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Clinical Guidance to Optimize Work Participation After Injury or Illness: The Role of Physical Therapists

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association

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SUMMARY OF RECOMMENDATIONS....CPG2
INTRODUCTION....CPG4
METHODS....CPG5
CLINICAL PRACTICE GUIDELINES
Diagnosis/Classification....CPG11
Clinical Course....CPG13
Risk Factors....CPG18
Examination....CPG26
Interventions....CPG39
DECISION TREE....CPG54
PROFESSIONAL DEVELOPMENT CHECKLIST AND AUDIT....CPG56
AUTHOR/REVIEWER AFFILIATIONS AND CONTACTS....CPG58
REFERENCES....CPG60
APPENDICES (ONLINE)....CPG72

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Summary of Recommendations*

CLINICAL COURSE – TIMING OF CARE

C Physical therapists may serve as the first health care provider up to 8 weeks after injury, according to regulatory scope and expertise, with initial consultation occurring within the first 7 days following injury.

B For workers who have been out of work for 6 to 8 weeks, physical therapists should engage in a multidisciplinary assessment to collaboratively determine the most appropriate plan of care and address potential barriers to work participation.

CLINICAL COURSE – THERAPEUTIC ALLIANCE

B Physical therapists should develop a therapeutic alliance by including the worker in return-to-work (RTW) planning and supporting the development of behaviors that are work focused throughout the episode of care, documenting and addressing worker goals, preferences, and concerns.

CLINICAL COURSE – DURATION OF CARE

F Physical therapists may reference data related to injury type, affected body part, and occupational category to form a prognosis and to develop an individualized RTW plan.

RISK FACTORS – CLIENT PRESENTATION

A Physical therapists should screen for risk factors associated with delayed RTW or work absence throughout the episode of care, using patient interview and validated tools. Risk factors include type of injury, previous injury episodes, extended work absence prior to referral, comorbidities, and the presence of psychosocial factors such as high levels of perceived or self-reported functional disability, severity of pain, pain behaviors, fear-avoidance beliefs, low recovery expectations, and low self-efficacy.

D Based on conflicting evidence, a physical therapist should not use age and sex as independent risk factors for delayed RTW and restricted work participation following injury.

RISK FACTORS – SOCIOECONOMIC AND WORK ENVIRONMENT

B Physical therapists should assess work demands, work-related psychosocial factors, and workplace policies regarding the availability of transitional or modified work to identify potential RTW barriers and inform the treatment plan.

D Based on conflicting evidence, a physical therapist should not use educational level as an isolated risk factor for delayed RTW and work participation following injury.

EXAMINATION – BODY FUNCTIONS AND STRUCTURES

D Physical therapists may screen for red flags and examine body functions and structures that underlie functional limitations in conjunction with activities and participation measures to develop an RTW prognosis and plan of care.

EXAMINATION – SELF-REPORT MEASURES

B Physical therapists should, during the initial evaluation, use validated self-report measures, such as the Work Ability Index and the Disabilities of the Arm, Shoulder and Hand questionnaire work subscale, that specifically address RTW in order to estimate RTW-related outcomes and guide the course of treatment.

EXAMINATION – PSYCHOSOCIAL FACTORS

A Physical therapists should administer reliable and valid tools, as part of the evaluation and throughout treatment, to identify the presence of fear avoidance, psychosocial risk, or readiness for change, which all impact RTW outcomes, to guide patient management.

EXAMINATION – JOB DEMANDS

C Physical therapists should document essential functions and exertional job demand information as part of examination to develop an RTW prognosis and plan of care, and to guide RTW decision making. Information sources may include job or ergonomic analysis, company documents, and/or interview.

EXAMINATION – PHYSICAL PERFORMANCE MEASURES

B Physical therapists should use valid and reliable physical performance tests throughout the episode of care to measure the individual's work ability and to inform treatment and prognosis, which may include a full Functional Capacity Evaluation (FCE), a short-form FCE, job-specific functional testing, or other performance measures.

DIAGNOSIS/CLASSIFICATION

F Physical therapists should document work-limiting diagnoses and relevant goals during examination and care planning, using relevant International Classification of Functioning, Disability and Health domains, including lift/carry, posture/positional changes, walking/moving around, hand/arm use, self-care/transfers, ability to use transportation, and interpersonal relationship skills.

INTERVENTIONS – COMMUNICATION AND COORDINATION

B Physical therapists should communicate and coordinate services with the employer, the employee, case managers, and health care providers in the presence of an estimated high risk for delayed RTW.

INTERVENTIONS – GRADED, MODIFIED, OR TRANSITIONAL WORK

B Physical therapists should provide consultation and recommendations to patients, employers, and the health care team for graded, modified, or transitional duties that promote work reintegration, while taking contraindications and barriers into consideration.

INTERVENTIONS – ERGONOMIC CONSULTATION

B Physical therapists should offer ergonomic consultation and recommendations to stakeholders and workers when work demands exceed the worker's ability, in an effort to temporarily assist workers in job performance during rehabilitation or to permanently accommodate workers.

INTERVENTIONS – PSYCHOLOGICALLY INFORMED PRACTICE

B Physical therapists should incorporate psychologically informed practice such as individual goal setting, motivational interviewing, education regarding activity pacing, problem solving, relaxation, and coping techniques into the plan of care when psychosocial barriers are identified during the episode of care.

INTERVENTIONS – EDUCATION

F Physical therapists may provide education regarding the worker's physical findings, the benefits of activity, and strategies to return to activity to improve work ability and limit time away from work.

B Physical therapists should not rely solely on written material or group education to improve work ability and limit time away from work.

INTERVENTIONS – PROGRESSIVE GRADED EXERCISE

C Physical therapists may prescribe intense graded exercise, including work-oriented functional activities and strengthening, cardiopulmonary, endurance, and motor control exercises, for workers who have not returned to work 6 weeks post injury as part of a rehabilitation plan focused on specific RTW goals.

B Physical therapy providers should not use light exercise as an isolated intervention to address RTW goals, except when there is an explicit reason documented, such as psychosocial or psychological involvement, catastrophic injury, and/or condition-specific or postsurgical guidelines.

INTERVENTIONS – CARE INVOLVING MULTIPLE COMPONENTS

A Physical therapy providers should treat workers with estimated low risk of delayed RTW with a combination of condition-specific exercise and clinic-based work-focused interventions, such as work-task replication, to improve work status.

A Physical therapy providers should treat workers with estimated high risk of delayed RTW with a combination of clinic-based work-focused interventions and jobsite interventions to improve work status.

B Physical therapy providers should include a behavioral approach in the treatment plan for individuals with estimated high risk of delayed RTW to improve work status.

F Physical therapists should modify the components included in the plan of care based on the estimated level of risk to avoid needless delay in RTW.

*The intervention recommendations are based on the scientific literature published through August 7, 2020.

List of Abbreviations

ADA: Americans With Disabilities Act
AOPT: Academy of Orthopaedic Physical Therapy
APTA: American Physical Therapy Association
AUC: area under the curve
BDRQ: Back Disability Risk Questionnaire
BLS: US Bureau of Labor Statistics
CBT: cognitive behavioral therapy
CI: confidence interval
CPG: clinical practice guideline
DAFW: days away from work
DASH: Disabilities of the Arm, Shoulder and Hand questionnaire
EATA: Ergonomic Assessment Tool for Arthritis
FABQ: Fear-Avoidance Beliefs Questionnaire
FCE: Functional Capacity Evaluation
GDG: Guideline Development Group
HR: hazard ratio
HRR: hazard rate ratio
ICC: intraclass correlation coefficient
ICD: International Classification of Diseases
ICF: International Classification of Functioning, Disability and Health
IQR: interquartile range
IRR: incidence rate ratio
***JOSPT*:** *Journal of Orthopaedic & Sports Physical Therapy*
LBP: low back pain

M-SFS: Modified Spinal Function Sort
NHIS: National Health Interview Survey
ODI: Oswestry Disability Index
OR: odds ratio
PICO: population/problem, intervention, comparison, outcome
RCT: randomized controlled trial
RMDQ: Roland-Morris Disability Questionnaire
RR: relative risk
RRTW: Readiness for Return-to-Work scale
RTW: return to work
SF-36: Medical Outcomes Study 36-Item Short-Form Health Survey
WAI: Work Ability Index
WBOAS: Worker-Based Outcomes Assessment System
WHO: World Health Organization
WHQ: Work and Health Questionnaire

Introduction

AIM OF THE GUIDELINE

The Academy of Orthopaedic Physical Therapy (AOPT) has an ongoing effort to create evidence-based clinical practice guidelines (CPGs) for physical therapy management of people with health-related impairments, limitations, or restrictions as described in the World Health Organization (WHO)'s International Classification of Functioning, Disability and Health (ICF).[351]

Objectives of this CPG follow.

- Describe evidence-based physical therapy practice, including diagnosis, prognosis, intervention, risks, and assessment of outcome, for individuals with work-limiting and work-restricting health conditions after injury or illness
- Classify and define common work-related limitations using the WHO's terminology related to impairments of activity limitations and participation restrictions
- Identify factors impacting recovery, work ability, and return to work (RTW)
- Identify and compare RTW interventions supported by current best evidence that address work activity limitations and participation restrictions, delivered in a clinical and/or workplace setting
- Identify appropriate outcome measures to assess change in the ability to participate in work throughout the course of care
- Provide a description to policy makers, using internationally accepted terminology, of physical therapy practice when consulting with or treating individuals who have work-limiting conditions after injury or illness
- Provide information for payers and claims reviewers regarding the practice of physical therapy for individuals with work-limiting conditions caused by injury or illness
- Create a published reference for physical therapy clinicians, academic instructors, clinical instructors, students, interns, and residents to inform best practice and decision making regarding the best current practice of physical therapy related to RTW after injury or illness

STATEMENT OF INTENT

These guidelines are not intended to be construed or to serve as a standard of medical care. Standards of care are determined on the basis of all clinical data available for an individual patient and are subject to change as scientific knowledge and technology advance and patterns of care evolve. These parameters of physical therapy practice should be considered as guidelines only. Adherence to them will not ensure a successful outcome in every patient, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The decision to include a particular clinical procedure and determine the plan of care must be made based on clinician experience and expertise in light of the clinical presentation of the patient, the available evidence, available diagnostic and treatment options, and the patient's values, expectations, and preferences. However, we suggest that the underlying rationale for significant departures from accepted guidelines be made clear in the patient's medical records at the time the relevant clinical decision is made.

SCOPE AND PURPOSE OF THE GUIDELINE

Work rehabilitation refers to the process of assisting workers to remain at work or RTW in a safe and productive manner, while limiting the negative impact of restricted work, unemployment, and work disability. Work rehabilitation is further defined, by Escorpizo et al,[91] as "a multiprofessional, evidence-based approach, provided in different settings, services, and activities to working-age individuals with health-related impairments, limitations, or restriction with work functioning, and whose primary aim is to optimize work participation." This conceptual definition is based on the WHO's ICF model and has been studied in relation to the role of the physical therapist in minimizing work limitations. The definition is generalizable to concepts of work and vocation across multiple countries and professions.

The primary purpose of this CPG is to systematically review available scientific evidence and provide a set of evidence-based recommendations for effective physical therapy evaluation, treatment, and management of individuals experiencing limitations in the ability to participate in work following injury or illness. This guideline is meant to be used in conjunction with other published guidelines that are based on pathoanatomic or other models of diagnosis (eg, classification, impairment based), to supplement physical therapist examination and management of patients aged 16 to 65 years in their role as a "worker." Readers will note varied terminology related to work and vocation, as the authors attempted to keep terminology consistent with specific study language when discussing individual articles.

Methods

Content experts were appointed by the AOPT to conduct a review of the literature and develop a CPG based on the best available evidence in the area of physical therapist practice for individuals with work-limiting conditions due to illness or injury. The Guideline Development Group (GDG) comprised physical therapists with extensive and complementary clinical and research expertise across the spectrum of occupational health, including the ICF, work disability prevention and management, clinical management of individuals with diverse work demands, outcome measurement, ergonomics, consultative services, knowledge transfer, work rehabilitation/vocational rehabilitation, case management, and work-related laws, such as the Americans With Disabilities Act (ADA). The GDG clinicians represent diverse practice settings, including large health systems, private practices, regional and national outpatient provider networks, workplace provider service groups, medical and disability management groups, research/academic institutions, and postprofessional development organizations.

The CPG development process was guided by the 2018 American Physical Therapy Association (APTA) CPG Process Manual. Throughout the CPG development process, the GDG received support through an APTA grant and sponsorship from the AOPT for travel, software, and expenses related to CPG development. The funding bodies did not influence the recommendations, and the CPG development team maintained editorial independence.

To develop the content areas of the guideline, a formative literature review and unpublished clinical practice appraisal were performed regarding the role of physical therapists in mitigating work participation restrictions and areas in need of more effective physical therapist practice. Feedback was solicited from physical therapists and external stakeholders (medical providers, doctors of chiropractic, occupational therapists, educators, nurses, management/business administrators, researchers, vocational rehabilitation counselors, and other stakeholders). Initial perceptions of the appraisal were obtained via survey, along with verbal or informal stakeholder feedback following educational presentations, and this information guided the GDG in the development of the final CPG.

Stakeholders viewed the role of the physical therapist as facilitating an active rehabilitation process and assisting the injured worker with setting realistic expectations for recovery, RTW, and home and leisure activities. Feedback also included the importance of physical therapists fostering a therapeutic alliance and having the ability to meet the varied needs of workers, judicious use of ergonomic modifications, and consulting on job accommodations for RTW. Behavior-based techniques were considered within the scope of physical therapists' practice to help optimize RTW or stay-at-work outcomes when moderate to high levels of psychosocial risk factors are identified. This feedback, in addition to scoring the agreement of draft practice guidance statements, informed the literature review on which this CPG is based.

The authors declared relationships and developed a conflict management plan that included submitting a conflict-of-interest form to the AOPT. All GDG members completed training and 2 rounds of calibration screening prior to abstract screening (using relevant inclusions/exclusions). The GDG members also participated in online PEDro training to improve critical appraisal skills, which included completion of online training and appraisal of standardized test articles. Studies authored by a reviewer were assigned to an alternate reviewer. Authors were assigned to work groups, with consensus activity scoring adjusted to consider nonresponses to avoid primary writing in sections where they had a potentially competing interest, such as employment in companies with products or services that overlapped the content area.

The recommendations provided in this CPG are based on scientific literature published in print (or as an electronic publication ahead of print) from January 1, 1999 to August 7, 2020. A 20-year search window (based on the year of the primary literature search) was used to focus on contemporary research and practice. The GDG worked with a methodologist and librarian at the University of Vermont through several phases of search strategies, including an initial clinical practice appraisal (which assisted the group in synthesizing risk, examination, and intervention areas that may be relevant to a CPG) and formal systematic search with updates for the final CPG.

The scope of the CPG was intended to address the needs of individuals with work-limiting injury and/or illness that impacts work participation. Systematic search strategies for the CPG were employed for articles related to work rehabilitation; published since 1999; related to classification, examination, and intervention strategies; and consistent with the ICF framework. The following databases were searched for articles published between January 1, 1999 and August 7, 2020: Ovid MEDLINE, PsycINFO, CINAHL, PEDro, and Cochrane Library. Covidence (Veritas Health Innovation Ltd, Melbourne, Australia), Dropbox (Dropbox, Inc, San Francisco, CA), Google Docs (Alphabet Inc, Mountain View, CA), and EndNote (Clarivate, Philadelphia, PA) were used to manage the literature searches, coordinate evidence selection, carry out extraction/appraisals, and store information about the evidence sources. **APPENDICES A** and **B** (available at www.jospt.org) provide details about the search strategies for all databases and a PRISMA flow chart of search results and articles.

Articles were reviewed based on specified inclusion and exclusion criteria (**APPENDIX C**, available at www.jospt.org), with the goal of identifying evidence relevant to physical therapist clinical decision making for people with work-limiting conditions due to illness or injury undergoing work rehabilitation. In addition to the main population/problem, intervention, comparison, outcome (PICO) question ("In a population with work participation limitations after injury or illness, what are the considerations and components of physical therapy assessment, evaluation, and treatment that can limit needless work participation limitations?"), detailed PICO questions related to risk, course of care, examination, treatment planning, and intervention are noted with evidence tables in **APPENDIX D** (available at www.jospt.org). Articles that considered the patient or stakeholder perspective on work rehabilitation RTW/stay-at-work outcomes were also included. Article titles and abstracts were imported into Covidence (Veritas Health Innovation Ltd) and reviewed independently by 2 members of the GDG to determine which had the potential to inform physical therapist practice. Full-text review and topical tagging were subsequently conducted by 2 GDG members, using inclusion/exclusion criteria to obtain the final set of articles for contribution to the recommendations. In cases where screeners disagreed or where the information was not clear enough to make a determination, a third reviewer independently evaluated the title/abstract or full text and made the final decision.

DATA EXTRACTION

Key findings pertinent to the effectiveness of work rehabilitation were extracted from each of the included articles using a standard extraction template. Based on terminology variations in the research literature relating to naming and content of work rehabilitation interventions, the GDG identified categories of interventions to optimize the ability to draw conclusions from the literature. For example, if an intervention included ergonomics education but did not include actual worksite assessment or modification, then the content was considered in the education category and not in the ergonomics category. The communication and coordination of services intervention category encompasses items such as interactive work accommodation and RTW communication or planning, worksite consultation, and supervisor/case manager/stakeholder communication. Multicomponent interventions were sorted into 3 broad intervention categories: exercise with behavior-based approaches; clinic-based work-focused interventions, which built on the exercise-based interventions to include graded work-specific activities; and jobsite intervention, which included an active workplace component as part of the intervention.

QUALITY ASSESSMENT AND DETERMINING LEVELS OF EVIDENCE

Individual clinical research articles were graded and appraised using the evidence table and procedure resources from the Centre for Evidence-Based Medicine,[259] Oxford, UK for diagnostic, prognostic, therapeutic, and exam/outcome studies (**APPENDICES E** and **F**, available at www.jospt.org), consistent with the APTA CPG Process Manual. Each study was independently reviewed by 2 GDG members and assigned a level of evidence, based on relevant information such as study design and methodology, sampling/blinding/concealment, study limitations, outcomes, and applicability to practice (an overview of general study information and evidence levels can be found in **APPENDIX G**, available at www.jospt.org). In the event of a disagreement between the 2 reviewers, a third independent reviewer was utilized. An abbreviated version of the grading system follows in **TABLE 1**.

TABLE 1 Levels of Evidence

I	Evidence obtained from high-quality diagnostic studies, prospective studies, randomized controlled trials, or systematic reviews
II	Evidence obtained from lesser-quality diagnostic studies, prospective studies, systematic reviews, or randomized controlled trials (eg, weaker diagnostic criteria and reference standards, improper randomization, no blinding, less than 80% follow-up)
III	Case-control studies or retrospective studies
IV	Case series
V	Expert opinion

DEVELOPMENT AND GRADING OF RECOMMENDATIONS

The GDG developed a summary of the evidence for each area of interest, considering the strengths and limitations of the body of evidence to develop recommendations (**APPENDIX D**, evidence tables and PICO questions). The GDG used BRIDGE-Wiz Version 3.0 (Yale University, New Haven, CT) to ensure consideration of evidence quality, potential benefits, harms, costs, and values, as well as the assumptions or judgments and rationale for any intentional vagueness in the formulation of the recommendations (resulting in a determination of the "level of obligation," such as "must," "should," "may," "should not," and "must not"). Grades for each recommendation were assigned through a consensus-based process, based on the key findings extracted from articles, strength of the evidence supporting the recommendation, and recommended grades/definitions provided in **TABLE 2**. Each member of the GDG reviewed the supporting evidence for each recommendation and completed a Delphi process that required at least 85% consensus of all GDG members.

DESCRIPTION OF GUIDELINE REVIEW PROCESS AND VALIDATION

Guideline development methods, policies, and implementation processes are reviewed at least yearly by the AOPT's CPG Advisory Panel, including consumer/patient representatives, external stakeholders, and experts in physical therapy guideline methodology.

This CPG underwent multiple formal reviews. The complete CPG draft was reviewed by invited stakeholders representing CPG methodology and a variety of clinical perspectives, including physical therapists, occupational therapists, physicians, chiropractors, psychologist vocational and disability specialists, and ergonomists, as well as academics/researchers, employer representatives, self-insured stakeholders, claims reviewers, policy makers, a legal representative, and medical/case management stakeholders. The draft was posted for public review on www.orthopt.org and a notification of the posting was sent to the members of the AOPT of the APTA, Inc. E-mail notifications of the public comment period were also sent to the following APTA academies: Academy of Acute Care, Academy of Cardiovascular and Pulmonary Physical Therapy, Academy of Education, Federal Physical Therapy Section, Academy of Geriatrics, Academy of Hand and Upper Extremity, Health Policy and Administration Section, Academy of Neurologic Physical Therapy, Academy of Oncology, Academy of Pediatric Physical Therapy, Academy of Pelvic Health, Private Practice Section, and the American Academy of Sports Physical Therapy. Public respondents identified as health care practitioners (86%), academic educators (24%), clinical educators (18%), researchers (18%), other (workers' compensation, physical therapy director, business owner, regulator leader, functional evaluator, clinical care specialist; 14%), administrators (7%), health care consumers (5%), claims reviewers (4%), and policy makers (2%). Reviewers completed online surveys rating the clarity, feasibility, and validity of the CPG recommendations. Additional data collection focused on feedback regarding the most helpful parts of the guideline and options for implementation, as well as general feedback. All comments, suggestions, and feedback from the expert reviewers, public, and consumer/patient representatives were reviewed by the authors and editors for consideration and revisions, and were used to develop the final document.

This CPG was issued in 2021, based on publications in the scientific literature between January 1999 and August 2020. It will be considered for review in 2025, or sooner if new clinically significant evidence becomes available. Annual literature searches and abstract reviews will be completed by the AOPT's Occupational Health Special Interest Group Research Committee, with GDG reformation/planning beginning no later than 2023 for methodology updates and timeline development.

DISSEMINATION AND IMPLEMENTATION

In addition to publishing this guideline in the *Journal of Orthopaedic & Sports Physical Therapy* (*JOSPT*), it will

TABLE 2 Grades of Recommendation

Grades of Recommendation		Strength of Evidence
A	Strong evidence	A preponderance of level I and/or level II studies support the recommendation. This must include at least 1 level I study
B	Moderate evidence	A single high-quality randomized controlled trial or a preponderance of level II studies support the recommendation
C	Weak evidence	A single level II study or a preponderance of level III and IV studies, including statements of consensus by content experts, support the recommendation
D	Conflicting evidence	Higher-quality studies conducted on this topic disagree with respect to their conclusions. The recommendation is based on these conflicting studies
E	Theoretical/foundational evidence	A preponderance of evidence from animal or cadaver studies, from conceptual models/principles, or from basic sciences/bench research support this conclusion
F	Expert opinion	Best practice based on the clinical experience of the guideline development team

be listed on the web pages of the AOPT, APTA, and ECRI Guidelines Trust, pending approval. These web pages have unrestricted public access. The CPG has been submitted for inclusion in the ECRI Guidelines Trust (guidelines.ecri.org). Implementation tools and associated implementation strategies to be made available for employers, patients, physicians, surgeons, clinicians, educators, payers, policy makers, and researchers are listed in **TABLE 3**.

