Although the evidence for occupational therapy interventions for the shoulder also supports a multidisciplinary and biopsychosocial approach, most evidence is for preparatory methods such as range of motion and exercise, conservative management, joint mobilization, laser, electromyography feedback, pulsed electromagnetic fields, the Cyriax methods, and ultrasound. Evidence for interventions for work-related injuries and clinical conditions of the elbow is limited and focuses on the preparatory activities of splinting, exercise, and the modalities of ultrasound and ionization.

Results of the systematic review of interventions for the hand, wrist, and forearm support the use of occupation-based assessment tools, adaptation to the environment to enable function and reduce pain, and simulation of activities of daily living. In addition, evidence was found for the effectiveness of several preparatory activities such as exercise, the use of the thermal modality of heat, and early mobilization after fractures and acute trauma. Other preparatory methods have been found to be effective for specific clinical conditions, including splinting for osteoarthritis and carpal tunnel syndrome; scar massage to prevent hypertrophic scarring and promote extensibility; the use of sensory focusing, a cognitive pain control technique during burn dressing changes; and the use of pressure garment work gloves after burns.

Strengths and Limitations of the Review and Implications for Practice, Research, and Education

Ninety-two articles were included in the review of the four focused questions: 79 (86%) were at Level I (indicating that the review incorporated evidence at the highest levels), 3 were at Level II, and 10 were at Level III. The review was broad and incorporated evidence for the effectiveness of interventions for the low back; hand, wrist, and forearm; elbow; and shoulder. Although the review included published literature from occupational therapy and related fields, all studies provided evidence within the scope of occupational therapy practice.

The breadth of the review was also a limitation, because its wide focus encompassed many interventions and variations in the outcome assessments used in clinical trials, making it difficult to compare trials. In addition, some reviews and studies had limitations such as small sample sizes, poor methodological quality, inadequate reporting of results, selection and publication bias, absence of full descriptions of terms and intervention techniques, potential placebo effect, lack of ability to isolate the effects of variables, methodological limitations, potential Hawthorne effect, brief periods of intervention, poor statistical methodology, geographic differences in variables, and regional differences in treatments administered.

The systematic reviews presented in this issue provide summaries of the best scientific literature to answer the focused questions. The results can be directly integrated into clinical practice by merging the scientific evidence with clinical expertise and client preferences. In addition, this information may be used when advocating for occupational therapy services to a payer or providing information and support to a client or family member at any point during the intervention process.

Strategies for the future indicate that researchers should build on the studies described in this issue’s systematic reviews. When engaging in clinical research, researchers need to be familiar with the most recent work to incorporate it into future research plans. Clearly, more work is needed to definitively answer the four questions included in this project. Although some future research can be conducted in isolation, research questions in the areas of work-related injuries and illnesses are often complex and may be best answered through collaborative research with other disciplines, such as physical therapy; psychology; and medical and surgical specialties such as occupational medicine, orthopedic surgery, and neurology. This collaboration should begin in the planning stages to ensure that well-controlled research projects that
incorporate the role of occupational therapy from a client-centered and occupation-based perspective are designed.

The future of our profession is based on all occupational therapy practitioners developing a firm grasp of the best available evidence. This agenda is also clear for academic programs training the next generation of occupational therapy practitioners. Educators need to be aware of the results of the systematic reviews and present this multifaceted information to students rather than focus on a favored type of intervention. In addition, the evidence should not be presented within a one-size-fits-all framework but should be discussed from a client-centered and occupation-based perspective as described in the Occupational Therapy Practice Framework: Domain and Process, 2nd Edition (AOTA, 2008).

AOTA’s Centennial Vision looks to a future in which occupational therapy meets society’s needs by being a powerful, science-driven, and evidence-based profession (AOTA, n.d.). Although the results of these systematic reviews have wide-ranging implications for occupational therapy, the Centennial Vision also indicates that the most important target audience for these reviews are individuals with work-related injuries and illnesses.

References