BARRIERS, FACILITATORS, AND RESOURCES IMPACTING IMPLEMENTATION

A potential barrier to implementation of this CPG is that physical therapist management of individuals who have experienced work limitations or participation restrictions may require evaluation and treatment strategies that are typically provided by clinicians with expertise across multiple areas of physical therapist practice. For example, an individual with an uncomplicated musculoskeletal problem may RTW following a short treatment episode by a physical therapist working in an outpatient clinical facility with a practice emphasis on orthopaedics, whereas an individual with a complicated brain injury or a cardiopulmonary condition typically requires multiple specialists in those clinical areas, in addition to those who focus on worker rehabilitation and work-related functional performance. Clinical integration and collaboration based on clinical strengths are needed to ensure patients receive the necessary care.

Physical therapists who work with patients to achieve RTW goals should ensure they have the training and skills to navigate the multifactorial nature of the RTW process discussed in this CPG. Monetary, time, and personnel resource demands may pose implementation barriers. In addition, time and human resources necessary for communication and coordination with employers and other stakeholders involved in navigating the workers' compensation system may be perceived as barriers to implementation. Physical therapists are encouraged to use this CPG to enhance collaboration and process flows with the other stakeholders, including external case administrators and medical team members who may use similar professional guidelines to reduce needless work disability.[290] Use of the algorithm and audit tools found at the end of this CPG will help improve efficiency and effectiveness, limiting the cited barriers to implementation.

While clinical practice changes are a key part of successful guideline adoption, systems factors such as employer communication, availability of job demand information/job descriptions, transitional work policies, and payment conventions can also be facilitators or barriers. Attempts to optimize work participation may be influenced by shared efforts to optimize communication and development of systems that incorporate work rehabilitation interventions within the workplace. This CPG may serve as a catalyst for discussion and inform collaborative dialog among employers, insurers,

TABLE 3 Planned Strategies and Tools to Support the Dissemination and Implementation of This CPG

Tool	Strategy
JOSPT's "Perspectives for Patients" and/or "Perspectives for Practice" articles	Patient- and clinician-oriented guideline summaries available at www.jospt.org
Clinician's decision tree and Quick-Reference Guide	Summary of guideline recommendations, with guidance for clinicians to help with risk assessment, examination, and development of a plan of care, available at www.orthopt.org and included in professional development modules
Clinician chart review audit checklist	Available at www.orthopt.org and included in professional development modules. Promote via AOPT member news. Content available for inclusion in electronic health records
CPG+ analysis and translational aid for applying the CPG to practice	APTA review process. AGREE II conducted by a team of experts
Presentation of the CPG at interdisciplinary meetings and symposium presentations	Develop abstract/core presentation materials based on stakeholder reference guide
Webinars: educational offering for health care providers	Guideline-based instruction available for practitioners at www.orthopt.org or in collaboration with other APTA component organizations
Develop core competencies for entry-level/advanced practice	Provide the CPG to program directors and faculty. Collaboration between the OHSIG, Education Committee of the AOPT, and APTA Academy of Education; resources such as a slide deck for faculty
Non-English versions of the guidelines and guideline implementation tools	Development and distribution of translated guidelines and tools to JOSPT's international partners and global audience
Development of a clinical research agenda	Collaboration between the OHSIG and AOPT, available at www.orthopt.org
Executive review of the CPG for advocacy, policy makers, and legislators	Collaboration between the OHSIG, AOPT, and APTA, available at www.orthopt.org. Development of a presentation for APTA component engagement with state departments of labor and other local stakeholders

Abbreviations: AGREE II, Appraisal of Guidelines for Research & Evaluation II; AOPT, Academy of Orthopaedic Physical Therapy; APTA, American Physical Therapy Association; CPG, clinical practice guideline; JOSPT, Journal of Orthopaedic & Sports Physical Therapy; OHSIG, Occupational Health Special Interest Group.

employment stakeholders, and health care policy makers in an effort to address practices or policies that create barriers to RTW or staying at work. The CPG can also be used in discussion with local, state, or national medical rehabilitation and case management groups, policy makers and insurers for multistakeholder problem solving, systems review, process improvement, and efforts to develop continuous improvement initiatives.

The recommendations in this CPG provide a framework for integration of best practice into local settings. This CPG can guide clinicians and facilitate cost-effective and efficient rehabilitation of individuals with work-limiting conditions. The adoption of clinical pathways in local practices to support optimal patient management has been gaining popularity in the care of injured workers. Another facilitator may be a commitment to pursue implementation across a network of health care providers to collaboratively manage patients with an estimated high risk of prolonged recovery following a work-related injury. Initial indicators of guideline adoption will likely be found in local, regional, or network outcomes measurement, based on intentional continuous improvement projects. Development of a clinical research agenda and/or partnership with policy or case management groups may also be viable ways to identify and monitor adoption of the guideline and outcomes. Integration of a minimal data set into outcomes registries may result from collaborative stakeholder efforts to develop a common data set that crosses multiple health and administrative stakeholder groups. Additional barriers, facilitators, and evidence gaps are noted in specific evidence synthesis areas throughout this review.

INCIDENCE AND PREVALENCE

Workplace Injuries

Data from 2018 from the US Bureau of Labor Statistics (BLS) identified more than 2.8 million nonfatal workplace injuries and illnesses, with more than 900 000 occupational injuries and illnesses requiring time away from work and another 700 000 cases involving job transfer or restriction.[303,322] Occupations with the highest number of injuries include laborers, heavy and light truck drivers, nursing assistants/nurses, order fillers/stockers, retail sales, maintenance, construction, and cleaners.[164] The distribution of injuries and illnesses in 2018, categorized by body part, showed that injuries of the upper extremity were most common at 32%, followed by lower extremities (24%), trunk (22%), multiple body parts (10%), head and neck (10%), and body systems (2%).[310] Falls, slips, and trips accounted for 27% of the private occupational injuries and illnesses in 2018.[310,315]

Active claims data from the National Safety Council showed that workplace injuries during 2018 resulted in 105 million lost workdays.[235] The leading type of injury or illness was sprain, strain, or tear, with 308 630 days away from work (DAFW) accounting for 34% of total cases.[309] Fractures were another leading cause of injury that accounted for 8.5% of injuries, with a median of 31 DAFW.

Reported work injuries likely underestimate the magnitude of the problem of restricted work participation. A number of studies have also found that work-related injury or illness may not be reported because of administrative barriers, regulatory noncompliance, data-entry errors, fear of reprisal/job security, or pressure to use personal insurance.[72,96,201,202]

Long-term Disability and Limited Work Participation

In 2018, there were 8.5 million workers with disabilities receiving disability insurance through the US Social Security Administration.[320] While estimates showed that about 10% of recipients entered the program by determination of work disability through workers' compensation, the remainder have severe medical conditions that restrict basic work-related activities or substantial amounts of work.[75] The musculoskeletal/connective tissue diagnostic grouping and mental disorders each accounted for approximately 30% of conditions impacting disabled workers.[320]

The Social Security Administration estimates that more than 1 in 4 individuals currently 20 years of age will have a medical disability negatively impacting their work ability before they reach retirement age.[321] Data from the National Health Interview Survey (NHIS) reported that approximately 5% of individuals between 18 and 44 years of age describe themselves or someone in the household/family as limited or unable to work, and this number increased to approximately 15% of individuals aged 45 to 64 years.[317] The NHIS also found a total of 171 million lost workdays attributed to illness or injury in the past 12 months; 58% of working-age individuals missed no work, 19% missed 1 to 2 days of work, 13% missed 3 to 5 days, and 10% missed more than 6 days.[316] While this CPG focuses on work-related illness or injury, the overlap in occupational and nonoccupational musculoskeletal factors between workers' compensation and disability may help reduce work absence and associated costs.

ECONOMIC BURDEN

The total cost of work injuries in the United States in 2018 was $170.8 billion, which included direct and indirect costs related to wages/productivity (31%), medical expenses (20%), and administrative expenses (34%). The remainder was composed of employers' uninsured costs (such as investigation, reporting, and property damage).[235] While care following work injury may be limited to simple first aid or basic medical care, claims costs per injured worker average between $900 and $1100.[195,235] Using a musculoskeletal problem as an example, the overall costs for a sprain/strain injury range from approximately $16 000 (National Safety Council) to $32 000 (Occupational Safety and Health Administration).[235] The costliest causes of workplace injuries include overexertion, falls, being struck by equipment or an object,[199] motor vehicle accidents, or burns.[235]

While only 0.5% of individuals who experience injuries that are work related will be considered permanently and totally disabled under workers' compensation, data from the Social Security Administration show that individuals experiencing work absence had double the risk of receiving disability benefits.[247] After 10 years, 6% of individuals with medical-only claims received Social Security Disability Insurance payments, compared to 12% of those with work absence.[247] Social Security Disability Insurance beneficiaries include individuals who are disabled and unable to work, even if the disability is not related to a work injury. In 2018, workers receiving disability payments through Social Security cost $143.7 billion overall, which accounted for almost 75% of disability insurance payments.[320] The Centers for Disease Control and Prevention estimates that the societal cost of work-related injury, illness, and fatalities could have been as high as $2.2 trillion from 2007 to 2015.[234] The interdependence of health and work participation makes a single approach to determining the economic burden of work-limiting conditions difficult.

Both health and illness can impact work productivity and performance, creating work limitations and difficulty with sustained work participation. Unum paid $3.8 million for long-term disability claims; the top 5 claims were related to cancer (17%), back disorders (13%), injury (12%), cardiovascular disorders (9%), and joint disorders (9%).[308]

CLINICAL PRACTICE GUIDELINES

Diagnosis/Classification

Work-limiting injury or illness is diagnosed or classified in a number of ways. Medical and regulatory diagnosis information most often follows the International Classification of Diseases (ICD). However, it is impractical to comprehensively list the extensive ICD codes relevant to work-limiting problems, and the use of codes that focus on body functions and structures has limited relevance in a guideline focusing on activity and participation limitations.

Current approaches to RTW are grounded in principles of function and participation presented in the ADA[318] and the ICF. The ADA focuses on the work ability of the patient/worker—assessing an individual's ability to perform the fundamental duties (or demands) of her or his job. This means that a functional gap analysis is conducted to identify a work limitation diagnosis/diagnoses, as well as a review of modifications (or accommodations) that would help the worker bridge performance gaps and successfully perform work tasks. Any residual gaps in work ability form the basis of functional goal setting. The benefit of this approach is that it is tailored to the individual, but it also complicates attempts to standardize measures or classification of function, as there is no single standard for activity/participation-based diagnosis/classification.

Kaech Moll et al[171] used a Delphi approach to identify a set of clinically appropriate ICF categories relevant to physical therapist practice internationally, which were broad enough to capture the variability of vocational demands for RTW interventions while still being narrow enough for practical use (**TABLE 4**). Many of the "mobility" domain items identified by Kaech Moll et al[171] are consistent with generally accepted taxonomies/terminologies describing job demands in the workplace. These include the Occupational Requirements Survey[311] and Dictionary of Occupational Titles,[88] which functionally connect clinical, practical, and regulatory considerations of job matching and work participation outcomes. The ICF categories of interpersonal interactions and environmental/support and relationship also address potential risk factors for delayed or restricted work participation.

Evidence Summary and Rationale

The isolated use of diagnosis based on body functions and structures leaves gaps in understanding work limitations and prognosis, and is not consistent with legal and regulatory guidance that considers the worker's ability to perform tasks with or without accommodation (eg, modification of job processes or equipment). The limited ICF activity and participation domains related to work or vocational demands that resulted from the international Delphi study are consistent with legal guidance and serve as a manageable way for clinicians to classify work-related activity and participation. Relevant domains include mobility (position changes, material handling, hand and arm use, walking/moving, and transportation), self-care, and vocational training. The evolution of function and participation classification and diagnosis is consistent with the American College of Occupational and Environmental Medicine guideline that described the value of identifying clear functional work limitations more than a decade ago.[290] Not accurately understanding work activity limitations can have negative impacts on communication, clinical decision making, RTW recommendations, the patient's work participation, and worker earnings.

Researchers have identified a set of classification and diagnostic domains that span multiple occupations and are clinically adaptable. Clinicians may choose to add or remove domains that are relevant to the needs of individual workers. The diagnostic domains outlined above are consistent with the upcoming 11th revision of the ICD (ICD-11), which includes the WHO Disability Assessment Schedule 2.0 and generic functioning domains found in the supplementary section for functioning, assessment, and problems.[92,350] Research and policy updates in the area of functional diagnoses have been nominal compared to the ICD. While the costs of updating regulatory and insurance systems to accommodate a new set of diagnosis codes may be high, therapists can include relevant ICF diagnostic classifications in prognosis and goal-related documentation with minimal cost until the ICD-11 is implemented. While the GDG found that the classification/diagnostic domains in the Delphi study were key elements for describing work activity and participation-based diagnosis, it acknowledges the need for physical therapists to address relevant body functions and structures diagnosis to manage underlying physical health conditions.

Recommendation

F Physical therapists should document work-limiting diagnoses and relevant goals during examination and care planning, using relevant ICF domains, including lift/carry, posture/positional changes, walking/moving around, hand/arm use, self-care/transfers, ability to use transportation, and interpersonal relationship skills.

TABLE 4 ICF Activity and Participation Domains Related to Work and Included in Examination[a]

Code	Title of Domain	Description
d4	Mobility	Changing body position or location or by transferring from one place to another by carrying, moving, or manipulating objects; by walking, running, or climbing; and by using various forms of transportation
d410	Changing basic body position	Getting into and out of a body position and moving from one location to another, such as getting up out of a chair to lie down on a bed, and getting into and out of positions of sitting, standing, kneeling, or squatting
d415	Maintaining a body position	Staying in the same body position for carrying out a task (includes lying, squatting, kneeling, sitting, and standing)
d420	Transferring oneself	Moving from one surface to another, such as sliding along a bench or moving from a bed to a chair, without changing body position
d430	Lifting and carrying objects	Raising up an object or taking something from one place to another (includes lifting; carrying in the hands or arms or on shoulders, hip, back, or head; putting down)
d440	Fine hand use	Performing the coordinated actions of handling objects, picking up, manipulating, and releasing them using one's hand, fingers, and thumb (includes picking up, grasping, manipulating, and releasing)
d445	Hand and arm use	Performing the coordinated actions required to move objects or to manipulate them by using hands and arms (includes pulling or pushing objects, reaching, turning or twisting the hands or arms, throwing, catching)
d450	Walking	Moving along a surface on foot, step by step, so that one foot is always on the ground (includes walking short or long distances; walking on different surfaces; walking around obstacles, and walking forward, backward, or sideways)
d455	Moving around	Moving the whole body from one place to another by means other than walking, such as climbing over a rock or running down a street, skipping, scampering, jumping, somersaulting, or running around obstacles
d460	Moving around in different locations	Walking and moving around in various places and situations, such as walking between rooms in a house, within a building, or down the street of a town
d470	Using transportation	Using transportation to move around as a passenger (includes using human-powered transportation, using private motorized or public transportation, using humans for transportation)
d475	Driving	Being in control of and moving a vehicle or the animal that draws it (includes driving human-powered transportation, motorized vehicles, animal-powered vehicles)
d5	Self-care	Caring for oneself, washing and drying oneself, caring for one's body and body parts, dressing, eating and drinking, and looking after one's health
d7	Interpersonal interactions and relationships	Carrying out the actions and tasks required for basic and complex interactions with people (strangers, friends, relatives, family members, and lovers) in a contextually and socially appropriate manner
d825	Vocational training	Engaging in all activities of a vocational program and learning the curriculum material for preparation for employment in a trade, job, or profession
e3	Support and relationship	People or animals that provide practical physical or emotional support, nurturing, protection, assistance, and relationships to other persons, in their home, place of work, or in other aspects of their daily activities. The environmental factor being described is not the person or animal, but the amount of physical and emotional support the person or animal provides

Abbreviation: ICF, International Classification of Functioning, Disability and Health.

[a]*Adapted from the ICF Browser (https://apps.who.int/classifications/icfbrowser/) and last accessed on April 19, 2020 (recreation and leisure was removed due to the focus on worker role in this clinical practice guideline).*

CLINICAL PRACTICE GUIDELINES

Clinical Course

For this CPG, we interpret clinical course in the context of work limitation or participation restriction. The literature in the area of RTW is vast and varies by condition. A full review of the evidence on RTW is not feasible. However, national estimates of work injury and RTW are publicly available from the BLS and the Occupational Safety and Health Administration for work-related injuries, and we provide a summary below that may be informative for clinical decision making.

DURATION OF CARE

Work disability following occupational injury is generally temporary, with a duration of less than 1 month, although there is often long-term incapacity in cases where work absence extends more than 3 to 6 months.[45] Data across all injuries and illnesses showed a gross median of 8 to 9 days of time lost or DAFW.[313] A categorical breakdown of the data shows that 42% of individuals RTW in 1 to 5 days, another 12% at 6 to 10 days, 11% at 11 to 20 days, 6% at 21 to 30 days, and 30% of cases extended beyond 30 days.[314]

For musculoskeletal problems involving sprains/strains, pain, or tendinopathies, data showed a median of 8 to 14 days of work absence.[309,313] Problems related to the upper extremities, wrist, and knee all tended to exceed the gross median time lost (medians of 21, 17, and 21 days, respectively), while more specific conditions such as fractures, carpal tunnel syndrome, amputations, and repetitive motion problems were associated with a median time loss of 30 or more days.[303]

Median time-loss data differed by worker age and type of work. A median time loss of 5 to 8 days was noted for workers younger than 45 years of age, rising to 11 to 14 days for individuals aged 45 years and older.[309] Industrial classification/type of work can also impact work recovery: some of the highest median days of time lost occurred in transportation/warehousing (71 days), construction (55 days), manufacturing (48 days), retail (42 days), and health care/social assistance (30 days) jobs, which may require high levels of physical demand or significant amounts of material handling.[314]

Data were also collected for days of job transfer or restriction. Cases of job transfer and restricted duty have essentially doubled over the last 20 years, demonstrating that modified or altered work strategies are consistently used for workers with musculoskeletal conditions.[312] **TABLE 5** shows 2016 data for DAFW and days of job transfer or restriction in selected industries to help illustrate that significant numbers of workers are participating in modified duty at the workplace during injury recovery.

Median days of restricted duty or job transfer for musculoskeletal disorders ranged from 13 to 24 days.[312] Survey data for restricted duty or job transfer days for workers commonly evaluated by physical therapists included back-related conditions (ranging from 12 to 20 days), shoulder-related conditions (15-30 days), wrist-related conditions (9-44 days), and knee-related conditions (14-23 days).[312]

Identification of those at risk for long-term work disability continues to be a challenge, as many extended or high-cost claims are often not identified during initial examination or the early stages of care.[107,268,340] This CPG has therefore emphasized early identification of risks for delayed RTW to help clinicians identify, address, and communicate information that may help reduce needless work disability by facilitating appropriate interventions.

TABLE 5 2016 Data on the Number of Nonfatal Occupational Injuries and Illnesses Involving DAFW and DJTR[a]

Industry	Total DAFW	Total DJTR	Total Musculoskeletal DAFW	Total Musculoskeletal DJTR
Beverage and tobacco product manufacturing	2690	4280	1100	2250
General merchandise stores	25340	36010	8640	15760
Couriers and messengers	13070	12400	5890	6480
Waste management and remediation	6710	3950	1610	1740
Hospitals	52190	38860	23510	21670
Accommodation	19200	17420	6090	6550

Abbreviations: DAFW, days away from work; DJTR, days of job transfer or restriction.
[a]Adapted from www.bls.gov. Values are n.

Evidence Synthesis and Rationale

Data from the BLS indicate that approximately 70% of individuals injured at work RTW 1 week to 1 month post injury, and 30% of workers will return later than 1 month post injury.[309] Over the past 2 decades, there has been a paradigm shift in work culture and health care to reduce work absence and disability through increased use of modified/restricted work duties following injury. The course of care and clinical progression of workers may be impacted by health conditions (body structures/body functions), age (older/younger than 45 years old), and role-specific elements such as industry/type of work (participation). While there are some concerns about injury underreporting and there is research on specific injury, diagnosis, or occupation injury subgroups,[72,96,201,202] the size and scope of the BLS data mean that the BLS is often considered the most comprehensive single source of publicly available data on work injuries when compared to the costs and difficulty of accumulating similar volumes of data or accessing proprietary data. Data from the BLS and physical therapist outcome registries (or proprietary/membership-based data sources) can be used to help physical therapists identify typical prognoses and outliers based on aggregate data. (Examples of common proprietary benchmark guidelines include the Occupational Disability Guidelines [ODG][245] and the American College of Occupational and Environmental Medicine's Occupational Medicine Practice Guidelines.[7])

Recommendation

F Physical therapists may document reference data related to injury type, affected body part, occupational category, and age to form a prognosis and to develop an individualized RTW plan.

CARE DELIVERY PATTERNS

II Two studies examined care that included physical therapy or chiropractic as the primary provider of services, and both reported benefits related to days of work absence (and related wage replacement costs).[30,294] Blanchette et al[30] studied characteristics associated with the timing of the first health care consultation for injured workers. While the average time to referral was just over 2 days overall, most workers received the first consultation within 7 days. Physical therapy referral averaged 5 days but was still sooner than the 16-day average when physician referral was required. Longer time to care was associated with a significantly longer episode of care in individuals experiencing their first compensable injury (hazard ratio [HR] = 0.98; 95% confidence interval [CI]: 0.97, 0.99), and each day of delay in initial consultation resulted in a 2% drop in the HR related to ending compensation.[30] First health care consultation occurred significantly sooner for men, for those previously compensated, and when early RTW programs were available.[30] Stephens and Gross[294] evaluated the impact of a soft tissue injury continuum of care, with a variety of services offered in different stages of care, for patients filing uncomplicated soft tissue work injury claims. The study found that primary care from physical therapists, chiropractors, or medical providers was indicated in the initial 6 to 8 weeks following a claim. In the second stage, claimants who remained off work at 6 to 8 weeks were referred for multidisciplinary assessment to identify RTW barriers and to determine the most appropriate subsequent care (which could include continued care by the primary provider or multidisciplinary rehabilitation). The continuum of care model demonstrated significant positive improvement in RTW outcomes for the intervention group (HR = 1.54; 95% CI: 1.50, 1.58) compared to a concurrent reference group composed of injured workers with fractures and traumatic non–soft tissue injuries (which were not anticipated to show changes based on the altered clinical course). Appropriate timing of multidisciplinary assessment resulted in a positive reduction in work absence duration (HR = 8.67; 95% CI: 7.02, 10.70) compared to nonadherent care.[294] Carlsson et al[54] found that multidisciplinary care was not of benefit early in the course of care for individuals with musculoskeletal care/psychiatric problems. The number of days on sick leave was significantly higher (P = .038) in the intervention group with early multidisciplinary care.[54]

III Bernacki et al[24] followed data from workers' compensation claims from the state of Louisiana, noting that 43% of injured workers who experienced lost time received services billed in the 97xxx Current Procedural Terminology code series (Physical Medicine and Rehabilitation), which totaled 4% of the total amount paid on the claims. Nine percent of claims involved care from a pain management physician.

Gaps in Knowledge

Additional research into timing and costs of care/interventions based on risk stratification and clearly designated intervention groups may provide additional information to refine 1 or more optimized care continua for clinicians in the future.

Evidence Synthesis and Rationale

Physical therapists may provide services as a primary provider or following referral.[30,294] Stephens and Gross[294] reported that staged care initiated with a physical therapist, chiropractor, or physician, followed by a comprehensive multidisciplinary evaluation at 6 to 8 weeks for those who had not returned to work, resulted in significant improvement in RTW outcomes compared to care that deviated from the recommended multidisciplinary evaluation timeline or other key continuum elements. Blanchette et al[30] reported that the number of days until initiating the first consultation can impact duration of compensation (with average care initiated in about 2 days and worse results associated with a delayed start of care beyond 7 days), which should be considered when the physical therapist is the first point of care. While US physical therapist and chiropractic license provisions may be accessible/cost-effective, state regulations and/or insurer policies may limit the ability of physical therapists to act as primary care providers following work injury, which creates a gap in clinical practice (related to US physical therapist practice). Many other countries allow physical therapists to act as entry points of care for work-limiting injury and illness. Stephens and Gross[294] noted that primary care was not recommended for conditions that would spontaneously resolve (which minimizes potential harms of medicalization and inefficient care). No safety concerns were identified in the research, and this is consistent with outside research and practice act updates (which include referring to appropriate providers when client presentation or conditions are outside the scope of physical therapist practice).[18,229,246] In some cases, physical therapists may also seek professional development opportunities to enhance skills related to the identification of work limitations, participation restrictions, and accommodation consultations.

There was no evidence of benefit from initiating multidisciplinary assessment with a care team composed of a physician, multiple therapists, and a psychologist before 8 weeks.[54,294] Cost and duration of care may be unnecessarily increased when multidisciplinary care is initiated too early, especially when individuals may not demonstrate risks associated with delayed RTW. Although the continuum of care presented by Stephens and Gross[294] considered services provided by multiple providers, one of the strongest effects came from the timing of the multidisciplinary assessment at approximately 8 weeks post injury, allowing for a cross-discipline standard of care. While the research did not discuss specific pathways post multidisciplinary care, there is research on this topic discussed later in the review.

Recommendations

C Physical therapists may serve as the first health care provider up to 8 weeks after injury, according to regulatory scope and expertise, with the initial consultation occurring within the first 7 days following injury.

B For workers who have been out of work for 6 to 8 weeks, physical therapists should engage in a multidisciplinary assessment to collaboratively determine the most appropriate plan of care and address potential barriers to work participation.

THERAPEUTIC ALLIANCE

Work disability is recognized as a multifactorial problem that is influenced by factors extending beyond medical diagnosis or worker characteristics.[203] One aspect of physical therapy management is the therapeutic alliance, also referred to as the working alliance, between the clinician and patient. Therapeutic alliance has been described as the social connection between therapist and patient.[97,104,136,215,295] It has 3 main components: (1) therapist-patient agreement on goals, (2) therapist-patient agreement on interventions, and (3) the affective bond between the therapist and patient.[97] Articles addressed in this area considered the relationship between the worker and the health system and its impact on duration of work absence and barriers or facilitators regarding RTW outcomes.

II A systematic review of qualitative articles by Kilgour et al[182] looked at 13 medium- and high-quality articles that considered the impact of workers' experiences after work injury on their recoveries (not specific to RTW) and the interactions between injured workers, health care providers, and workers' compensation insurers (using an 18-item quality assessment framework and a meta-ethnographic method of synthesis). Although research was considered in varied countries, worker experiences were found to be similar across studies. Findings showed that health provider-worker interactions can be both healing and harming. The authors considered how interactions can influence the care provided within several theme areas. Themes included claim legitimacy, minimizing workers' compensation system intrusions in the health care provider-injured worker relationship, and a broad category called "nontherapeutic encounters" (encompassing limited ability to obtain information, interactions with nontreating examiners, and diagnosis/treatment difficulties).[182] While supportive worker-focused interactions were found to be important to injured workers, negative or difficult interactions created more adversarial relations.[182] Key concepts identified for promoting positive provider-worker interactions included demonstrating respect and understanding, assuming legitimacy, educating workers on process considerations, good communication, providing a supportive environment to allow workers to ask questions and voice concerns, and avoiding bias, stigma, stereotyping, or hostility.[182] Butler and Johnson[49] examined worker satisfaction using 2 components: bedside manner (took my pain seriously, listened to me, explained the injury and treatment) and effectiveness of care (provider delivery of active versus passive elements of care). The study found that workers were more concerned with the effectiveness of care than with the bedside manner component of satisfaction; 1 SD of positive change in workers' satisfaction with health providers reduced claim duration by about 25%.

II Muenchberger et al[232] conducted a multistage study that identified 9 key clinical factors and 3 clusters impacting recovery trajectory. In addition to progressive/supportive employer policies regarding RTW, clinically useful elements found to facilitate RTW included clear RTW goals, communication between the medical team and injured worker, and timeliness/intensity of rehabilitation.

II Azoulay et al[17] performed a pilot study to investigate the effect of medical provider agreement and the patient's perceptions regarding care management for back pain. The majority (97.1%) of patients agreed with their physical therapists' management of their condition and believed their care was consistent with the physician-referred care. Patients disagreeing (28.6%) with their physician on medical management did not RTW later; however, they were less satisfied with their medical care (P = .05) and catastrophized more about their pain (P = .03).

IV Kirsh and McKee[184] studied the experiences of injured workers, identifying a range of financial, emotional, and physical hardships that were attributed to limited input into medical care planning and insufficient information concerning their rights or RTW processes. More than half of workers felt understood or respected by health professionals and coworkers, but not necessarily by employers, insurance boards, or society.[184] Recommendations for health providers to consider include working from a perspective of claim legitimacy, including the worker in treatment planning, and improving workers' access to information about their rights.

Gaps in Knowledge

Research related to measuring working or therapeutic alliance, identifying meaningful thresholds of patient-provider agreement on alliance, the impact of worker engagement/readiness for change, and provider bias could further improve the ability to make specific recommendations in this area. Additional clinical research on leveraging facilitators and overcoming barriers to achieving alliance will strengthen practical application of this content.

Evidence Synthesis and Rationale

There is moderate evidence[44,97,114] that a worker's rehabilitation experience with health providers (and potentially the health care system) can influence the RTW trajectory of the worker,[49,182] although research is limited on the exact nature and impact of the underlying factors. The studies in this section discussed potential for considerable influence of the working relationship as a component of care, noting the potential negative impact on RTW delays and services the worker may receive during care.[182] While the majority of studies identified an impact of the worker-provider relationship, 1 study found that the provider-patient alliance did not impact RTW outcomes but did impact satisfaction.[17] Another indicated that perceptions of care effectiveness may be more important than relational components in achieving positive RTW outcomes.[49] This study helps to illustrate the need to understand the impact and directionality of factors impacting the worker-provider relationship (and related outcomes). Within the context of this review, studies identified a number of areas for reflection and consideration by clinicians who treat patients with work-limiting conditions. Maintaining a positive working relationship can help minimize work disability.[184,232] Understanding workers' stressors, engaging in respectful communication, and seeking worker input regarding care decisions can help foster change strategies to reduce hardships and challenges that negatively impact RTW,[184,232] but this does not mean workers and therapists necessarily need to agree on care.[17] Appropriate (clinical and process-related) information, advice, and encouragement may also positively impact RTW.[33] Supportive worker interactions include respecting the worker and assuming legitimacy, ongoing communication, providing education, minimizing system intrusion on the provider-worker relationship, and avoiding bias, stigma, stereotyping, or hostility.[182]

While the responsibility for implementing best practices lies with the clinical provider, resource costs of schedule time, payment policy, and systems factors may present real or perceived barriers to implementation. Physical therapists may be able to offset some of the pressures of systematic communication and authorization burdens using patient advocacy and evidence-based practice to justify care, but recognition of the therapist's critical thinking skills and systems streamlining to minimize administrative intrusions could help focus care delivery.

Recommendation

B Physical therapists should develop a therapeutic alliance by including the worker in RTW planning and engaging in work-focused supportive behaviors throughout the episode of care, documenting and addressing worker goals, preferences, and concerns.

TEMPORARY WORKERS AS A VULNERABLE POPULATION

II Vermeulen et al[333,335] conducted a series of studies focused on temporary workers who developed musculoskeletal disorders. In addition to clinical care, regulatory requirements in the study setting required insurance physicians to engage in specific discussion of and planning for RTW. Specific discussion of RTW was reported in 47% of cases, planning was noted in 19% of cases, and there was limited vocational rehabilitation referral for temporary workers.[335] Using an RTW coordinator and a structured/stepwise participatory RTW program (development described in Vermeulen et al[333]) resulted in a nonsignificant delay in RTW during the first 90 days, followed by a significant advantage in RTW rate after 90 days, compared to usual care (HR = 2.24; 95% CI: 1.28, 3.94).[332]

Evidence Summary

Temporary workers may not have specific job duties to return to following injury. Lack of defined RTW job duties or clear goals can delay return to employment for temporary workers.[335] There is evidence that an interactive RTW process that identified work benefits, problem solved barriers to RTW, and achieved consensus on an RTW plan through collaboration with an RTW coordinator was associated with engagement and minimized RTW delays.[332,333]

CLINICAL PRACTICE GUIDELINES

Risk Factors for Delayed RTW

Work disability and delayed RTW can be influenced by multiple factors, including physical determinants (including medical history and mental health), psychosocial issues, workplace considerations, and health care and regulatory systems.[203] Risk factors for delayed RTW can be barriers to RTW, and we use these terms as synonyms in this CPG.[286] The Psychosocial Flags Framework[46] is one approach that has been used in musculoskeletal literature to identify and address obstacles to working.[254] Three commonly discussed categories or obstacles impacting RTW examination and care planning include yellow, blue, and black flags. Yellow flags include feelings, beliefs, judgments, and behaviors about symptoms, health conditions, and self-efficacy in their management.[178] Work-related barriers to recovery have been described as black and blue flags.[237,283] Black flags describe the nature of work, elements of the workplace, and regulatory systems such as job demands/characteristics and the insurance or compensation system, while blue flags relate to worker perceptions of work environment, such as mental stress or lack of support.[237,283] This section of the CPG has been organized into 2 areas: (1) client presentation and (2) socioeconomic and work environment factors. Client presentation includes factors that are identified through physical therapist examination, including history taking. Information related to socioeconomic and work environment factors may be communicated prior to examination (from employers or other health and insurance stakeholders) or during examination through history taking (with updates and clarifications throughout care). Factors that fit the flag designations are included throughout this section, but, in general, yellow flags are most likely included in client presentation, and factors that are considered blue and black flags are addressed as socioeconomic and work environment factors.

CLIENT PRESENTATION

Risks for delayed RTW or work disability have been associated with worker presentation, which includes demographic and psychosocial factors, medical history and mental health conditions, and reported functional status.

Age

I Two prospective cohort studies,[157,267] a secondary analysis of prognostic factors from a randomized controlled trial (RCT),[289] and a prospective analysis of registry outcomes[67] found no impact of age on RTW or work absence in individuals injured at work. In contrast, there were 2 prospective cohort studies that found a negative association between age and work status.[5,251] The study by Øyeflaten et al[251] analyzed the use of leave, pension, and vocational rehabilitation, controlling for age. While vocational services were associated with younger workers, sick leave and pension were associated with older age. The probability of using vocational rehabilitation services decreased with age and was estimated as a hazard rate ratio (HRR) of 0.76 (95% CI: 0.70, 0.83).[251]

II Two systematic reviews, one with 3 prospective and 6 retrospective cohort studies[297] and another with 29 studies (including 7 RCTs, 6 prospective cohort studies, and a variety of lower-quality studies),[263] along with several other studies, including a lower-quality RCT,[210] a prospective cohort study,[208] a prospective observational study,[273] and a retrospective cohort study,[223] identified older age as a negative factor for working status/RTW. One review concluded that older age was associated with poor RTW outcomes and a decreased likelihood of finding work upon recovery,[263] while other studies found a correlation between increasing age and slower claim closure, but not overall RTW or recurrence.[4,48,143] Age was not found to be a significant predictor of RTW for individuals with shoulder and upper extremity problems[14,189] or arthritis.[76] Duration of care and job loss were also found not to be associated with age for individuals with back pain.[146,170]

Sex

I Abegglen et al[5] reported that men were more at risk of more days of work disability and more complicated recovery 18 months following work injury than women ($P<.001$). In a 4-year study encompassing diverse diagnoses and vocations by Øyeflaten et al,[251] women were found to have a significantly greater risk of not returning to work (HRR = 0.73; 95% CI: 0.57, 0.94), receiving partial disability (HRR = 1.81; 95% CI: 1.00, 3.26), or receiving full disability (HRR = 2.08; 95% CI: 1.23, 3.49). Men more frequently had musculoskeletal diagnoses (58%), while women more often had a mental diagnosis (55%; $P<.001$).[251] Two RCTs found that sex did not impact RTW in workers with back pain.[289,296]

II Female sex was associated with extended absence and poor RTW outcomes in a systematic review by Street and Lacey[297] and several other studies.[4,146,223] Street and Lacey[297] included 3 prospective and 6 retrospective cohorts, and identified the traditional role of women, a caregiver/home role, as an influence on longer recovery times or not returning to work. In contrast, Aas et al[1] found that women in a prospective cohort study had higher RTW rates and shorter work absences following brain injuries. Keeney et al[177] found that women were less likely to experience back reinjury compared to men (odds ratio [OR] = 0.60; 95% CI: 0.47, 0.81).

II In a systematic review, Rinaldo and Selander[263] included 3 studies that identified sex as a risk factor for work disability; 1 RCT found that sex was not a risk factor related to RTW, while a pair of prospective and retrospective cohort studies disagreed on which sex was more at risk for disability. Kvam et al[190] identified conflicting results in a prospective cohort, finding women less likely to achieve "full return to work" (OR = 0.09; 95% CI: 0.02, 0.48), but no relationship was found between sex and part-time RTW or disability pension. Lydell et al[208] found that women were less likely to be engaged in sustained full-time work after 5 years (OR = 0.310; 95% CI: 0.104, 0.922), but not at 10 years.

Evidence Summary

There is conflicting evidence on the role of age and sex as risk factors for delayed RTW and work participation following injury. Research indicated that other factors, such as social[190,297] and economic considerations,[297] may influence the relationship between sex and delayed RTW. While there may be subgroups where these factors are relevant, confounding social role assumptions, vocational factors and other factors limit overarching recommendations in this area.

Recommendation

D Based on conflicting evidence, a physical therapist should not use age and sex as independent risk factors for delayed RTW and restricted work participation following injury.

History of Restricted Work Ability and Prior Sick Leave

I Øyeflaten et al[251] found that individuals with previous long-term sick leave of more than 12 months for musculoskeletal or mental health conditions had a 3-fold higher risk of delayed RTW than those without prior sick leave (HRR = 3.13; 95% CI: 1.51, 6.46).

Injury Type and Severity

I Hou et al[157] found no difference in duration of work absence following traumatic work-related injury based on the type of injury (low-energy cutting or crushing injuries versus high-energy motor vehicle, fall, or strike accidents), or in duration of hospitalization (less than or more than 14 days). Schultz et al[279] found that study participants with subacute back pain were 7 times more likely to RTW than individuals with chronic problems.

II A systematic review by Street and Lacey[297] with 3 prospective and 6 retrospective cohort studies reported that greater injury severity and a diagnosis of carpal tunnel syndrome or back or neck injury were predictive of poor RTW outcomes such as longer recovery periods.

II Aas et al[1] found that individuals with acquired brain injury without comorbidities (HR = 0.519; 95% CI: 0.336, 0.802) and those with mild cognitive impairments (HR = 0.404; 95% CI: 0.214, 0.763) returned to work earlier compared to those who had comorbidities or moderate cognitive impairments.

II Hebert and Ashworth[143] reported that amputation level, number of surgical procedures, and length of hospital stay were significantly related to days of total disability following lower extremity amputation. Each additional surgical procedure accounted for 52 additional days of disability, each day of acute care resulted in 10 additional days of disability, and there were more DAFW for transtibial (mean ± SD, 676.4 ± 100.4 days) or transfemoral amputation (mean ± SD, 684.6 ± 122.1 days) compared to toe amputation (mean ± SD, 126.8 ± 26.3 days). Significantly more days of work absence were also noted following transtibial amputation compared to a partial foot amputation (mean ± SD, 345.1 ± 76.3 days).[143]

Pain and Symptom Patterns

I Patient symptoms, pain patterns, and pain experience were associated with RTW outcomes in a number of prospective cohort studies[279,296,323,344] and an RCT.[148] The presence of radiating pain was found to increase the risk of delayed RTW in a number of studies.[279,323,344] van der Weide et al[323] found the presence of right-leg sciatica to be one of the best negative predictors of RTW (HR = 0.45; 95% CI: 0.30, 0.70), and this was similar to an OR of 0.216 in the study by Schultz et al.[279] Pain intensity was associated with longer time to RTW in regression modeling (HR = 0.89; 95% CI: 0.83, 0.96) done by Heymans et al.[148]

II Gauthier et al[110] reported that lower pain catastrophizing and lower pain severity were significant predictors of RTW. A systematic review of studies of various evidence levels and several prospective cohort studies found that pain symptoms/patterns were associated with RTW outcomes.[21,101,146,208,263] Specific factors associated with poor work outcomes were radiating/noncentralizing[21,101,149] or higher-intensity pain/difficulty managing pain[21,146,263] and longer duration of the problem prior to evaluation.[21,101,146,149] Cougot et al[71] found that a visual analog pain rating of less than 4/10 was predictive of RTW in those with chronic back pain. Mngoma et al[225] developed pain profiles of patients with subacute low back pain (LBP), determined differences in depression and anxiety symptoms over time between the profiles, and analyzed the association between the profiles and RTW at the end of a treatment program. Patients in the severe pain cluster had higher depressive and anxiety symptom scores than patients in the moderate pain cluster. When each cluster was considered separately, only 31% in the severe pain cluster had returned to work at program completion, compared to 90% in the moderate pain cluster.

CoMorbid Psychological Conditions

II

Dersh et al[82] evaluated the impact of psychiatric disorders on successful completion of a multidisciplinary functional restoration program for individuals with chronic disabling occupational spinal disorders and subsequent RTW. Patients with panic disorder (axis I) were 2.5 times (95% CI: 1.2, 5.3) less likely to complete the program. Patients with antisocial personality disorder (axis II) (OR = 2.4; 95% CI: 1.2, 4.8) and dependent personality disorder (axis II) (OR = 2.3; 95% CI: 1.3, 4.1) were found to be significantly associated with lower completion rates. Patients who were diagnosed with current opioid dependence disorder were 2.7 times (95% CI: 1.6, 4.6) less likely to RTW, and those who did RTW were 2.6 times (95% CI: 1.6, 4.1) less likely to retain work at 1 year relative to patients without the disorder. Patients with the axis II disorder of paranoid personality disorder were 1.6 times (95% CI: 1.1, 2.3) less likely to RTW and 1.6 times (95% CI: 1.1, 2.2) less likely to have retained work at 1-year follow-up compared with those without the axis II disorder.

Workers' Expectations and Beliefs

I

Based on a large prospective cohort with 10-year follow-up, Palmlöf et al[253] reported a higher risk of long-term sickness absence for workers who perceived lower physical and mental health in relation to work demands at baseline. Among those 20 to 34 years old, the incidence rate ratio (IRR) in the exposure category "rather poor/poor" was 2.15 (95% CI: 1.14, 4.06), while it was 4.94 (95% CI: 3.02, 8.08) for those 35 to 49 years old and 6.68 (95% CI: 4.05, 11.04) for individuals in the 50-to-65-year age range. Regarding mental health, the strongest associations were found in those reporting "rather poor/poor" mental work capacity, with IRRs of 2.00 (95% CI: 1.26, 3.16), 2.32 (95% CI: 1.50, 3.60), and 3.70 (95% CI: 2.23, 6.16) for the 3 age groups, respectively. Schultz et al[279] reported an 80.5% accuracy rate for predicting RTW and a 74.4% accuracy for failure to RTW for the following predictive factors: pain guarding, disability-related perceptions, beliefs, and expectations of recovery. In a follow-up investigation, Schultz et al[278] reported the key psychosocial predictors for RTW to be expectations of recovery and perception of health change, and that their models were better at predicting who will RTW than who will not RTW. Xu et al[352] used the stages-of-change model to predict RTW outcomes for a group of unemployed workers with chronic pain and physical injury. This model focuses on the decision making of the individual. The authors reported that the most significant factors for predicting workers' RTW are the readiness of workers for action and their confidence in returning to work.

II

Carlsson et al[55] investigated associations between motivation for RTW and RTW. Participants were on long-term sick leave due to pain or mild to moderate mental health conditions. Participants categorized as being motivated to RTW had more than 2-fold odds of reporting "increased employability" or "increased work" (OR = 2.44; 95% CI: 1.25, 4.78). Gross and Battié[125] reported that recovery expectations predict future recovery in workers filing injury claims for back pain (adjusted HR = 0.9), but do not seem to predict recovery in claimants with other musculoskeletal conditions. Rinaldo and Selander[263] performed a literature review and reported that psychological factors are very important in determining the outcomes of vocational rehabilitation. Salzwedel et al[273] reported that patients' expectations regarding their ability to work play a crucial role in predicting RTW 6 months after an acute cardiac event and cardiac rehabilitation (OR = 0.19; 95% CI: 0.06, 0.59). Patients with the comorbidity of depression were also less likely to RTW (OR = 0.52; 95% CI: 0.36, 0.76). In their systematic review that included 5 studies assessing psychological predictors of poor RTW outcomes, Street and Lacey[297] found that poor self-perceived health status and worry about reinjury, poor personal or family attitudes about work, and lower expected outcomes predicted poor RTW outcomes.

Self-reported Function

I

Margison and French[211] found that the Örebro Musculoskeletal Pain Questionnaire correctly classified claimants' ability to RTW, and concluded that it may be used for early identification of individuals likely to fail a physical therapy program and who might benefit from biopsychosocial interventions. Claimants with an Örebro Musculoskeletal Pain Questionnaire score of 147 or less were classified as "fit to return to work," and claimants with a score greater than 147 were classified as "not fit to return to work" and received additional treatment that included cognitive behavioral intervention. The model correctly classified 78% of derivation claims.[211]

II

Self-reported function or disability, as identified by measures such as the Oswestry Disability Index (ODI)[101,149] and the Roland-Morris Disability Questionnaire (RMDQ),[21] was found to predict workers at risk of work disability. Fransen et al[101] found a 3-fold higher risk of delayed RTW for individuals with ODI scores indicating worse than minimal disability. Baldwin et al[21] found that a 10-point increase above baseline values, indicating higher levels of functional disability, in RMDQ score was associated with a 25% increase in the probability of not returning to work within 1 year. Lydell et al[208] reported that perceived functional capacity and pain intensity are important predictors for RTW in the long term, but that quality of life, measured by 1 global question on a visual analog scale, was not.

II Milidonis and Greene[223] studied questions from the NHIS Disability Supplement related to work status in individuals with arthritis, and found that self-reported "difficulty lifting 10 pounds" was associated with not working (OR = 1.64; 95% CI: 1.15, 2.34). Other items were correlated with work disability status, including overall number of functionally limited activities and difficulty with activities such as walking, stairs, or lifting up to 25 lb (r = 0.30-0.34).

Fear of Movement

I Fritz and George[102] found that work-related concerns, measured using the Fear-Avoidance Beliefs Questionnaire (FABQ) work subscale, had the greatest predictive validity for prolonged work restrictions for patients with acute, work-related LBP. They reported that a score of 29 or less would reduce the risk for prolonged work restrictions from 29% to 3% in a patient receiving therapy for acute work-related LBP (negative likelihood ratio = 0.08). Staal et al[287] found that workers with moderate FABQ and Tampa Scale of Kinesiophobia scores had a better chance of returning to work than workers with higher (worse) scores (HR = 1.9-2.2 for fear-avoidance beliefs about work and 1.9-2.3 for fear of movement/reinjury). Storheim et al[296] reported that the best predictors of RTW were fear-avoidance beliefs for work (95% CI: 0.38, 0.64), disability, and cardiovascular fitness. Wideman and Sullivan[347] reported that fear of movement was the only factor from the fear-avoidance model to significantly predict RTW status at 1-year follow-up (B [regression coefficient] = 0.061, P<.05).

II Holden et al[154] investigated the predictive validity of fear-avoidance beliefs as assessed by the work subscale of the FABQ in a sample of 117 patients with a work-related musculoskeletal disorder. They identified 2 FABQ work subscale cutoff points that identified participants as having a high or low risk of not returning to work following an interdisciplinary rehabilitation program. Receiver operating characteristic curves for the FABQ work subscale cutoffs showed that the maximum sensitivity was 100% for a score of less than 27.5, with a score of greater than 39.5 identified as having optimum specificity (81.9%). All participants with an initial FABQ work subscale score of 27.5 or less achieved a successful outcome.

Nonorganic Signs/Symptom Magnification

I Fritz et al[103] reported that, for patients with acute LBP, Waddell nonorganic signs were not effective screening tests for the early identification of increased risk for delay in returning to work.

II Chapman-Day et al[61] determined that the presence of symptom magnification syndrome did not impact the readiness-to-work rate but did impact stay at work at 6 months after discharge from a work rehabilitation program. Among workers who did not display symptom magnification syndrome, 76% continued to work full-time at 6 months, in contrast to 39% of those with symptom magnification syndrome (P = .006).

Multiple Concurrent Risks

I Abegglen et al[5] completed a hierarchical regression analysis of individuals following mild to moderate work injury, where older age, sex (men), and higher scores on the job design, somatic condition/pain, and anxiety elements of the Work and Health Questionnaire (WHQ) were identified as risk factors in the final model that demonstrated a medium effect size on days of work disability (f_2 = 0.17). Heymans et al[148] performed a secondary analysis of data from a prior RCT[147] and identified several prognostic factors that were significantly associated with lasting RTW. Multivariate analysis identified that pain intensity, pain radiation, workers' predicted timing of RTW, job satisfaction, expectations about the success of treatment by the occupational physician, and social support contributed to lasting RTW. Kinesiophobia was related to later RTW during long-term follow-up. Multivariate analysis explained 18% of the variance in the RTW model, indicating that despite a significant association with these prognostic factors, RTW was not predictable. Roesler et al[267] and Haahr and Andersen[133] reported that higher injury severity, higher pain, lower self-efficacy, and more functional limitations are risks for work disability. van der Weide et al[323] reported that radiating pain, high functional disability, poor interpersonal relationships, and high work demands were related to delayed RTW (P = .0001), while a high-avoidance coping style predicted functional disability at 3 months for workers with LBP (P = .004). At 12 months, psychosocial factors, including lack of energy and social isolation, more accurately predicted functional disability (P<.001). Vendrig[329] reported that self-perceived disability (P<.001) and self-report of decreased pain (P<.01) were closely related to a successful RTW. Hunt et al[160] reported that physical examination findings alone in out-of-work workers with subacute LBP had limited prognostic value in predicting RTW at 3 months (60%-69% correct classification), and concluded that nonmedical (eg, psychosocial, work, and economic) factors may be more powerful predictors of the course of recovery than medical assessments.

II Armijo-Olivo et al[14] examined prognostic factors for RTW following upper extremity injuries. Multivariate modeling revealed that (1 to 5 prior claims with reference, 0 prior claims; OR = 1.69, $P = .0007$) greater than 21 physical therapy visits (reference, 10 or fewer visits; OR = 4.2, $P<.001$), and total Disabilities of the Arm, Shoulder and Hand (DASH) score (OR = 1.01, $P = .01$) were predictive of work status at 90 days.

II Abásolo et al[4] found that osteoarthritis not including the spine (HR = 1.75; 95% CI: 1.14, 2.6), inflammatory disease (HR = 1.66; 95% CI: 1.01, 2.72), sciatica (HR = 1.30; 95% CI: 1.08, 1.56), and duration of previous episodes (HR = 1.00; 95% CI: 1.00, 1.01) were all risk factors for recurrent/subsequent additional work absence. de Buck et al[76] found that individuals with chronic arthritic or rheumatic problems who had a period of complete sick leave were 4 times more likely to experience job loss at 2 years (OR = 4.74; 95% CI: 1.86, 12.07).

II Ernstsen and Lillefjell[89] investigated the impact of physical functioning on RTW in patients with comorbid musculoskeletal pain and depression. They reported that self-reported physical functioning measures (muscle strength, mobility, endurance capacity, and balance) were inversely related to RTW following a 57-week rehabilitation program. The odds of a participant with higher self-reported physical functioning measures of being on an active work re-entry strategy were 23% to 39% lower compared with those with poorer physical function. This suggests that depression impacts RTW and should be further investigated and considered in treatment planning.

II Kuijpers et al[189] developed a clinical prediction rule for work-related shoulder pain during a 6-month period to help identify workers who may be at risk for sick leave. Risk factors included cause (overuse injury/strain), sick leave in the prior 2 months (3 categories: none, 0-1 week, greater than 1 week), pain intensity (3 categories: 0-3, 4-6, 7-10), and psychological comorbidities (anxiety, distress, depression).

III Stromberg et al[298] found that increased duration of posttraumatic amnesia was associated with work disability in individuals following closed brain injury (duration of 3-4 weeks; models varied slightly at 1, 2, and 5 years). Preinjury employment and high school/equivalent education were associated with better long-term employment outcomes. Turi et al[307] reported that following an aneurysmal subarachnoid hemorrhage, patients had decreased RTW 1 year after stroke if they were older, depressed, and/or anxious ($P = .052$).

Gaps in Knowledge

Future research may identify an optimal tool or battery of tools and examination measures to identify and stratify workers at risk for delayed recovery to inform clinical prognosis. Clinical research investigating risk-targeted interventions may also strengthen practice.

Evidence Synthesis and Rationale

Several risk factors for delayed RTW can be detected during the examination process. Strong evidence has consistently identified radicular signs and symptoms,[146,148,279,323] pain severity/symptomatology/behaviors,[14,133,189,263,267,279] and the extent of functional disability determined via self-report instruments[14,21,101,133,223,279] as being associated with delayed RTW and not returning to work. Prior work absence[4,76] or episodes of leave[14,251] were also noted in the literature as risk factors for work disability. A history of and/or current comorbid psychological conditions and musculoskeletal pain may impact the patient's participation in treatment and RTW/stay at work.[82,89] While the conditions related to work injury are numerous, results were consistent across different areas.

Strong evidence indicates that a patient's beliefs, perceptions, and motivations regarding injury and RTW impact the course of recovery and time to RTW following a work-limiting injury.[14,55,102,133,154,211,253,267,273,278,287,296,297,323,329,347,352] The risk factors identified in these studies were fear of movement/fear-avoidance beliefs, decreased motivation to RTW, pain severity, perceived ability/disability, recovery expectations, self-efficacy, and satisfaction with one's health care provider. Risk factors can be identified during evaluation and the course of care through patient interviewing and the use of validated tools. Some of the tools used to identify these risk factors include the work subscale of the FABQ (score greater than 27.5), Tampa Scale of Kinesiophobia, RMDQ, expectations of recovery, and ODI.[347] This list should not be regarded as all inclusive, but reflects the tools used to identify risk factors relative to RTW in the above investigations to serve as examples for clinicians. There are other tools available to clinicians that are not linked to RTW, which is why they have not been included here. Two examples include the Optimal Screening for Prediction of Referral and Outcome[111] and the Patient-Reported Outcomes Measurement Information System.[59]

Early identification of patients at risk for delayed RTW can inform treatment by allowing physical therapists to integrate appropriate approaches and/or to refer patients for necessary evaluation and treatment by other providers. For patients with multiple psychosocial risk factors who are not progressing or participating in treatment, referral to a psychologist may be beneficial. Discussion with stakeholders regarding psychologist referral is encouraged, although the GDG recognizes that there has been resistance to the inclusion of psychology by some stakeholders, who fear this will delay recovery and increase costs. There is literature to support cognitive behavioral therapy (CBT) intervention, but this is beyond the scope of this review. The potential benefits of early identification and management of recovery barriers far outweigh the costs associated with work injury cases, which include the medical and productivity costs to the worker, employer, insurer, and society (see the Economic Burden section). There is additional time required for the physical therapist to administer and score relevant questionnaires and/or interview the worker, but the time is modest and of benefit. The early identification of barriers to recovery far outweighs the cost of ineffective treatment and ongoing work absence. Data on many of the risks noted in this section are already being collected as part of routine physical therapist examination; therefore, the GDG believes that there will be a low cost of implementation.

Recommendation

A Physical therapists should screen for risk factors associated with delayed RTW or work absence throughout the episode of care, using patient interviewing and validated tools. Risk factors include type of injury, previous injury episodes, extended work absence prior to referral, comorbidities, and the presence of psychosocial factors such as high levels of perceived or self-reported functional disability, severity of pain, pain behaviors, fear-avoidance beliefs, low recovery expectations, and low self-efficacy.

SOCIOECONOMIC AND WORK ENVIRONMENT FACTORS

Educational Level

I Hou et al[157] found more years of higher education to be associated with early RTW in individuals with traumatic orthopaedic injuries, while Storheim et al[296] found no impact of level of education on RTW following back pain.

II Two systematic reviews identified that lower education was associated with longer sick leave for a broadly defined workforce and specifically for individuals with arthritis.[223,297] Several other studies found that education was not associated with ability to RTW in individuals categorized with musculoskeletal pain.[14,190] One study found higher education to be associated with working full-time at 5 years post injury, but not at 10-year follow-up.[208]

Evidence Summary

There are conflicting findings about the relationship between level of education and delayed RTW. Whether less than high school education is a barrier to returning to work and/or higher education is a facilitator remains in question. Researchers noted that education may need to be considered in the context of the type of work and socioeconomic factors such as the competitiveness of related labor markets to fully understand the impact of education on RTW.[208,223,297]

Recommendation

D Based on conflicting evidence, a physical therapist should not use educational level as an isolated risk factor for delayed RTW and work participation following injury.

Work Demands and Policy

I Øyeflaten et al[251] found that workers performing manual job duties had a lower probability of being at work and a higher probability of full disability payment when compared to administrative or professional workers (RTW HRR = 1.69; 95% CI: 1.29, 2.22; sick leave HRR = 0.73; 95% CI: 0.57, 0.94).

I Kapoor et al[173] showed that individuals with acute back pain and higher levels of physical work had lower/negative expectations about returning to work (P<.001). Storheim et al[296] found physically demanding jobs, irregular shifts, and strict routines to be potential predictors of not returning to work full-time (P<.05). Heymans et al,[148] using a univariate analysis, found that daily bending and high trunk rotation demands negatively impacted RTW status for employees with back pain (P<.10), but not when performing a multivariate regression analysis.

I Kuijpers et al[189] found overuse (OR = 1.9; 95% CI: 1.1, 3.5) to be 1 of 4 risk factors in a prediction model related to sick leave for individuals with shoulder pain. Higher physical workload and lower decision authority were also associated with longer sick leave at the univariate level, but not at the multivariate level. Haahr and Andersen[133] found that individuals with manual jobs (OR = 3.0; 95% CI: 1.0, 8.7) and high work-related physical strain (OR = 8.5; 95% CI: 1.0, 74.7) had poor global improvement at 1 year following onset of lateral epicondyle tendinopathy, although Roesler et al[267] found that job classification was not predictive of RTW for individuals with broadly defined traumatic hand injuries.

I van der Weide et al[323] found that prognostic factors related to delayed RTW included high work quantity and problematic relationships with work colleagues (both HR = 0.82; 95% CI: 0.73, 1.00). Poorer RTW outcomes were also found with limited employee influence on work planning (HRR = 1.40; 95% CI: 1.03, 1.90)[289] and lesser willingness of work colleagues to listen (HRR = 1.33; 95% CI: 1.03, 1.72).[289] Schultz et al[278] found skill discretion and coworker support to be significant (P<.10) but only weakly associated with RTW and cost models, respectively, following back pain. Abegglen et al[5] reported the job design element of the WHQ as one of several factors predicting days of work disability (f_2 = 0.47).

I Schultz et al[279] found that work accommodation was a predictive variable for workplace impact on occupational disability for workers experiencing back pain. Availability of accommodation was associated with better prognosis for RTW (73.7%) than non-RTW (40%). The integrative predictive model developed by the authors, which included medical, pain, psychosocial, and workplace factors, had an overall prediction rate of 77.6%, correctly classifying 80.5% of RTW and 74.4% of non-RTW. The study also found that union members were 2 to 3 times more likely to RTW than nonmembers.

II Physical demands or work classification were identified as risk factors in several studies. Abásolo et al[4] found that manual work was a risk for delayed RTW in individuals with musculoskeletal conditions compared to those in administrative/professional-type positions (HR = 0.86; 95% CI: 0.79, 0.94), as well as for injury recurrence (HR = 1.19; 95% CI: 1.00, 1.42). Frequent kneeling was also a factor for recurrent problems (HR = 1.39; 95% CI: 1.15, 1.69).[4] A systematic review by Street and Lacey[297] found that jobs with high levels of manual work were associated with extended absence. Lydell et al[208] found no predictive effect for bending (P = .513), heavy physical labor (P = .472), or heavy lifting (P = .314) after 5 or 10 years, but found light labor as a positive predictor for RTW at 5-year follow-up compared to heavy physical labor (95% CI: 1.3, 17.7).

II Fransen et al[101] identified job requirements including lifting 75% of the day, compared with lifting up to 25% of the day (OR = 1.9; 95% CI: 1.3, 2.8) and lack of light duties (OR = 1.8; 95% CI: 1.3, 2.7), as significant risk factors negatively impacting RTW following back pain. A systematic review by Rinaldo and Selander[263] identified unsuitable equipment and bad postures as risks for non-RTW in individuals with back, neck, or shoulder problems. Keeney et al[177] identified several work-related baseline predictors of reinjury in bivariate associations (including heavy lifting, whole-body vibration, physical demands, fast pace, and excessive amounts of work; P<.05) 1 year after back injury; however, only constant whole-body vibration was significant in multivariate modeling (P = .04).

II Strong evidence of the impact of work accommodation to reduce delayed RTW and costs was found in a systematic review with mixed-level studies (fewer than half the studies were RCTs).[100] This included the role of early assessment, contact with the workplace or RTW coordinators, and ergonomics. Longer durations away from work were found in a systematic review with studies of various evidence levels when light duties were not available as an accommodation, and increased rates of RTW were noted when workplace-based/coordinated RTW services were available for individuals with neck, back, or shoulder pain.[263] Busse et al,[48] in a high-level retrospective cohort study, found that claims resolved almost twice as fast when RTW programs were available for those with back pain (HR = 1.78; 99% CI: 1.45, 2.18). Availability of modified work significantly lowered duration of wage replacement in univariate analysis (OR = 0.65; 95% CI: 0.51, 0.82), but not in multivariate analysis including the DASH, in individuals with work-related upper extremity injuries.[14] Muenchberger et al[232] conducted a multistage study, identifying work risk predictors that were clinically useful in facilitating RTW. Items that facilitated RTW included a proactive response by the employer, workplace accommodations, elimination of risk factors from the workplace, and modified work.

Work-Related Psychosocial Factors

I Clausen et al[67] reported that employees who perceive their work to have low meaning, based on the Copenhagen Psychosocial Questionnaire, had a lower probability for returning to work than colleagues with a high meaning (HR = 0.69; 95% CI: 0.49, 0.97). Similarly, Brouwer et al[38] reported that perceived work attitude (HR = 1.33; 95% CI: 1.01, 1.75), self-efficacy (HR = 1.49; 95% CI: 1.12, 1.99), and perceived social support (HR = 1.39; 95% CI: 1.12, 1.99) are relevant predictors of time to RTW. Stapelfeldt et al[289] identified that only "job satisfaction" significantly predicted RTW (HRR = 3.26; 95% CI: 1.03, 10.3; n = 30). Abegglen et al[5] found self-report measures of job design (including elements of job control, learning, and perceptions of impact) to be predictive of days of work disability (f_2 = 0.47).

II Heymans et al[146] found moderate to poor job satisfaction to be associated with higher risk of not returning to work at 6 months following sick leave for back pain as part of a clinical prediction rule, but the variance explained by the model was limited. Rinaldo and Selander[263] found that lack of coworker/supervisor support and experiencing exclusion in decision making about work ability also hindered RTW. Svedmark et al[302] reported high perceived stress (15-month estimate, 3.11; 95% CI: 0.93, 5.28) and low "control of decision" (15-month estimate, –3.09; 95% CI: –5.84, –0.33) to be associated with more neck pain, increased neck disability, and decreased work productivity in women after a rehabilitation intervention.

Evidence Synthesis and Rationale

For individuals with general musculoskeletal or upper extremity problems, physical demand/type of work was the most consistent work-related risk factor for delayed RTW.[4,101,133,143,148,177,251,297] Worker-colleague relationships were also consistently identified in the literature as impacting RTW.[263,279,289,323] The influence of factors related to nonphysical work demands, such as psychological demands, meaningfulness, satisfaction with work, and influence on work planning, was also found across subgroups.[67,132,263,267,278,279,289] Across multiple studies, work policy factors related to employer response following injury, specifically the availability of RTW programs, modified duties, or ergonomic changes, were noted to serve as a facilitator of or barrier to RTW outcomes.[14,48,100,101,232] While some information on job demands may be identified during history and examination, worker reporting and knowledge of RTW programs may be limited, negatively impacting the physical therapist's ability to plan for timely and appropriate RTW. Timely and appropriate RTW can be significantly influenced by the clinician's knowledge of risks/barriers and facilitators that can impact care planning, as well as influencing determination if health services need to supplement or replace graduated RTW. Routine communication of information on job demands and availability of RTW programs could aid in minimizing RTW delays, although there are limited systems to accomplish this and case-by-case queries are routine. The time and effort of therapist communication between supervisors and stakeholders can be seen as inefficient and costly, yet there are few systems that routinely facilitate communication of RTW programs, policies, and job information. Employer policy and job description information may be difficult to access or lack detail relevant to rehabilitation. Process improvement related to accessing accurate and relevant job content and RTW policy could improve efficiency in the rehabilitation process.

Recommendation

B Physical therapists should assess work demands, work-related psychosocial factors, and workplace policies regarding the availability of transitional or modified work to identify potential RTW barriers and inform the treatment plan.

CLINICAL PRACTICE GUIDELINES

Examination

BODY FUNCTIONS AND STRUCTURES

There were few articles identified in the literature search regarding body function and structure examination measures specifically associated with RTW. As the focus of this CPG considers the ICF domains of activities and participation related to work, readers are reminded that this document is meant to be used as a companion to complement condition-specific CPGs/best practices.

Assessment of Body Functions and Structures

I Hunt et al[160] evaluated whether physical examination variables could predict RTW status in sick-listed workers with subacute LBP. Only lumbar extension mobility was statistically significant (P = .039) at 3 months and allowed correct prediction of RTW in 62.9% of cases. There was a trend for significance for a functional test composite score created from the McKenzie push-up, prone active extension, active sit-up, bilateral straight leg raise, and timed walk (P = .055). This functional composite score had an overall correct classification rate of 61.6%, and the authors concluded that medical variables alone were not strongly predictive of RTW status at 3-month follow-up.

I Werneke and Hart[345] investigated anatomical pain patterns to assess the validity of the modified Quebec Task Force Classification system and the Pain Pattern Classification system to classify patients, and to predict pain and disability at discharge and work status at 1 year. They reported that the Pain Pattern Classification system predicted pain intensity and disability at the time of discharge from rehabilitation. Although this study lacked precision, patients classified as having noncentralized symptoms were almost 9 times more likely not to RTW (OR = 8.8; 95% CI: 1.9, 40.1).

Evidence Synthesis and Rationale

While assessment of body functions and structures is often considered a standard of practice during examination, there were limited studies to support the use of body structure and function measures when used in isolation to predict RTW outcomes. Detection of red flag contraindications and client safety often involves body function and structure examination, necessitating systems review and targeted examination of a worker as part of a baseline evaluation to avoid significant harm. Several studies in the Risk Factors section refer to elements of body function and structure examination that support the use of examination measures in this area.

Recommendation

D Physical therapists may screen for red flags and examine body functions and structures that underlie functional limitations in conjunction with activities and participation measures to develop an RTW prognosis and plan of care.

SELF-REPORT MEASURES

Work Ability Index

I Roelen et al[265] examined the predictive ability of the Work Ability Index (WAI) to identify male construction workers at risk of premature work exit. While scores on the WAI did not correlate with risk of early retirement (area under the curve [AUC] = 0.58; 95% CI: 0.53, 0.61) or unemployment (AUC = 0.51; 95% CI: 0.47, 0.55), the WAI was found to have a sensitivity of 0.63 and specificity of 0.83 for risk of disability pension at follow-up, as well as fair discrimination (95% CI: 0.70, 0.77), with discriminative ability of the WAI decreasing with age.

III Bethge et al[28] examined whether the WAI was associated with modifiable behavioral and occupational health risks, health service utilization, and intended rehabilitation and pension requests in people aged 40 to 54 years who received sickness benefits in 2012. They found that lower scores on the WAI were associated with a higher prevalence of occupational risk (relative risk [RR] = 1.74-2.4, P<.0001) for factors such as high job demands, high effort-reward ratio, or low procedural/relational justice, but were only slightly increased for behavioral health risks (RR = 1.26-1.54, P<.001), including factors such as high body mass index or exercising less than 2 h/wk. People with low WAI scores had 4 times the health care utilization as those with high scores. Risk of intended rehabilitation and pension requests was 4 to 6 times higher in those with low WAI scores. The authors concluded that the WAI is a useful screening tool for identifying those workers on sick leave with a probable need for rehabilitation.

III Notenbomer et al[241] explored the association between work ability as determined by the WAI and the frequency and duration of sickness absence. Scores on the WAI were negatively associated with frequent (OR = 0.85; 95% CI: 0.82, 0.88), long-term (OR = 0.79; 95% CI: 0.75, 0.82), and combined sickness absence (OR = 0.74; 95% CI: 0.71, 0.77; P<.001), with WAI scores for these participants being significantly lower (mean WAI score, 37.2-41.2) than those for the individuals in the reference group (mean WAI score, 43.2). Kinnunen and Nätti[183] investigated 2 items of the WAI as predictors of disability pension and long-term sickness absence over a 3-year follow-up. These items were "current work ability compared with lifetime best" (work ability score) and "Do you believe that, from your health perspective, you will be able to do your current job 2 years from now?" (future work ability). Risk of disability pension was higher for the response of poor current work ability (HR = 9.84; 95% CI: 6.68, 14.49) than for moderate current work ability (HR = 1.59; 95% CI: 1.32, 1.92). Similarly, disability pension risk was high for those who reported poor future work ability (HR = 8.19; 95% CI: 4.71, 14.23). These same measures predicted an increase in the number of days of long-term sickness absence. At 3-year follow-up, work ability score (IRR = 3.08; 95% CI: 2.19, 4.32) was a better predictor of long-term sickness absence days than future work ability (IRR = 1.51; 95% CI: 0.97, 2.36).

The DASH

II Armijo-Olivo et al[14] investigated the addition of the DASH tool to a generic model predicting RTW in individuals with upper extremity musculoskeletal conditions (including fractures, dislocation, sprains, strains, contusions, nerve damage, or joint disorders); AUC improved from 0.70 to 0.76 with use of the DASH. Various combinations of factors were explored to find the best predictive model. The final model included the generic model plus the DASH and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) (AUC = 0.77). The authors also looked specifically at the predictive validity of item 23 on the DASH, which has to do specifically with work. They found no statistically significant difference when adding the full DASH score (AUC = 0.77) or item 23 alone (AUC = 0.76) to the final model for analysis. The authors concluded that the DASH tool contributes significantly to predictability for RTW beyond generic factors, and that item 23 has equal predictive ability to the total score of the DASH. Dale et al[74] evaluated the responsiveness to change of a modified version of the work portion of the DASH questionnaire. Changes in modified DASH work subscale scores at 1 year were moderately correlated with changes in work ability (r = 0.47), work productivity (r = 0.44), and symptom severity (r = 0.36).

III Moshe et al[231] identified predictors of RTW in patients with upper-limb conditions. Participants' scores on the DASH questionnaire were the only significant independent predictor of RTW (OR = 0.92; 95% CI: 0.84, 0.99), with average DASH score in the non-RTW group (55.7) being significantly higher than in the RTW group (26.6).

Other Self-report Measures

I Abegglen et al[5] examined the validity of the WHQ in workers with minor to moderate injuries. They also examined the prognostic ability of the WHQ to identify workers at risk of a complicated rehabilitation. Good model fit was found with the following 5 factors: job design, work support, job strain, somatic condition/pain, and anxiety/worries. Internal validity of the WHQ in workers with an insurance claim for a mild to moderate injury was supported. Furthermore, the WHQ was found to have good psychometric properties useful in identifying workers with multiple psychosocial risk factors. Increased number of days of disability were found to be related to older age (P<.001), male sex (P<.001), and higher scores on the following WHQ subscales: job design (P<.05), somatic condition/pain (P<.001), and anxiety/worries (P<.001).

I Bergström et al[22] and Gabel et al[105] examined the predictive ability of the original Örebro Musculoskeletal Pain Screening Questionnaire (generally related to spinal conditions) and the broader Örebro Musculoskeletal Screening Questionnaire, which applied to a broader group of musculoskeletal conditions. Cronbach's alpha for the internal consistency of the total Örebro Musculoskeletal Pain Screening Questionnaire score was .87,[22] whereas that of the Örebro Musculoskeletal Screening Questionnaire was .83.[105] The Örebro Musculoskeletal Screening Questionnaire was found to have high test-retest reliability (r = 0.978, P<.001).[105] The AUC for the Örebro Musculoskeletal Pain Screening Questionnaire ranged from 0.67 (least accurate; for predicting sickness presenteeism) to 0.93 (most accurate; for predicting disability pension).[22] For prediction of long-term sick leave, accuracy decreased with time (AUC = 0.81 from 0-6 months, AUC = 0.69 from 13-24 months). Gabel et al[105] showed predictive validity of the Örebro Musculoskeletal Screening Questionnaire through positive likelihood ratios for absenteeism, long-term (28 days or more) absenteeism, functional status, problem severity, high cost, no absenteeism, and low cost. Sensitivity of the Örebro Musculoskeletal Pain Screening Questionnaire was 0.89, with a cutoff score of 90, but specificity was 0.46.[22] Findings suggest that routine assessment of psychosocial risk factors in employees with LBP could be useful in predicting future work disability, and that the Örebro Musculoskeletal Screening Questionnaire was shown to retain the predictive capacity of the original Örebro Musculoskeletal Pain Screening Questionnaire.

I Gatchel et al[109] examined the association between Pain Disability Questionnaire scores taken before and after an interdisciplinary functional restoration program and health-related outcomes at 1-year follow-up in people with chronic disabling musculoskeletal disorders. Higher prerehabilitation Pain Disability Questionnaire scores were associated with decreased work retention. Higher postrehabilitation Pain Disability Questionnaire scores were associated with decreased rates of RTW, decreased work retention, and an increase in the number of individuals seeking care from another provider. Furthermore, Pain Disability Questionnaire scores were found to be associated with psychosocial factors such as perceived pain intensity and depression.

I Roy et al[270] examined the discriminative validity of the Chronic Pain Grade Questionnaire and its ability to predict disability and work status in workers with chronic upper extremity injuries. Baseline scores on the Chronic Pain Grade Questionnaire did not predict outcomes related to upper extremity disability, work productivity loss, or work instability. Initial scores on the Chronic Pain Grade Questionnaire predicted work status at 6 months, but only when considering those participants who were not working at baseline. The Chronic Pain Grade Questionnaire was not predictive of RTW.

I Shaw et al[282] investigated the validity of the Back Disability Risk Questionnaire (BDRQ) for predicting the development of chronic back disability. Classification accuracy of the BDRQ was 75.0% (sensitivity, 44.8%; specificity, 88.8%). The presence of persistent pain, functional limitation, or impaired work status was predicted by the following 7 factors in the BDRQ: injury type, work absence preceding medical evaluation, job tenure, prior back surgery, worries about reinjury, expectation for early RTW, and stress. Thus, the BDRQ may be useful in providing prognostic factors for disability in workers with back pain.

I Trippolini et al[305] investigated the reliability and validity of the 20-item Modified Spinal Function Sort (M-SFS) using a test-retest design. The M-SFS measures a worker's perceived self-efficacy to perform work-related tasks. The authors reported no ceiling or floor effects. The M-SFS total score for all participants was 54.4 ± 16.4 and 56.1 ± 16.4 for test and retest, respectively. Internal consistency was: Cronbach's α = .94 and .95 for test and retest, respectively. The test-retest reliability measured with the intraclass correlation coefficient (ICC) was 0.90 (95% CI: 0.84, 0.94).

II Backman et al[19] designed and pilot tested the Ergonomic Assessment Tool for Arthritis (EATA) in a population of workers with inflammatory arthritis. The EATA consists of both self-report and clinician-assessment components. Assessment forms were individualized based on job demands. At 12 months, 85% of ergonomic recommendations based on the EATA had been implemented for 73% of participants. The authors concluded that the EATA is an effective tool to identify and implement solutions to reduce ergonomic risk factors by collaborating between occupational therapists and their clients in a single consultation. The EATA was able to assess workers in a range of occupations with varying job demands.

II Ross et al[269] examined the ability of the Worker-Based Outcomes Assessment System (WBOAS) to improve treatment effectiveness and decrease cost of care delivered by physical and occupational therapists. The WBOAS includes the following self-report measures in part or in entirety: the SF-36, Treatment Outcomes in Pain Survey, and Work Limitations Questionnaire. Physical and occupational therapy care that included the WBOAS was found to improve physical functioning, injury avoidance, and cost-adjusted income based on these dimensions ($P \leq .05$). Mental health, pain symptoms, and RTW or stay-at-work success, as well as cost-adjusted outcome on these dimensions, were not improved ($P > .05$).

II van Schaaijk et al[326] evaluated the reproducibility of the Work Ability and Work Functioning instruments. Work ability is the extent to which people are capable of doing their job satisfactorily with respect to the job demands and their health. Work functioning is described as the relationship between health-related capacities and the ability to fulfill obligations to meet expectations in the workplace. The participants completed the Work Ability questions and composite Work Functioning questionnaire twice, 1 week apart. General, physical, and mental/emotional Work Ability items had moderate ICC values of 0.52, 0.69, and 0.56, respectively. The ICC values for the Work Functioning instrument were found to have good reliability at 0.85. Generally, the standard error of measurement of the Work Ability instrument ranged from 0.71 to 0.75 across multiple dimensions. The smallest detectable change in the Work Ability elements ranged from 1.98 to 2.09. The standard error of measurement of the Work Functioning score was 4.78, and the smallest detectable change was 13.25.

II Wästberg et al[342] performed a psychometric analysis of the Worker Role Self-assessment instrument. Test-retest reliability using Altman categories ranged from "fair" to "very good," with most items showing "good" or "moderate" agreement. Internal consistency was measured in 2 samples, with a Cronbach alpha at the 1- to 2-week interval between sampling of .75 at the first measurement and .83 at the second measurement, while values for the first visit and the completion of the work training portion of the intervention were .65 and .78, respectively. One item showed good predictive validity of rehabilitation outcomes (*P*

= .009; "I do not think work will be part of my life in the future"). The utility of the Worker Role Self-assessment was found to be good, but a ceiling effect was found that caused limitations to assess change. Because of this, the authors recommend revision of the Worker Role Self-assessment, with further testing to follow.

III Many other studies found varying degrees of support for additional measures, including the Readiness for Return-to-Work (RRTW) scale,[35,256] the RMDQ,[81] and the Worker Role Interview.[328]

IV Haraldsson et al[139] reported good content validity of the Structured Multidisciplinary work Evaluation Tool, a questionnaire that evaluated 3 areas of work: physically experienced, psychosocially experienced, and environmentally experienced demands.

Gaps in Knowledge

Future research may identify the optimal questionnaire or battery of questionnaires and examination measures to identify risk of delayed recovery in individuals with work-limiting injury or illness and stratify the degree of risk.

Evidence Synthesis

Many self-report measures have been published (**TABLE 6**). The WAI was found to be predictive of disability pension, long-term sickness absence, and workers who would benefit from a rehabilitation program, but not of unemployment or early retirement.[28,241,265] Scores on the DASH were found to be predictive of RTW outcomes in workers with upper extremity conditions.[14,231] The DASH work subscale, or item 23 alone, may be considered in place of the full DASH questionnaire. The WBOAS, Worker Role Self-assessment, and Chronic Pain Grade Questionnaire were found to have conflicting ev-

TABLE 6 SELF-REPORT MEASURES EXAMINED IN THE LITERATURE AND THEIR RECOMMENDED USES

Outcome Measure/Study	LoE	Population	Validated for
BDRQ Shaw et al[282]	I	Adults with nonspecific low back or thoracic pain of occupational origin, with onset or exacerbation in the past 14 days	Sensitivity, 44.8%; specificity, 88.8%. May be useful in providing prognostic factors for disability in workers with back pain
CPGQ Roy et al[270]	I	Individuals with work-related injuries attending upper extremity specialty clinics	Baseline CPGQ scores could predict work status at 6 months, but could not predict outcomes related to upper extremity disability, work productivity loss, or work instability
DASH			
Armijo-Olivo et al[14]	II	Workers' compensation claimants with upper extremity injuries	Adding the DASH to a generic model aids in predicting return to work. Item 23 alone has equal predictive ability to the total DASH score
Moshe et al[231]	III	Patients with upper-limb disorders referred for an occupational fitness evaluation	The DASH score was a significant predictor of return to work
DASH work subscale Dale et al[74]	II	Healthy workers possibly at risk for carpal tunnel syndrome	Changes in DASH work subscale scores at 1-year recall were moderately correlated with changes in work ability, work productivity, and symptom severity
EATA Backman et al[19]	II	Workers with inflammatory arthritis	Helps provide and implement solutions to reduce ergonomic risk factors
M-SFS Trippolini et al[305]	I	Patients with chronic (>3 months), nonspecific musculoskeletal disorders	Recommended to assess perceived self-efficacy for work-related tasks
ÖMPSQ Bergström et al[22]	I	Employees with back pain	Good internal consistency. Sensitivity, 0.89 with a cutoff score of 90; specificity, 0.46. Most accurate for predicting disability pension and least accurate for predicting sickness presenteeism. Accuracy in predicting long-term sick leave decreased with time
ÖMSQ Gabel et al[105]	I	Patients with acute musculoskeletal injuries	Good internal consistency and high test-retest reliability. Predictive validity for absenteeism, long-term absenteeism, functional status, problem severity, high cost, no absenteeism, and low cost
PDQ Gatchel et al[109]	I	Patients with chronic, disabling musculoskeletal disorders	Higher scores are associated with decreased work retention, decreased rate of return to work, increased number of patients seeking care from another provider, and psychosocial factors
RMDQ Denis et al[81]	III	Female nurses with low back pain	Worse disability on the RMDQ is correlated with increased work limitation. The RMDQ scores showed strong discrimination between nurses in the regular group and those in the off/modified work group
RRTW			
Braathen et al[35]	III	Patients in a 5-day inpatient rehabilitation program with musculoskeletal disorders, mental health problems, or fatigue syndromes	Satisfactory content validity and internal consistency

Table continues on page CPG30.

TABLE 6 Self-report Measures Examined in the Literature and Their Recommended Uses (continued)

Outcome Measure/Study	LoE	Population	Validated for
Park et al[256]	III	Patients with open workers' compensation claims for musculoskeletal disorders	Satisfactory construct validity and concurrent validity
SMET Haraldsson et al[139]	IV	Not available	Evaluates physically, environmentally, and psychosocially experienced demands. Very good content validity; good pragmatic and communicative validity
WAI			
Roelen et al[265]	I	Male construction workers	Scores on the WAI are associated with risk of disability pension. No correlation with risk of early retirement or unemployment was found
Bethge et al[28]	III	People aged 40-54 years who received sickness benefits in 2012	The WAI is sensitive for identifying workers with a probable need for rehabilitation. Lower scores were associated with higher prevalence of occupational and behavioral health risks, as well as increased health care utilization
Notenbomer et al[241]	III	Employees in the Netherlands who participated in an occupational health survey	Poor to moderate scores are associated with disability pension and increased number of days of long-term sickness absence
WBOAS Ross et al[269]	II	Patients with musculoskeletal injuries referred to physical/occupational therapy	Physical/occupational therapy care including the WBOAS improved physical functioning and injury avoidance. It did not improve mental health, pain/symptoms, or return-to-work or stay-at-work success
WHQ Abegglen et al[5]	I	Workers with minor to moderate injuries	Internal validity is supported; good psychometric properties are useful for identifying workers with multiple psychosocial risk factors
WRI Velozo et al[328]	III	Workers with low back pain recruited from industrial rehabilitation, workers of all injury types recruited from work-hardening programs	The WRI is not supported as a valid measure for predicting return-to-work outcomes
WRS Wästberg et al[342]	II	Unemployed patients with chronic pain syndromes, stress-related disorders, and/or medical/social problems	Satisfactory test-retest reliability and internal consistency. A ceiling effect affected sensitivity to change. Authors of this CPG recommend revision and further testing
Work Ability and Work Functioning instruments van Schaaijk et al[326]	II	People working at least 12 h/wk at the same job for the past 4 weeks	The Work Ability instrument showed moderate reliability and the Work Functioning instrument showed good reliability

Abbreviations: BDRQ, Back Disability Risk Questionnaire; CPG, clinical practice guideline; CPGQ, Chronic Pain Grade Questionnaire; DASH, Disabilities of the Arm, Shoulder and Hand questionnaire; EATA, Ergonomic Assessment Tool for Arthritis; LoE, Level of Evidence; M-SFS, Modified Spinal Function Sort; ÖMPSQ, Örebro Musculoskeletal Pain Screening Questionnaire; ÖMSQ, Örebro Musculoskeletal Screening Questionnaire; PDQ, Pain Disability Questionnaire; RMDQ, Roland-Morris Disability Questionnaire; RRTW, Readiness for Return-to-Work scale; SMET, Structured Multidisciplinary work Evaluation Tool; WAI, Work Ability Index; WBOAS, Worker-Based Outcomes Assessment System; WHQ, Work and Health Questionnaire; WRI, Worker Role Interview; WRS, Worker Role Self-assessment instrument.

idence in RTW outcomes.[269,270,342] The benefits of using these self-report measures (establishing an RTW prognosis, determining suitability for rehabilitation, and informing the plan of care) outweigh the time to administer and score the tools. Patients who have a higher risk of delayed RTW may need different treatment from that for those who have low risk. This will be discussed in the Interventions section.

Recommendation

B Physical therapists should, during the initial evaluation, use validated self-report measures, such as the WAI and DASH work subscale, that specifically address RTW in order to estimate RTW-related outcomes and guide the course of treatment.

ACTIVITY LIMITATIONS – PHYSICAL PERFORMANCE MEASURES

Physical performance measures in work rehabilitation are performance-based tests used to evaluate the worker's ability to perform physical tasks related to work. Most of the investigations assessed worker ability with a commercially available Functional Capacity Evaluation (FCE), a series of performance-based tests that include material handling, mobility, and sustained positional tolerance. There are additional indications for physical performance measures (FCE) that are beyond the scope of this guideline.

Use of Physical Performance Tests to Identify Work Ability

I Gross and Battié[123] investigated the Isernhagen Work Systems FCE and reported that this FCE was a weak predictor of work ability in 336 patients with upper extremity work-related injuries. They reported that heavier weights lifted from waist height to overhead (HR = 1.5-1.7) and floor to waist (HR = 1.2-1.3) were modestly associated with faster RTW. Similarly, Kuijer et al[188] explored to what extent the standardized Isernhagen Work Systems FCE matched observed work demands in workers with chronic LBP. They reported that 7 of the 11 FCE activities analyzed could be directly matched with work demands. The standardized Isernhagen Work Systems FCE was not able to match all observed work demands in the 18 occupations studied.

II Matheson et al[216] evaluated the ability of the Isernhagen Work Systems FCE tests of lifting ability and grip force to determine RTW in a population of out-of-work individuals. The Isernhagen Work Systems FCE lifting ability (floor to waist, waist to crown, horizontal) and 2 measures of grip force (whole-hand isometric grip force) were used in the study. For each Isernhagen Work Systems FCE performance variable, those who returned to work performed better than those who did not RTW (all, $P<.05$). Of the performance variables, only floor-to-waist lift ($P = .028$) was related to RTW, with greater lift ability related to improved likelihood of RTW. Grip test performance was not related to RTW.

II A study by Chapman-Day et al[61] investigated the impact of symptom magnification syndrome on rehabilitation and RTW. The presence of symptom magnification was determined from information gathered from 13 measures during intake and from results of an FCE, which was used to establish a work-conditioning/work-hardening program. The RTW status was determined by the therapist by comparing the patient's current functional ability to the employer's job description or self-reported job demands described at intake. If the therapist deemed the patient to be able to perform all functions, the patient was categorized as RTW "full duty." If the patient could meet some but not all demands, RTW "modified duty" was recommended. Some patients were determined to need further medical care and were discharged from the program to return to active care with their physician. Following discharge from the program, chi-square analysis found no relationship between symptom magnification scores and status at discharge. The RTW full-duty rate for those with symptom magnification was 72% and for those without was 80%, a nonsignificant difference, suggesting that symptom magnification does not affect RTW.

III Denis et al[81] reported that the RMDQ and Sørensen back extensor endurance test correctly classified 87% of the nurses' work status. The authors noted that the RMDQ was the single best measure to discriminate between the off/modified work group and the regular work group of nurses, with 92% sensitivity and 83% specificity (based on a cutoff score of 2.5 on the RMDQ and 67 seconds for the Sørensen test). The authors concluded that both the RMDQ and Sørensen test can be used as diagnostic and prognostic tools in this Canadian nursing population.

II Gross et al[130] used the WorkWell FCE (formerly the Isernhagen Work Systems FCE) at the beginning and end of the rehabilitation program to evaluate the rate of clinically important functional change in workers with musculoskeletal disorders. The clinically important rate of change, 5 kg/wk, was based on workers who returned to work at their preaccident status.

III Gross et al[129] reported that better performance on the Isernhagen Work Systems FCE was related to faster time to total temporary disability suspension and claim closure. Claimants were approximately 9% less likely to experience total temporary disability suspension at any time in the follow-up year for each FCE task item rated as "failed." Greater amounts of weight on the floor-to-waist lift were crudely associated with case closure. Increased number of failed tasks was related to longer time to claim closure.

Short-Form FCE (an Abbreviated Physical Performance Test) to Predict Work Ability

I Branton et al[36] evaluated the ability of a short-form FCE to predict future timely and sustained RTW. They reported good predictive work ability: subjects who did not fail any FCE items were 5.5 times (95% CI: 3.42, 8.89) more likely to have benefits suspended, and 5.5 times (95% CI: 2.73, 10.85) more likely to have their claim closed over the following year, compared to subjects who failed 1 or more items. This compared favorably with the full FCE from which it was derived. Similar to the full FCE, they reported that overall FCE performance was not significantly associated with future recurrence (OR = 1.31; 95% CI: 0.48, 3.60).

II Gross et al[128] found no statistically or clinically relevant differences between the short-form FCE, which takes less time to complete, and the standard FCE regarding median claim duration, days to claim closure, and recurrence.

III Gross et al[127] developed a short-form FCE based on 3 items from the Isernhagen Work Systems FCE, and then validated the data from a cohort of participants who had undergone the Isernhagen Work Systems FCE. A second validation was composed of participants who had undergone a modified 1-day FCE. After Cox regression analysis, only 3 items remained independently predictive. These 3 items were maintained within the short-form FCE and included floor-to-waist lifting, crouching, and standing. They reported that data analysis of the 3-item FCE was comparable to the predictive ability of the Isernhagen Work Systems FCE ($P = .05$).

Ability of FCEs to Predict Sustained Work Ability

I Kuijer et al[188] used the standardized Isernhagen Work Systems FCE in a small sample of 18 participants to determine whether the FCE results could be matched to the participants' job demands. They found that the general (not job specific) FCE result did not predict participants' ability to perform specific job demands and did not predict sick leave.

I Gross and Battié[124] found that 46 of 226 patients (20%) experienced a recurrent back-related event within the year following FCE, with 16% of those with a higher number of failed tasks having recurrent events, in contrast to 25% of those with fewer (fewer than 8) failed tasks having recurrent events after RTW. Gross et al[122] also reported that the FCE did not predict sustained work ability in 336 patients with upper extremity work-related injuries, with no difference found based on the type of upper extremity injury.

II Chapman-Day et al[61] identified the presence of symptom magnification during intake and FCE. They reported that at 6-month follow-up the relationship between symptom magnification and work status was statistically significant (P = .006), but not immediately following an industrial rehabilitation program. This suggests that although symptom magnification does not predict RTW (study details discussed above), it may impact sustained work ability several months later.

II Gross and Battié[123] reported that the Isernhagen Work Systems FCE performance indicators were not significantly correlated with self-reported outcomes of work status (future recurrence) (r = 0.02-0.07), pain intensity (r = 0.02-0.09), and disability (r = 0.08-0.26).

Reliability and/or Validity of FCE Models

Job-Specific FCE

II Cheng and Cheng[63] examined the predictive validity of a job-specific FCE for RTW of patients with distal radius fractures. The FCE protocol used a psychophysical testing approach and was customized to be job specific. Among the patients, 63.9% were classified with a pass rating and 36.1% had a fail rating. The recommendation to "return to previous job" (94.83%) was correct more often than the recommendations "do not work at the moment" (60.47%), "change job" (52.63%), and "return to previous job with modifications" (9.38%). A longer period from injury to FCE and compensable injury reduced the predictive ability of the job-specific FCE. The authors concluded that the job-specific FCE could have better predictive validity in patients with a specific injury versus a nonspecific injury, particularly in determining whether workers can return to their previous job.

The Ergo-Kit FCE

I Gouttebarge et al[115] reported poor criterion-related validity for future work disability for the 2 isometric Ergo-Kit FCE lifting tests ($-0.17<r<0.07$) and moderate validity for the 3 dynamic lifting tests ($-0.47<r<-0.31$), especially the carrying/lifting strength test. Predictive validity for sustainable RTW was poor.

II Caron et al[56] evaluated the relevance of the Ergo-Kit FCE findings for health care professionals making RTW determinations, and also explored the relationship between the patient's self-report and test findings. Discriminative validity and convergent validity evaluated with Pearson correlation coefficients showed poor convergent validity between the scores on the Von Korff questionnaire and the Ergo-Kit FCE lifting tests ($-0.29<r<0.05$).

The Physical Work Performance Evaluation

II Lechner et al[194] examined the predictive validity of the Physical Work Performance Evaluation by determining whether the test results accurately predicted the worker's RTW status at discharge and at 3 and 6 months post discharge from a work rehabilitation program (n = 30). They reported moderate agreement (κ = 0.69-0.74) between the recommendations for RTW based on the FCE and actual RTW actions, suggesting that the FCE is a valid predictor of RTW ability.

II Tuckwell et al[306] evaluated the test-retest reliability for 9 tasks in the "dynamic strength," "position tolerance," and "mobility" sections of the Physical Work Performance Evaluation. The authors reported substantial test-retest reliability (κ = 0.75-0.77) for 4 dynamic strength tasks of the Physical Work Performance Evaluation. Percentage agreement for the 3 "position tolerance" tasks ranged from 66.7% to 83%, and the kappa coefficients also varied widely (κ = 0.38-0.70), with sitting being the weakest and better scores for standing and kneeling. Mobility tasks had variable agreement (κ = 0.19-0.60), with better agreement for squatting and walking than for stair climbing.

The Blankenship FCE

III Brubaker et al[40] determined the sensitivity and specificity of the validity criteria of 4 components of the Blankenship FCE, and reported a sensitivity of 80% and a specificity of 84.2% in determining submaximal effort. The 70% cutoff score developed by the Blankenship group was shown to provide the greatest diagnostic accuracy for determining effort. Five indicators of validity were shown to have 70% sensitivity or greater and 12 indicators had 100% specificity.

Progressive Isoinertial Lifting Evaluation

II Haldorsen et al[135] used physical testing to place a patient into a prognostic category for RTW. The evaluation included a self-report questionnaire, spinal mobility, number of tender points, the sock test, and the progressive isoinertial lifting evaluation. They reported that the instrument differentiated patients with different prognoses for RTW, independent of the type of treatment, especially for patients classified with poor prognosis. For those with poor prognosis, 44% returned to work after 14 months, compared to 61% among patients with good prognosis and 57% among patients with medium prognosis.

II The Progressive Isoinertial Lifting Evaluation was used to investigate the sensitivity and specificity of maximal-effort testing in FCE by Lemstra et al[196] in a population of out-of-work workers with back pain. One group was instructed to perform maximally and the other group was instructed to perform at 60% of their perceived maximum, but to act as if they were performing maximally. The test protocol, performed by a physical therapist, included the Progressive Isoinertial Lifting Evaluation, hand-grip tests, and a clinical examination. The evaluator correctly identified maximal performance in 30 of 46 (65.2%) workers (sensitivity). Submaximal performance was correctly identified in 37 of 44 (84.1%) workers (specificity). The probability that the worker was correctly classified in the 100%-effort group was 30 of 37 (81.1%) (positive predictive value). The probability that the worker was correctly classified as submaximal was 37 of 53 (69.8%) (negative predictive value). The false-negative rate was 34.8% (workers performing maximally who were classified as performing submaximally).

Semi-structured Interviews to Determine Work Ability

II Gross et al[121] compared the improvement in functional levels at baseline and at discharge between WorkWell FCE results and the patient's report during a semi-structured functional interview based on the WorkWell FCE. They found that claimants undergoing FCE had 15% higher average functional work levels recommended at time of assessment ($P<.002$), but differences at other follow-up times were smaller (0%-8%) in favor of functional interviewing and not statistically significant. Gross et al[120] compared the functional outcome and difference in compensation between a semi-structured interview and the WorkWell FCE. The interview took place during a half-day session (1.5-3 hours). Functional levels were similar across groups (mean, 2.4 out of 4 for FCE, 2.3 out of 4 for interview; $P = .58$), representing a mean difference of 3%. In regard to compensation outcomes, there were no statistically significant differences between groups.

The Joule FCE

IV The interrater reliability for the Joule FCE was investigated by Mitchell et al[224] for lifting and carrying (bilateral and unilateral) and forceful tasks (lifting, bilateral and unilateral carrying). Interrater reliability for determining the last safe weight lifted for each forceful task subtest of this FCE protocol was high as evaluated by the ICC (greater than 0.90), with narrow CIs ranging from 0.738 to 0.987 for unilateral nondominant carry and from 0.939 to 0.997 for waist-to-floor carry. Reasons for terminating tests and identifying maximum safe capacity were also identified as having high interrater reliability as determined by percentages of agreement, ranging from 97.2% to 100% for reasons for terminating tests and from 97.2% to 98.6% for identifying maximum safe capacity, but full agreement for identification of last weight safely lifted in forceful tasks was only between 8.3% and 50%.

II Although the study by Scheman et al[275] did not assess a specific FCE model, the authors investigated whether an evaluator's instructions impacted results. Pretesting and posttesting was done as part of a pain management program, and there were 2 patient cohorts. The 2 groups comprising the first cohort received different instructions, while the instructions were the same for the second cohort groups. There was no significant difference in performance between groups when the 2 groups received the same instructions prior to testing. But when a patient group was instructed that test results would determine job classification, there was less improvement in their performance following 3 weeks of treatment than for patients advised to perform to the best of their ability. Patients told to do their best improved significantly more than the other group on all 3 measures (floor-to-waist lift, waist-to-chest lift, and weight carried).

Evidence Synthesis and Rationale

Most of the studies included in this systematic review investigated specific commercially available FCE models to evaluate work ability. Investigations used varied methodology, making comparative analysis challenging. Full FCE protocols generally include 11 to 15 performance tasks and last 3 to 6 hours over 1 day. There is moderate evidence that lifting tests (primarily floor to waist) predict time to recovery and current work ability.[122,129,135,216] Material handling tasks have demonstrated better reliability than mobility and positional tolerance tests.[306] There is strong evidence that FCE does not predict sustained RTW, which is not surprising, because there are multiple psychosocial, workplace, and environmental factors that impact sustained work that are beyond the clinician's ability to control and assess. Standardized FCEs may not match a worker's specific job requirements,[188] an important consideration because job-specific testing is reported to have better predictive validity.[63] When determining a worker's ability to return to a particular job, a job-specific test is indicated. Users of FCEs should be aware of the reliability and validity outcomes that support or refute the FCE model or specific performance measures used, and should be aware that not all studies demonstrated validity or consistency across all subtests of a model. Physical therapists need to consider the worker's stage of healing, symptom reports, and physiological responses during performance testing to ensure safety. Additional research on test method reliability, validity, usefulness, and safety is available outside the specific scope of this systematic review. Barriers to implementing FCE include the evaluator's time to administer the test and report the results and the costs associated with the full test battery. A short-form FCE and semi-structured interviews have been found to mitigate these barriers without negatively impacting outcomes.

The short-form FCE and semi-structured interviews had similar outcomes (predicting time to recovery) as those of a full FCE,[36,128] which improves the utility and cost-effectiveness of these performance measures. Gross et al[128] also reported good worker satisfaction with the shortened test battery. The short-form FCE has protocols for the trunk and upper and lower extremities, with 5 primary tasks per protocol (combinations of material handling, mobility, and positional tolerance). Therapists can add additional measures if needed. Both the short-form FCE and semi-structured interviews take 1.5 to 3 hours to perform. Full-battery FCE, short-form FCE, and semi-structured interviews are most often performed at the end of a subacute treatment episode, when a fitness-to-work determination is needed. These tests are also performed prior to initiating and at the termination of an RTW program.

Clinicians engaged in treating workers with work-limiting conditions are able to evaluate the worker's ability to perform his or her essential job functions during the course of care by administering relevant and reliable physical performance tests. The use of selected item performance tests (with therapist discretion to add relevant tests) is supported by moderate evidence.[81,122,128,129,135,216] In addition to cost savings, testing in this manner can be more easily integrated into a treatment session than longer, more comprehensive testing. By using physical performance tests throughout the treatment episode, the clinician can monitor the worker's response to testing and adjust the activity/exercise program as necessary. Testing throughout the episode of care provides stakeholders with specific information regarding the worker's ability and tolerance for RTW. Testing relevant performance measures during the course of care would preclude the need for a comprehensive test at the end of a treatment episode.

Gaps in Knowledge

Future research should aim to elucidate the most efficient testing methodology, especially for evaluation of movement and positional tolerance, sustained work tolerance, and clinician training protocols.

Recommendation

B Physical therapists should use valid and reliable physical performance tests throughout the episode of care to measure the individual's work ability, and to inform treatment and prognosis, which may include a full FCE, a short-form FCE, job-specific functional testing, or other performance measures.

PSYCHOSOCIAL FACTORS

The following studies validated tools that evaluate both work and psychosocial factors to identify people at risk of delayed recovery or delayed RTW.

I Abegglen et al[5] reported that the WHQ has good psychometric qualities (internal validity), with high clinical utility to identify injured workers with multiple psychosocial risk factors for a complicated recovery. They identified 5 subscales, and each subscale was predictive of at least 1 of the evaluated outcomes 18 months post injury. The 5 coefficients demonstrated a significant relationship with days of working disability: sex, age, job design (P<.05), somatic condition/pain (P<.001), and anxiety/worries (P<.001).

I Margison and French[211] reported that the Örebro Musculoskeletal Pain Questionnaire could correctly predict clinical discharge status ("fit" versus "not fit" for RTW) for 85% of claimants after a standardized 6-week physical therapy–based work-conditioning program. The derived Örebro Musculoskeletal Pain Questionnaire cutoff score of 147 was tested in 2 language groups, both separately and combined. The combined validation group showed that 85% of 211 cases were correctly classified. Sensitivity was 37.5%, specificity was 89.2%, the positive predictive value was 28.6%, and the negative predictive value was 94.6%.

II Haldorsen et al[135] developed and validated a brief standardized screening instrument to differentiate patients with good, medium, or poor prognosis for RTW. The screening instrument consisted of a patient-completed questionnaire (15 questions related to psychological and motivational factors, based on earlier research) and physical therapy evaluation that included flexibility, tender points, the sock test, and the Progressive Isoinertial Lifting Evaluation. Their instrument differentiated patients with different prognoses for RTW, independent of the type of treatment. This was especially the case for patients classified to have poor prognosis

(44% returned to work after 14 months, compared to 61% among patients with good prognosis and 57% among patients with medium prognosis).

II Iles et al[163] reported the predictive validity of the Plan of Action for a Case tool that allows case managers to identify workers at risk of delayed RTW. The 41-item Plan of Action for a Case tool gathered information from the worker, health practitioner, and employer, improved the ability to identify workers at risk of ongoing work disability, and identified modifiable factors for a case manager–led intervention (P<.001).

The following studies validated tools that evaluate fear-avoidance beliefs to predict people at risk for delayed recovery or delayed RTW.

I Fritz and George[102] reported that the work subscale of the FABQ was the strongest predictor of work status of the variables tested on 78 workers with LBP. The negative likelihood ratio was 0.08 for scores less than 30, and the positive likelihood ratio (meaning the presence of fear-avoidance beliefs) was 3.33 for scores greater than 34.

I Wideman and Sullivan[346] developed a cumulative prognostic factor index to better evaluate prognosis and to facilitate decisions regarding clinical management. They reported that the risk associated with problematic recovery increases with cumulative prognostic factor index scores above 0 and that levels of risk are most severe with elevated scores on all 3 psychosocial factors (fear of movement, depression, and pain catastrophizing).

The risk of delayed recovery for workers with subacute LBP was investigated with the following tools.

I Schultz et al[276] determined the predictive validity of a Psychosocial Risk for Occupational Disability Scale using a paper-and-pencil version. Stepwise backward elimination resulted in a model with these predictors: expectations of recovery, SF-36 vitality, SF-36 mental health, and Waddell symptoms. The correct classification of RTW/non-RTW was 79%, with sensitivity (non-RTW) of 61% and specificity (RTW) of 89%.

I Shaw et al[282] assessed the validity of the BDRQ to predict development of chronic back disability. The BDRQ is a 16-item patient questionnaire that provides a self-assessment of factors related to prognosis for work-related back pain. The study included 519 working adults seeking outpatient care for acute, work-related back pain. Classification accuracy of the BDRQ was 75.0% (sensitivity, 44.8%; specificity, 88.8%). Classification accuracy at 3 months was 76.3%.

I Fritz et al[103] reported that nonorganic tests, using the definitions given by the Waddell symptoms screen, did not demonstrate predictive validity for RTW for people with subacute LBP.

II Carleton et al[53] reported an association between Waddell's symptoms screen and measures of psychological distress, pain, and treatment outcomes. Patients who endorsed more than 2 of Waddell's symptoms reported higher levels of psychological distress, perceived disability, pain intensity, and pain duration. Patients in the negative symptoms group were significantly more likely to RTW (50%) in comparison to people in the positive symptoms group.

II Franche et al[99] reported acceptable internal validity and concurrent validity of the RRTW scale. The RRTW scale was used to assess the stage of readiness for RTW in a cohort of workers who had been absent from work due to a work-related back or upper extremity musculoskeletal disorder. For workers not working, 60% of the variance was explained by 4 factors: (1) precontemplation, (2) contemplation, (3) prepared for action: self-evaluative, and (4) prepared for action: behavioral. For those working, 58% of the variance was explained by 2 factors: (1) uncertain maintenance and (2) proactive maintenance.

III Park et al[256] examined the construct and concurrent validity of the RRTW scale in a population of claimants enrolled in an occupational rehabilitation program. They reported that construct and concurrent validity of the RRTW scale was supported based on their analysis. Mental health was found to significantly compromise RTW with the non–job attached/not working group.

Evidence Synthesis and Rationale

Tools and screening examinations have been investigated for their reliability and validity in identifying the presence of psychosocial factors, alone or in combination, that contribute to delayed recovery or delayed RTW. These tools are listed in **TABLE 7**. Pain severity, pain catastrophizing, fear of pain, readiness for change, and psychosocial factors at the workplace may impact recovery, and their presence can be identified through questionnaires and some exam processes. While Waddell's nonorganic signs and symptoms may suggest the presence of psychosocial factors that might interfere with recovery, diagnostic accuracy has not been demonstrated. As seen in the Ernstsen and Lillefjell[89] investigation, self-reported physical function was inversely

TABLE 7 — Exam Questionnaires Validated for the Indicated Psychosocial Construct

Psychosocial Factor	Validated Questionnaire
Psychosocial and work factors	Work and Health Questionnaire[5] Örebro Musculoskeletal Pain Questionnaire[211] Plan of Action for a Case[163]
Fear-avoidance beliefs	Fear-Avoidance Beliefs Questionnaire[102,154] Cumulative prognostic factor index[346]
Psychosocial factors and low back pain	Psychosocial Risk for Occupational Disability Scale[276] Back Disability Risk Questionnaire[282] Waddell's symptoms screen[53]
Stage of change	Readiness for Return-to-Work scale[99,256]

related to RTW in patients with comorbid depression, indicating that RTW is impacted by more than physical factors. The use of screening tools can enhance the information obtained during verbal patient interaction, and the results can be used to inform treatment and monitor progress during the course of care.

Recommendation

A Physical therapists should administer reliable and valid tools, as part of the evaluation and throughout treatment, to identify the presence of fear avoidance, psychosocial risk, or readiness for change, which impact RTW outcomes, to guide patient management.

JOB DEMANDS

Understanding job demands is a key component of activity and participation prognosis, care planning, and RTW decision making. Job demands form the goal or standard in assessing vocational abilities. Several studies identified measures that aim to characterize work demands as a discrete activity or as part of a job-matching activity.

I Baker and Jacobs[20] evaluated the accuracy of using remote methods (tele-ergonomics) to identify demands/risks and potential mismatches between workers and their computer workstations. Sixteen diagnostic questions of the Computer Workstation Checklist were used, with photographs to supplement the questions. Remote ergonomic evaluation was compared to results of an onsite computer workstation visit, with 92% of mismatches identified, sensitivity of 0.97, and specificity of 0.88.

II Backman et al[19] looked at development of the EATA, which included a self-report instrument component and semi-structured ergonomic assessment interview (with supplemental photographs). The interview components include a work task summary, questions about work organization/work process, and physical demand questions related to sitting, standing/walking, upper extremity use, and material handling. In addition to a content validation process, the tool was evaluated in pilot testing, demonstrating feasibility as a comprehensive ergonomic assessment and usefulness/flexibility to assess both office work and physically demanding jobs. At 1 year, 85% of recommendations were implemented by 73% of the participants.

III Velozo et al[328] researched the Worker Role Interview, which examines a worker's physical status and functional performance, motivation, lifestyle, capacity, and environmental elements. The 3 studies included in the article found that the semi-structured interview had good measurement properties/reliability and was independent of diagnosis; however, none of the variables predicted RTW, with ORs of 0.33 to 1.00. The authors concluded that the semi-structured interview may help identify potential worker-work disconnects between perceptions/ability or help identify barriers to RTW.

IV Escorpizo et al[90] reviewed ICF core sets for arthritis and musculoskeletal problems to identify measures that related to productivity and employment, linking questionnaires to domains relevant to ICF core sets for arthritis and musculoskeletal problems. All of the questionnaires considered ICF-relevant information related to activities and participation (including employment). The aim of the study was not to propose which questionnaires were preferred; however, the Workplace Activity Limitations Scale, Work Role Functioning Questionnaire, and 25-item Work Limitations Questionnaire had the highest coverage of ICF work-related activities commonly discussed in this CPG, including carrying, moving, and handling objects (d430-d445), interpersonal relationships (d710-d760), and elements of general tasks and demands (d210-d240). The overall kappa coefficients for percentage of linkage agreement with ICF categories were 0.75 for the Workplace Activity Limitations Scale (bootstrap CI: 0.61, 0.94), 0.66 for the Work Role Functioning Questionnaire (CI: 0.47, 0.94), and 0.73 for the 25-item Work Limitations Questionnaire (CI: 0.66, 0.84).[90]

Clinical Application of Job-Demand Information

II Bernacki et al[23] noted that for RTW planning to be effective, a task or job analysis should be performed. Lambeek et al[192] completed a process evaluation of an integrated care program that focused on achieving patient, supervisor, and therapist consensus on the best ways to promote graded activity and RTW. Physical workload (36.4%) and work design (25.5%) were the most frequently identified work barriers. Common RTW solutions focused on work design (25.3%), training (22.2%), and equipment changes (20.7%).

V Michel et al[222] analyzed patterns of data collection for work rehabilitation programs, finding that job-related information was most often collected at program entry (89%) or at the end of the program (66%). The most common methods of data collection were individual interview (91%) and self-administered questionnaire (71%). Obstacles to RTW (84%) and feasibility of work modification (90%) were commonly discussed as part of care, but collection information on fitness for work data occurred in less than 50% of cases. Job information was used to adapt programs in less than 20% of centers, although it was almost always used in requests for RTW medical examination and approximately two thirds of requests for determining disability status.

The use of job-demand information found in the Methods section of a number of intervention studies illustrates the need for a practical examination method that helps identify the abilities or gaps in work ability at the time of evaluation/re-evaluation. Common examination methods identified in intervention studies in this CPG that were used to establish and progress a plan of care include job analysis and related questionnaires,[23,63,76,98,205,276,292] ergonomic assessment,[68,70,172,252,262] and functional/performance-based examination.[34,61,63,89,187,188,266,304]

Gaps in Knowledge

Job analysis or description is seen as a key element of determining worker needs and goals, yet research on the topic is limited. There is a research gap in understanding what specific data-collection methods and job information are relevant and necessary for developing an effective plan of care, as well as information on the accuracy of worker- or employer-provided job information for RTW interventions or stay-at-work planning.

Evidence Synthesis and Rationale

This CPG did not identify any specific examination measures of job demands, although several studies[19,20,90,328] identified measures that considered situational or generalized descriptors of worker status/job demands that may help the clinician identify potential RTW (or stay-at-work) barriers. Prospective studies discussing ergonomic assessment[19,20] and interview[328] had limited strength and modest sample sizes and provided minimal specifics on assessment criteria. Baker and Jacobs[20] showed good sensitivity and specificity in clinical determination of mismatches between workers and work, but the study was small. Although information provided by the employer or case manager is often considered as a best-practice standard, no relevant studies were identified in this search, and there is no regulatory or policy guidance in most states on providing health care providers with this information.

Job taxonomies may provide some generalizable information on jobs and are often used as a starting point for interviews, but they lack individual specificity when used in isolation and require validation/adaptation with the worker to meet the intent of the ADA. The benefit of employer-provided information compared to worker-reported information may be the employer stakeholder understanding essential functions/demands, although explicit review with a worker can also provide insights into problem areas, dated or inaccurate data, and barriers to/facilitators of RTW. Because job descriptions are not routinely provided to physical therapists, decisions about how to obtain data often relate to feasibility and resource use as well as worker reporting ability. Data requests to an employer and data triangulation between the employer and worker may provide the strongest content validity, although physical therapists may find this impractical and rely on easily available information. The human resources cost of performing a formal job analysis on every job may be considered cost prohibitive, although some type of measurement (or semi-structured interview) may help clinicians objectively document/determine worker status and progress. From a systems perspective, multiple medical and case management stakeholders rely on work-related information, and future efforts to obtain job descriptions and provide them as a standard part of injury reporting, claim submission, or medical referral should be considered.

While research on job analysis was limited in this study, the need/value of relevant information in identifying clear RTW limitation and goals is long-standing.[290] Job information is critical to RTW decisions, as well as staging clinical/home activity progression of the worker. Articles identified in this literature search illustrated that job information is consistently sought and used by clinicians in the development of a clinical plan of care,[23,34,61,63,68,70,76,89,98,172,187,188,205,252,262,266,276,292,304] with low quality evidence that most information is likely generated from interviews, self-administered questionnaires, or ergonomic analysis.[23,63,68,70,76,98,172,205,222,252,262,276,292] Not understanding the job/possible modifications may limit therapist development of effective intervention options and negatively increase the costs and duration of care.[192]

Recommendation

C Physical therapists should document essential functions and exertional job-demand information as part of examination to develop an RTW prognosis and plan of care, and to guide RTW decision making. Information sources may include job or ergonomic analysis, company documents, and/or interviews.

ADMINISTRATIVE AND ECONOMIC OUTCOME MEASURES

Administrative measures, such as case closure or DAFW, and economic measures, such as employer-related costs and medical costs, are cited as primary or secondary outcomes in the literature. Case closure is an administrative measure that marks the regulatory end of a work-related injury or illness. This indicates that the worker has achieved maximum medical improvement with the primary rehabilitation goal of returning to work. Return to work is described further as sustained work over a period of time, return to restricted or modified work, or modified productivity expectations. Economic measures include both direct and indirect costs to the employer and costs of services rendered from the time of injury to case closure. This information is tracked for individual workers or at a program level.

II Wasiak et al[341] suggested an expanded phase-based conceptualization of RTW outcomes, with descriptions including off work, work reintegration, work maintenance, and work advancement. After reviewing current literature, these are also categorized as "tasks and actions," "contextual," or "process-driven" outcomes.

III Cheng et al,[65] rather than defining outcome by "achieving" or "not achieving" physical therapy goals such as the absence of impairment or pathology, recommended that measures of outcome should consider the perspectives of the employer, patient, and physical therapist. For the employer, successful treatment results in the return of an injured worker to her or his job responsibilities. In this study, rehabilitation provider goals and employer goals were moderately correlated, 81% of patients achieved rehabilitation provider goals, and 77% achieved desired employer outcomes.

IV Vogel et al[337] suggested that in contrast to using RTW as a singular outcome, alternative metrics should be used to evaluate the success or effectiveness of rehabilitation programs, as well as for administrative benefits. Proposed measures include attempts to RTW (no attempt, failed attempt, successful attempt), current working status (working/not working), duration of RTW (greater or less than 3 months in duration), and number of working hours (less than preinjury or equal to/greater than preinjury).

Gaps in Knowledge

There is a lack of consistency and comprehensiveness of RTW measurements.[337,341] Further research is needed to measure and determine factors that affect RTW and control for specific work status, such as being unemployed, off work, on restricted duty, or having a job change.

Evidence Summary

Administrative and outcome measures are not typically the focus of research; however, they are relied on to objectively measure change with intervention. The level of work returned to by the worker, case closure, case costs, and disability duration are examples of administrative and economic measures that are monitored over the course of care. There is moderate evidence that administrative and economic measures need to be relevant to the employee and the employer, as well as to justify interventions taken by the physical therapy provider.[65]

CLINICAL PRACTICE GUIDELINES

Interventions

COMMUNICATION AND COORDINATION OF SERVICES

Communication refers to sharing appropriate information among stakeholders such as the employer, employee, medical providers, therapy providers, and payers. This communication identifies the availability of modified or graded RTW, RTW barriers, or the need for workplace adaptation. Communication leads to the development of a coordinated plan of care that reflects common work-related goals between all stakeholders.

I A secondary analysis of prognostic factors of a randomized trial with a population of 351 workers sick listed for 3 to 16 weeks due to LBP compared usual care (medical consultation and physical therapy) with coordination of services with a case manager, integrating care between the rehabilitation physician, physical therapist, occupational therapist, social workers, specialists of social medicine, and the employer.[289] Coordination of services was more effective than brief intervention (usual care) when measuring RTW only in 3 subgroups of patients with low job satisfaction (HRR = 1.41; 95% CI: 0.77, 2.57), no influence on work planning (HRR = 1.23; 95% CI: 0.67, 2.25), and feeling at risk of losing their jobs due to their sick leave (HRR = 1.95; 95% CI: 0.78, 4.88).

I Coordination of services between medical providers, rehabilitation team members, and the workplace was shown to be cost beneficial in a 6-year follow-up study in a population with occupation-related back pain.[206] In the original study, workers with LBP and work absence of more than 4 weeks were assigned to 1 of 4 interventions: usual care, clinical rehabilitation, occupational intervention, or combined clinical and occupational intervention (referred to as the Sherbrooke model). Consequence-of-disease costs at 1-year follow-up were higher in the usual-care group ($7133) than in the experimental arms (respectively, $6458, $6529, and $6515) and much higher in the subsequent 5.4 years ($16 384 compared to $3586, $6291, and $545).

I Comparison between usual care alone and the addition of case coordination in populations with neck or back pain found no differences in RTW rates or employment status at 1-, 2-, and 5-year follow-ups.[233,258] The intervention groups met with a case worker to discuss work history, family life, obstacles to RTW, and facilitation of communication with the employer.

I No difference was found in the rate of RTW between groups involved in advice and education from a team and the same program with the addition of a case manager for coordination of communication among stakeholders.[166,227] Cost-effectiveness and cost-benefit analysis found that the brief intervention resulted in fewer sick-leave weeks and was less expensive than the addition of case management.[167]

I A systematic literature review showed no significant difference in work status outcomes when comparing usual care to the addition of case management for workers on sick leave or disability for at least 4 weeks.[338]

I A comparison of usual stroke care to the addition of workability assessment and workplace visits by the therapist and worker in a population of 80 previously employed stroke survivors aged 26 to 60 years was performed.[242] At 6-month follow-up, 60% in the intervention group returned to work, versus 20% in the usual-care group.

I A systematic review of studies that included workplace intervention, defined as promotion of changes in work design and organization, working conditions, or work environment through communication between workers and supervisors, included 14 RCTs involving 1897 workers.[327] Moderate-quality evidence supports workplace interventions to reduce time to first RTW. The effectiveness of workplace interventions differs based on cause of work disability.

II Communication, initiated by the physical therapist, directly with a workplace representative and the patient to identify workplace adjustments and to agree on an RTW plan was compared to standard physical therapy treatment.[271] There was a significant increase in quality-adjusted life-years after 12 months in the intervention group compared to the reference group (0.033, P = .01). Eighty-six percent of the intervention group was working for at least 4 weeks in a row at 12-month follow-up without report of sick leave, compared to 74% of the reference group (P = .01).

II The employee, the case manager, the occupational therapist/ergonomist, and the employer met at the employee's workplace to design an RTW plan within 1 week of sick listing.[15] Compared to traditional case management, this early work-focused intervention resulted in a total mean number of sick days of 110 in the intervention group, compared to 131.1 in the reference group ($P<.05$), during 0 to 6 months and 144.8 versus 197.9 sick days, respectively ($P<.01$), during 0 to 12 months.

II Comparison of a coordinated and tailored work rehabilitation approach with conventional case management showed a net benefit of the tailored approach of approximately $10 666 per person.[43] The coordinated and tailored approach included the occupational physician, physical therapist, chiropractor, psychologist, and a social worker who maintained contact with the workplace.

II A systematic review included 10 studies showing strong evidence that duration of work disability is reduced by work accommodation offers and contact between the health care provider and workplace, and moderate evidence that disability duration is reduced by interventions that include early contact with the worker by the workplace, ergonomic worksite visits, and presence of an RTW coordinator.[100] There is weak evidence that these interventions have an impact on quality-of-life outcomes.

II Lambeek et al[192] performed a study of a workplace intervention consisting of communication between the therapist, the patient, and the worker's supervisor that focused on work adjustments to facilitate RTW. Application of the program was appropriate when there were problems with communication with the employer and when patients showed chronic pain behavior. Application of the program was not recommended if the patient had any juridical conflict with the employer, lacked motivation, had uncomplicated LBP, or was physically very fit.

II A multidisciplinary program involving physicians, specialists, and physical therapists was compared to the same program with the addition of case management with an RTW focus.[210] The caseworkers contacted participants' employers by phone to inform them of the program and inquire about possible temporary modifications at work. The patients created an RTW schedule with the caseworker and the multidisciplinary team. The work-focused intervention had the same effect on pain and disability as control interventions.

II A pilot study compared RTW outcomes of conventional case management and an integrated occupational, clinical, and case management approach for 72 workers with nonspecific back pain lasting 4 to 10 weeks and with medium and high risks for disability.[277] By 6 months after the onset of back pain, workers with estimated high risk of work disability who received the integrated intervention were more likely to RTW than high-risk workers who received conventional case management. The intervention group had 87 workdays lost, compared to 120 days in the control group ($P = .016$).

II Usual care was compared to a participatory RTW program in a population of workers sick listed due to musculoskeletal disorders between 2 and 8 weeks.[332] The RTW plan consisted of communication between insurance representatives, the labor expert of the Dutch Social Security Agency, the sick-listed worker, and the RTW coordinator. The median duration until sustainable first RTW was 161 days in the participatory RTW program group, compared to 299 days in the usual-care group (log-rank test, $P = .12$). The median total number of days at work during the follow-up period was 128 days (interquartile range [IQR], 0-247 days) in the participatory RTW program group and 46 days (IQR, 0-246 days) in the usual-care group. An economic evaluation found that for each 1-day gain in time to RTW, there was a cost of approximately 80 euros (USD$106) using the participatory RTW program.[334]

III To be most effective, an RTW program includes a task or job analysis and identification of alternative work assignments, with participation of medical providers, safety professionals, injured employees, and supervisors and an individual trained in ergonomics to facilitate the job placement process.[23] In this study of the Johns Hopkins Facilitated Early Return to Work Program in Baltimore, MD, the number of lost workday cases decreased from 20 per 1000 to 10 per 1000 employees in the same periods.

Evidence Synthesis and Rationale

There is conflicting evidence regarding the impact of communication and coordination between all stakeholders on RTW. In the studies that controlled for risk of delayed recovery,[192,277,289,327] communication and coordination of services between all providers improve RTW outcomes and lead to cost savings. In the presence of an estimated risk of delayed RTW, when goals are not being achieved as expected, communication and coordination of services are indicated. Communication between the therapy provider, worker, and work supervisors identifies barriers to RTW, the availability of graded or transitional work, or the need for workplace modifications. Regarding workers with an estimated low risk for delayed RTW, multidisciplinary case management meetings are not beneficial in promoting RTW. A workplace visit with stroke survivors led to an improved rate of RTW in this population.

Recommendation

B Physical therapists should communicate and coordinate services with the employer, the employee, case managers, and health care providers in the presence of an estimated high risk for delayed RTW.

GRADED, MODIFIED, OR TRANSITIONAL WORK AS PART OF THE PLAN OF CARE

I van Vilsteren et al[327] performed a Cochrane review and found moderate-quality evidence that workplace interventions resulted in a reduction of work absence in workers with musculoskeletal disorders and of time to first RTW (HR = 1.55; 95% CI: 1.20, 2.01). High-quality evidence was found regarding the role of workplace adaptations, changes in work design/organization, equipment, or work environment changes in cumulative work absence, with a mean difference of 33.33 fewer days (95% CI: –49.54, –17.12). There was no evidence that workplace interventions impacted time to RTW in workers with mental health problems or cancer.[327] Ntsiea et al[242] found that workplace intervention for individuals employed prior to experiencing a stroke resulted in a 60% RTW rate, which was 3 times higher than a usual-care group at 6-month follow-up. Intervention was tailored according to functional ability and workplace challenges for individuals between 18 and 60 years of age and fewer than 8 weeks since the onset of stroke.[242] Those who received workplace intervention had better functional mobility, activities of daily living scores, and higher quality-of-life scores compared to those in the usual-care group.[242]

I Roels et al[266] performed a systematic review to identify interventions enhancing employment in individuals following spinal cord injury. There was significant variability of rehabilitation settings, duration of time since injury, and types of interventions. Only 1 high-quality RCT looked at supported employment: the results confirmed that a vocational intervention improved employment rate for people with spinal cord injury at 1- and 2-year follow-ups.[266] Even considering a number of cases of extended work absence, the results after 1 year found that the employment rate was 26% for competitive work (defined as a paying job earning at least minimum wage), compared to 10.5% in the treatment-as-usual interventional site control group and 2.3% in the treatment-as-usual observational control group.[266]

II van Duijn and Burdorf[324] found that individuals who engaged in modified work as part of their rehabilitation during their first episode of sick leave were less likely to have a recurrence of musculoskeletal sick leave compared to those returning directly to full duty (univariate association OR = 0.37; 95% CI: 0.18, 0.75; multivariate model OR = 0.35; 95% CI: 0.16, 0.78). Bethge[26] explored the long-term effects of graded RTW following a rehabilitation program for patients at the end of an orthopaedic, cardiac, oncologic, or psychosomatic rehabilitation program. The probability of disability pension was decreased by about 40% in the gradual RTW group (5.4% versus 8.6%; HR = 0.62; 95% CI: 0.49, 0.80), and accumulated time loss was reduced by 52 days (95% CI: 40, 64).

II One RCT found limited support (P = .10) for reducing work hours to part-time (and workload in some cases), with earlier sustained RTW (of 4 weeks) in the intervention group.[336] One cohort study in the review by Williams et al[348] found that adaptation of work hours and job tasks was effective for RTW after 200 days of sick leave, with an HRs of 1.41 and 1.78, respectively (95% CIs: 1.12 to 1.76 and 1.42 to 2.23, respectively).

II A systematic review with 1 RCT and 1 consecutive cohort study by Khan et al[181] found inconclusive evidence to support vocational rehabilitation as an intervention to improve job retention or RTW for individuals with multiple sclerosis, noting methodological limitations of studies and a need for clinicians to be aware of timing of interventions and the importance of identifying/managing barriers to work. van Duijn et al[325] found duration of sick leave to be influenced by chronicity and disability but not by modified work. van Duijn et al[325] identified conditions that may impact modified work feasibility: workers were less likely to return to modified jobs that required frequent lifting (OR = 0.16; 95% CI: 0.07, 0.40) or if they had low support from coworkers (OR = 0.29; 95% CI: 0.12, 0.69), but were more likely to return to modified duty for jobs with prolonged standing (OR = 5.21; 95% CI: 2.13, 12.75).

Gaps in Knowledge

Although research in this area shows consistent benefits of graded or modified work, there is a gap in research on the interplay of diagnostic groupings, job demands, and timing of intervention delivery.

Evidence Synthesis and Rationale

Research in this area spanned a number of conditions; however, there was moderate to strong evidence in favor of graded/modified work strategies reducing the duration of leave compared to usual care,[327,336,348] along with improved worker coping over subsequent episodes of care.[242,266,325] Individuals with musculoskeletal problems, those experiencing their first episode of work absence, those who have been out of work for 12 to 16 weeks, or those attempting to go back to work following cardiac conditions, stroke, or spinal cord injury may benefit most from this category of interventions.[242,266] There is mixed or no evidence of the benefits of modified work for individuals with multiple sclerosis, traumatic upper extremity injuries, and oncologic or mental health problems.[156,181,327] van Duijn et al's[325] results questioned whether jobs with frequent/prolonged demands may be less amenable to modified or graduated work, and whether delivery timing contributes to limited success in individuals with chronic progressive conditions. Additional information on the use of graded/modified work as part of a multicomponent intervention is discussed later.

The practical application of graded/modified work is consistent with physical/social benefits of work engagement and minimizing future disability. There are a number of potential barriers to implementation of graded or transitional RTW, which may include acute tissue healing, workplace familiarity and training of medical stakeholders to develop transitional work recommendations, and workplace or systems barriers. Barriers to transitional or modified work may extend beyond physical contraindications, so the term is used broadly—examples include jobs with frequent material handling that may not be amenable to modification and work/workplace limitations to implementing an intervention.[325] Physical therapist professional development, consultation with physical therapists proficient in RTW skills, and communication with stakeholders are viable options for enhancing clinical care. Conflicting evidence regarding recurrence is the only construct that might be considered related to harm, although the literature only identified recurrence of sick leave (which may be impacted by multiple factors), not reinjury. This is an important point because provider fear of worker reinjury could lead to medicalization (and iatrogenic disability), which may negatively impact clinician exploration of this intervention and reduce clinical effectiveness of care. Strategies such as designation of key contacts, shared job information, and communication among stakeholders may help reduce the impact of barriers and foster team competence/confidence and promote clear recommendations that promote transitional work programs. This section supports the premise that interventions can respect healing, while optimizing tissue remodeling and function.

As noted earlier in this review, a number of employers are integrating modified RTW into their policies and processes based on research, and expect health providers to partner with them in collaborative RTW planning. Because graded RTW is often combined with other strategies, cost information is presented later in this review. If transitional or modified duty barriers limit this intervention, progressive home and work simulation activities should be included in care until the barriers are addressed as part of stakeholder meetings.

Recommendation

B Physical therapists should provide consultation and recommendations to patients, employers, and the health care team for graded, modified, or transitional duties that promote work reintegration, while taking contraindications and barriers into consideration.

ERGONOMICS/PARTICIPATORY ERGONOMICS

Ergonomics is a broad term in occupational health, with a range of definitions and applications that address the efficiency and safety of work. This section considers studies focusing on ergonomic interventions impacting stay at work/RTW (secondary/tertiary prevention). The term *participatory ergonomics* used in this section considers the common definition applied at the individual worker/clinician level: actively involving workers in developing and implementing workplace changes that aim to reduce risks and improve productivity.[172,230] Ergonomic interventions will also be discussed as a component of multimodal interventions later in this section.

I Anema et al[13] found that worksite assessment and ergonomic work adjustment interventions had a beneficial effect on RTW in an RCT involving individuals out of work for 2 to 6 weeks due to back pain. The authors found that workplace modifications/adaptation of job tasks reduced the time needed to RTW by 27 days (P = .002) compared to usual care, with an HR of 1.7 (95% CI: 1.2, 2.3) for RTW.[13] The authors considered both the changes to physical demands and the process of collaborative assessment as mediators of positive outcomes.

II Franche et al[100] completed a systematic review (4 high-quality RCTs, 3 high-quality prospective cohorts, 3 high-quality non-RCT or pre-post design studies) to synthesize evidence on effectiveness of workplace-based RTW interventions and strategies that assist workers with musculoskeletal and other pain-related conditions to RTW after a period of work absence. Interventions included early contact with the worker, ergonomic site visit, supervisor training, and work accommodation. There was strong evidence that work disability duration is significantly reduced with work accommodation offers, and moderate evidence that it is reduced by interventions that include early contact with the worker by the workplace and ergonomic worksite visits. There was limited or insufficient evidence of sustainability of effects. Steenstra et al[292] found that work assessment and modification based on participatory ergonomics resulted in RTW 30 days earlier than usual care (95% CI: 3.1, 51.3). Arnetz et al[15] found that workplace ergonomics assessment and interventions reduced sickness absence compared to the reference group with case management, which had an OR of 1.9 at 6 months (95% CI: 1.0, 3.6) and an OR of 2.5 at 12 months (95% CI: 1.2, 5.1). Ergonomic improvements often included multiple interventions such as changes in work organization, work methods or task changes, tool changes, or vocational training. Franche et al[100] found moderate evidence that costs were decreased with early workplace/worker/health provider contact, ergonomic site visit, and work accommodation, although there was limited evidence of sustainability over 1 year. A cost-benefit ratio of 6.8 was reported (in addition to a shortened disability duration) by Arnetz et al,[15] with direct savings of USD$1195 per case in the intervention group (this is a conservative calculation, as indirect cost savings tend to be greater than direct costs).

Steenstra et al[292] reported that the workplace intervention group had slightly higher direct costs than the reference group.

II Verhagen et al[330] performed a Cochrane review on a range of conservative interventions for work-related complaints of the upper extremities, reporting the results of 2 studies relevant to the impact of ergonomic interventions that showed decreased sick leave (RR = 0.48; 95% CI: 0.32, 0.76); however, ergonomic interventions were not more beneficial compared to other interventions. Interventions largely included adjustments to office furniture, keyboards, and computer mice. Martimo et al[214] reported increased on-the-job productivity at 8 and 12 weeks when ergonomic improvements were made for injured workers with upper extremity disorders. Following ergonomic assessment, technical and administrative interventions included changes to tool/instrument use, education and self-care, work task adaptation, and new tools/equipment. While productivity losses decreased for both groups at 8 weeks, there were no significant differences between groups. At 12 weeks, both the proportion and magnitude of productivity loss were lower/more improved in the intervention group (P<.001).[214]

Gaps in Knowledge

Client needs and employer willingness to adapt workstations vary from case to case. Additional research into intervention clusters or patterns, and the impact of varying levels of worker-workplace interaction, may be helpful in determining best practices for work adaptation for individuals dealing with a work-limiting injury or illness.

Evidence Synthesis and Rationale

The majority of studies demonstrated improved RTW with ergonomic interventions, with a moderate to strong effect when compared to usual care.[13,15,100,292] Most programs involved a structured ergonomics element, although others noted informal, case-specific interventions for work-worker matching using modified work or other strategies to reduce stress/force/risk, consistent with secondary and tertiary prevention (which resulted in some vagueness in the recommendation). Higher levels of worker/stakeholder involvement may improve RTW outcomes.[214] The effect of ergonomics compared to other interventions or supplementing exercise is not clear. The use of ergonomics as a sole intervention aimed at minimizing time away from work was addressed in a limited number of studies; the largest application may be related to promoting "stay at work" (preventing or minimizing time out of work). Ergonomic interventions may not show an impact for 8 to 12 weeks.[214] Ergonomics principles (matching the worker and work) are consistent with the ADA and the Americans With Disabilities Act Amendments Act (fostering work participation with/without accommodations).[319]

While not all physical therapists may be comfortable performing ergonomic assessments, developing recommendations, or providing specialty adaptive equipment, ergonomics services are commonly available in many local settings and across provider networks or disciplines (such as ergonomist, engineering, etc). Beyond professional degree training, a growing number of physical therapists have advanced ergonomics training, certifications, or academic degrees. Physical therapists may also draw on internal practice referrals or clinical peer consultation services, depending on their setting and professional network. Practical and logistical considerations of video, photo, or workplace observations have been briefly discussed in the literature noted above, and employers may be willing to share information to minimize clinician time out of the clinic. Logistics for scheduling workplace visits often involves coordinated availability of both clinicians and stakeholders, which improves as processes are established and relationships are developed. The literature did not directly address payment, but work integration/reintegration is a common finding on fee schedules for individuals with work-limiting injury or illness. In some cases, employers or case managers can request performance of and payment for a workplace ergonomics/RTW assessment to help facilitate RTW. No harm was associated with ergonomic interventions. There were some conflicting cost/cost-benefit outcomes included in this group of articles, although costs of providing ergonomics were largely positive. Ergonomic interventions were found to be slightly more expensive than usual care/other intervention in the studies noting higher direct costs of the intervention. There was variability of direct/indirect costs studied in this section; later sections of this review will look at case/longer-term costs related to ergonomics as part of a multicomponent intervention.

Recommendation

B Physical therapists should offer ergonomic consultation and recommendations to stakeholders and workers when work demands exceed the worker's ability, in an effort to temporarily assist workers in job performance during rehabilitation or to permanently accommodate workers.

PSYCHOLOGICALLY INFORMED PRACTICE

Psychologically informed physical therapy treatment addresses both physical and psychosocial factors by integrating behaviorally based techniques into conventional physical therapy. This intervention is focused on influencing a patient's pain perception, behaviors, attitudes and beliefs, and his or her response to a painful experience. Examples of this treatment include graded activity, graded exposure, motivational interviewing, coaching, and education regarding pain neuroscience, activity, and body mechanics. This approach can be incorporated into work rehabilitation programs.

Improved RTW Following Psychologically Informed Intervention

I Gross et al[131] reported that workers with musculoskeletal disorders who received motivational interviewing added to a rehabilitation program were more likely to collect temporary disability benefits during the follow-up year (mean, 8.2 versus 0.2 days; $P<.001$) and receive job search allowance (mean, 3.1 versus 1.0 days; $P = .01$), but were less likely to experience any recurrence (4.5% versus 9.1%, $P = .04$) and to experience recurrence of partial temporary disability benefits (2.9% versus 7.7%, $P<.05$), compared with those who had the same intervention without motivational interviewing.

I Hara et al[138] investigated the impact of the use of a cognitive behavioral–based follow-up phone call on RTW outcomes. Workers received at least monthly telephone follow-up after completion of an occupational rehabilitation program and were compared to a group that received no phone follow-up. The telephone follow-up was delivered over 6 months. Acceptance and commitment therapy, a type of CBT, was used in the booster phone follow-up. One year after discharge, the intervention group had 87% increased odds (OR = 1.87; 95% CI: 1.06, 3.31) of (re)entry to competitive work 1 day or more per week compared with the controls, with similar positive results in the sensitivity analysis of participation half-time (2.5 days or more per week). The cost of boosted follow-up was 390.5 euros (USD$461) per participant.

I Heathcote et al[142] performed a systematic review and meta-analysis of resilience training programs compared with rehabilitation providing standard care for out-of-work patients with physical injuries. The authors defined resilience as a positive adaptation or adjustment in the face of adversity that is related to self-efficacy. They reported that resilience rehabilitation programs significantly increased the likelihood of ever returning to work (OR = 2.09; 95% CI: 0.99, 4.44), decreased the number of days taken to RTW (mean difference, −7.80; 95% CI: −13.16, −2.45), and increased total self-efficacy scores (mean difference, 5.19; 95% CI: 3.12, 7.26).

I Kool et al[187] reported improved RTW outcomes for workers with nonacute LBP who received function-centered treatment emphasizing improved self-efficacy versus pain-centered treatment. At the 3-month follow-up, RTW was 47% in the function-centered group and 27% in the pain-centered group ($P = .037$). In a follow-up study, Kool et al[186] reported that function-centered treatment significantly increased the average number of workdays during the follow-up year. The benefit was 40 days (increase in average) and the effect size was 0.35.

I Linton et al[200] compared 2 interventions to prevent chronic disability with a control group who received minimal intervention (examination, reassurance, and activity advice). Intervention groups received minimal intervention plus CBT or CBT plus physical therapy. At follow-up, the control group had the highest percentage of individuals on sick leave (9%-14%), the CBT group fell in the middle (6%-8%), and the CBT plus physical therapy group had the lowest percentage on sick leave (2%-5%).

II Godges et al[113] investigated whether education and counseling on pain management, physical activity, and exercise could significantly decrease the number of days off work for workers with LBP (compared with conventional care). Patients who scored 50 points or higher on the FABQ were randomly assigned to the education or control group. The median number of days to RTW was 19 and 35 days for the education and comparison groups, respectively. All those in the education group returned to work within 90 days, versus 83.3% in the comparison group ($P = .27$).

II Olsson et al[249] reported that the Redesigning Daily Occupations Program improved the participant's work ability at 1-year follow-up (WAI single item, $P = .003$). This program focused on changing women's perceptions regarding their work ability.

II Park et al[255] compared motivational interviewing added to functional restoration versus functional restoration alone for injured workers with a work-related musculoskeletal disorder. Return to work at the time of discharge was 12.1% higher for the intervention group (21.6% versus 9.5%, $P = .03$).

II Wisenthal et al[349] reported improvement in depressed patients' perceptions regarding RTW readiness following a cognitive work-hardening program performed by occupational therapists. The program included identification of work barriers, pacing techniques, targeted coping and behavioral skill development, and customized work simulation based on individual need. The therapists used education, role playing, coaching, and goal-setting techniques during the intervention. Scores on the WAI, Multidimensional Assessment of Fatigue, and Beck Depression Inventory-II improved significantly from pretest to posttest ($P<.05$).

III Nicholas et al[237] reported benefit of a multimodal intervention program that targeted workers identified as having high risk for delayed recovery based on psychosocial risk factors (using a cut-point score greater than 50 on the short version of the Örebro Musculoskeletal Pain Screening Questionnaire) within 1 to 3 weeks following injury. The intervention included several stakeholders (including an RTW coordinator, psychologist, physical therapist, and insurance case manager) who focused on the worker's perceived barriers to RTW. The physical therapists used an activity-based approach to treatment. Lost days of work for this program were compared with results for workers receiving usual care (risk factors were addressed if there was a poor response to the initial care after 6 to 8 weeks). Workers were followed for 2 years. The mean number of lost workdays for the control group was 66.5 ± 116.2, versus 20 ± 30 days (median, 10.1 days) for the intervention group.

Conflicting Results Following Psychologically Informed Intervention

I Palmer et al[252] performed a systematic review to evaluate the effectiveness of RTW interventions. Among the interventions in the 42 included studies, 37 promoted behavioral change, with interventions often applied in combination with exercises. The psychological interventions included CBT or coping and relaxation, or were vocationally focused on overcoming psychosocial barriers to working, or on attitudes toward and perceptions of work. The authors reported that most of the behavioral interventions were effective. There was no clear benefit of one behavioral intervention over another, although studies that involved setting graded tasks were slightly more positive (the median RR for RTW was 1.21 overall, and the RR for avoiding musculoskeletal disorder–related job loss was 1.25; the median reduction in sickness absence was 1.11 overall).

I Staal et al[288] developed a graded exercise program (physical exercise based on operant-conditioning principles) for workers with LBP and compared the treatment to usual care. The median number of days of absence from work over 6 months of follow-up was 58 days in the graded activity group and 87 days in the usual-care group. The intervention had no statistically significant effect on functional status and pain when compared with usual care. In a level II secondary analysis, Staal et al[287] reported that workers who perceive their disability to be moderate, and workers with moderate scores for fear-avoidance beliefs, have a better chance of a successful treatment result (ie, RTW) than workers with higher scores.

II Doda et al[84] evaluated the prevention of musculoskeletal pain and discomfort between ergonomic interventions tailored to the employee's readiness for change (based on the stage-of-change model) and standard ergonomic interventions. They reported lowered risk of musculoskeletal symptoms with the tailored interventions for workers with LBP, but not other musculoskeletal complaints.

II Verhagen et al[330] performed a Cochrane review to assess the effects of nonsurgical interventions for work-related complaints of the arm, neck, and shoulder and concluded that behavioral interventions had inconsistent effects on pain and disability, with some subgroups showing benefit and others showing no significant improvement when compared with no treatment, minor intervention controls, or other behavioral interventions.

Studies Refuting the Benefits of Psychologically Informed Intervention

I Anema et al[13] reported a negative effect during follow-up for the group that received graded activity with an operant-conditioning behavioral approach (HR = 0.4; 95% CI: 0.3, 0.6) compared with the group that received workplace intervention.

I Meyer et al[221] reported no statistically significant improvement in RTW when a progressive exercise treatment by a rheumatologist was compared to an interdisciplinary work rehabilitation program (P>.46). The work rehabilitation program included an operant behavioral therapy approach to improve self-efficacy.

II Heinrich et al[145] compared the effectiveness of physical training alone, physical training with a cognitive behavioral component and workplace-specific exercises, and usual care. Pain severity and functional status similarly improved in both intervention groups. At 12-month follow-up, there was no difference in claim duration between physical training and usual care (HR = 0.7; 95% CI: 0.4, 1.1) or the more comprehensive treatment approach and usual care (HR = 0.9; 95% CI: 0.6, 1.4).

II Marchand et al[210] compared work-focused and control interventions. They also evaluated the influence of fear-avoidance beliefs on pain, disability, and RTW at 12 months. The physical therapist focused on reducing fear avoidance, advised patients on activities, and encouraged exercise. The changes in FABQ scores were not significantly different between the groups. It should be noted that the control interventions included education and cognitive behavioral interventions.

II Two studies by Steenstra et al[291,292] evaluated the addition of graded activity as part of a multistage RTW program for workers with LBP. They reported that graded activity did not significantly improve pain or functional status. In addition, they concluded that the clinical intervention of graded activity was associated with higher costs.

Gaps in Knowledge

There are gaps in our current knowledge in regard to how best to package and deliver psychologically informed treatment in work rehabilitation, in addition to identifying the subgroup of patients most likely to benefit from this intervention.

Evidence Synthesis and Rationale

The majority of investigations reported benefit following psychologically informed treatment. Some of the interventions that resulted in RTW included coaching on performance of activities that patients reported as problematic, individualized goal setting, motivational interviewing, workplace visits, practical sessions in ergonomics, instruction in relaxation and coping techniques, patient education regarding activity pacing and goal setting, and problem solving.[113,131,237,255,349] A common element in these studies was that the intervention was directed to the identified barriers to RTW. For example, Godges et al[113] demonstrated the benefit of education and counseling on pain management, physical activity, and exercise in patients with an elevated FABQ score (score greater than 27.5). Some studies combined several treatment elements (such as education, targeted coping and behavioral skill development, and progressive work simulation) into the intervention.[142,237,249,347,349] Staal et al[287] reported positive outcomes when treatment was directed to patients with moderate (versus higher) scores for perceived disability. The study by Nicholas et al[237] demonstrated a long-term positive outcome when workers with high psychosocial risk factors were targeted in treatment. This suggests that there is a subgroup of people for whom psychologically informed treatment should be targeted. Communication with stakeholders regarding referral to other clinicians, such as a psychologist, is advised in cases where progress is slow or absent despite the clinician's best efforts to manage psychosocial factors.

Recommendation

B Physical therapists should incorporate psychologically informed practice, such as individual goal setting, motivational interviewing, education regarding activity pacing, problem solving, relaxation, and coping techniques, into the plan of care when psychosocial barriers are identified during the episode of care.

EDUCATION

The literature investigated the impact of sharing information with the worker or supervisors, using a verbal or written format, on the ability to work. Topics generally included information related to pain, return to activity, ergonomics advice, exercise, and symptom management.

I Education about LBP, pain pathways, fear-avoidance beliefs and coping, training sessions in the workplace, and instruction in a home-based exercise program based on a booklet in a population with LBP lasting 3 months was no better than usual care.[60] Twenty-four percent in the intervention group and 21% in the control group had 1 or more recurrences of LBP with sick leave. Mean duration of sick leave due to LBP episodes was comparable between groups (25 ± 50 days in the control group compared to 32 ± 65 days in the intervention group, $P = .940$).

II Patients with subacute LBP RTW sooner if they are referred to a clinic offering information regarding somatic findings, explanation of radiographic findings, and the importance to engage in physical activity as normally as possible.[134] The physical therapist instructed patients in training and stretching, how to manage back pain, and how to resume normal activities in a 1- to 1.5-hour session. The education intervention group had fewer days of sickness compensation (mean, 125.7 days per person) compared to the control group (169.6 days). The effect occurred during the first year after intervention. There were no significant long-term effects found in a follow-up study.[226]

II Provision of an ergonomic training brochure to provide basic information on workstation evaluation for computer workers was compared with a control group.[93] Intensity, duration, and frequency of work-related upper extremity musculoskeletal disorders decreased significantly in the intervention group compared with the control group. There was no improvement of workdays lost between groups ($P = .05$).

II Mailing an educational pamphlet to recently back-injured workers did not reduce subsequent work loss, speed recovery, or reduce health care visits.[141] The pamphlet contained information to encourage self-care and quick return to activities. A follow-up phone interview was made at 3 and 6 months post injury. At 3 months, 7.9% of those who received a pamphlet were not working, compared to 7.7% of those not receiving the pamphlet ($P = 1.00$). At 6 months, 6.5% of persons who received a pamphlet were not working, compared to 5.9% of those not receiving the pamphlet ($P = .84$).

II Distribution of written information and 2 to 3 group training sessions for supervisors in the use of a participatory approach for dealing with employees' work functioning problems due to health concerns resulted in no difference in DAFW and perceived social norms.[179]

Gaps in Knowledge

A therapeutic alliance is formed largely via the ability of the clinician to provide information that engages the worker in the RTW plan. More studies are needed to determine the effect of education on the rate of RTW. Studies are also needed to determine the value of education regarding personal health, such as sleep hygiene, nutrition, and the social determinants of health, which may impact RTW.

Evidence Synthesis and Rationale

There is moderate evidence that providing information to the worker on an individual basis regarding physical findings, the rationale for activity, and ergonomics training improves the level of work participation.[134] There is strong evidence that education exclusively by way of written material, training of supervisors, or group training of workers is not beneficial.[93,141,179]

Recommendations

F Physical therapists may provide education regarding the worker's physical findings, the benefits of activity, and strategies to return to activity to improve work ability and limit time away from work.

B Physical therapists should not rely solely on written material or group education to improve work ability and limit time away from work.

PROGRESSIVE/GRADED EXERCISE

I Schaafsma et al's[274] Cochrane review of RCTs/cluster RCTs looked at the impact of light or intensive physical conditioning (including structured and graded exercise to increase physical, psychological, and emotional preparedness) on reducing time lost and promoting RTW in individuals with LBP. Physical conditioning focused on training to meet functional job demands and was composed of graded strengthening, endurance, cardiopulmonary function, and motor control and flexibility activities (which may have included work-related exercises). Fewer than 5 sessions (5 to 10 hours' total duration) were considered low intensity, while high intensity was defined as more than 5 sessions or full-time delivery for more than 2 weeks.[274] (There was heterogeneity of high-intensity programs, where it was not uncommon to find 3 to 12 weeks of delivery with approximately 10 to 30 hours per week, but there were a number of studies with intervention durations of approximately 2 to 5 hours per week.) Schaafsma et al[274] found low-quality evidence of little or no impact of physical conditioning on sickness absence duration compared with care as usual for workers with acute (less than 6 weeks) injuries, regardless of the level of exercise. There was low-quality evidence that light physical conditioning reduced sickness absence duration, and conflicting evidence supporting intense physical conditioning for workers with subacute (6-12 weeks) LBP. There was moderate-quality evidence that intense physical conditioning reduced sickness absence duration for workers with subacute LBP at 2 years, and that intense physical conditioning reduced absence duration in workers with chronic LBP (defined as more than 12 weeks) at 12 to 24 months compared to usual care. Another study[9] found tailored physical activity to be more effective than a reference group at 12 weeks, but there was not a significant difference compared to a chronic pain self-management program at 12 weeks or 11 months.[9,10]

I Sundstrup et al[300] studied a workplace-based, high-intensity progressive upper extremity strength training program compared to job-specific ergonomic analysis/training. Strength training prevented deterioration of work ability for individuals with chronic problems who were exposed to forceful and repetitive job tasks, with improved work ability (medium effect size: Cohen $d = 0.52$).

Gaps in Knowledge

Building clinical research capacity for exploring practical progressive exercise interventions may help yield more specific exercise interventions and results by expanding sample sizes, reducing variability, and studying subgroups to improve data for an updated Cochrane review. Exploring graded exercise or activities based on occupational groupings may also provide insight into optimal content and dosage. Stratification of light and intense exercise levels within several studies may provide some insight to key parameters of service provision for therapists to consider in their use of progressive exercise.

Evidence Synthesis and Rationale

There are conflicting findings regarding the benefits of graded exercise/conditioning on work-related outcomes compared to usual care, with little support for the role of graded exercise as a sole intervention in the acute stages of care (less than 6 weeks).[274] High levels of intervention variability make aggregating the results of different studies difficult and limit generation of specific recommendations about intervention content. Intense graded activity based on client presentation and overload principles, work demands, and worksite integration shows a small effect on RTW and duration outcomes,[9,10,264,289] with inconsistent findings on benefits at 6-, 12-, and 24-month follow-ups.[10,264] Light exercise as an isolated intervention does not appear to be effective in positively impacting RTW. This evidence focuses on exercise as an RTW intervention at the activities and participation level; however, the reader should also consider body function and structure CPGs for additional guidance that may support different patterns of exercise during acute care, etc. Therapeutic exercise is one of the most frequently billed services in physical therapy; while no harms were identified in studies, understanding which exercises are appropriate and cost-effective could make a significant impact on the efficacy and cost benefits of future service delivery. Research in this area looked at graded exercise or activity intervention comparisons to usual care; multimodal care, including graded exercise and activity, is discussed in the next section.

Recommendations

C Physical therapists may prescribe intense graded exercise, including work-oriented functional activities and strengthening, cardiopulmonary, endurance, and motor control exercises, for workers who have not returned to work 6 weeks post injury, as part of a rehabilitation plan focused on specific RTW goals.

B Physical therapy providers should not use light exercise as an isolated intervention to address RTW goals, except when there is an explicit reason documented, such as psychosocial or psychological involvement, catastrophic injury, and/or condition-specific or postsurgical guidelines.

CARE INVOLVING MULTIPLE COMPONENTS

The design of programs described in the literature with RTW measures as the primary outcome varies widely in content and type of provider. Combinations of various approaches and components of the treatment are described in the studies. For clarity in this section, programs with multiple components have been divided into 3 broad categories. Exercise plus behavioral interventions are clinic based and include a combination of education and general or nonspecific exercise such as strengthening, stretching, or conditioning, and a psychosocial or behavioral component. Work-focused interventions are clinic based and target achieving goals related to RTW, such as the inclusion of graded work-specific activities (ie, lift, push, carry, squat, etc), and developing an RTW plan, which may include contact with the workplace. The third category, addition of jobsite interventions, includes active involvement of the worker, the employer, and rehabilitation professionals in the workplace. Examples of jobsite interventions include job coaching, ergonomic assessment and modifications, or planning for transitional work with the employee and supervisor. Jobsite interventions may be combined with a behavioral approach, with musculoskeletal interventions, or with a work-focused intervention. The programs may include combinations of professionals such as medical providers, physical therapists, occupational therapists, social workers, psychologists, providers of behavior-based care, case managers, vocational consultants, and social workers.

For each intervention (exercise plus behavioral approach, work focused, and jobsite), the studies are divided into the following groups, based on the results related to improving RTW outcomes: those that support the intervention, studies that provide conflicting evidence (some, but not all, outcome measures support the intervention), studies that show no difference, and studies that refute the intervention (outcomes are worse with the intervention).

Exercise Plus a Behavioral Approach

Studies Supporting Exercise Plus a Behavioral Approach

II Extensive multidisciplinary treatment was shown to have better RTW outcomes for a population classified as having a poor prognosis.[135] A statistically significant difference was found in favor of extensive multidisciplinary treatment over ordinary treatments (55% and 36% RTW rate, respectively; $P<.05$). Extensive multidisciplinary treatment for patients with good prognosis did not result in higher RTW rate. This RCT compared groups assigned to ordinary care, a "light multidisciplinary program" of 1 hour of education and 3 to 12 visits for exercise, and an "extensive multidisciplinary program" that consisted of 4 weeks of 7-hour sessions, 5 days per week, including cognitive behavioral modification, education, and exercise interventions. The extensive multidisciplinary program encouraged patients to focus on their functioning and not to focus on their pain. Good, medium, and poor prognoses were determined by physical therapists scoring the ability to relax and spinal mobility, number of tender points, the sock test, and a lifting test.

II Problem-solving therapy in addition to behavioral graded activity resulted in fewer days of sick leave (50%) during the second half-year after the intervention, compared to patients not receiving additional problem-solving therapy. Graded activity with problem-solving therapy resulted in 85% returning to full employment, compared to 63% of workers participating in behavioral graded activity and group lectures, in a population of workers on leave due to LBP for 6 to 20 weeks.[322]

III Workers with neck, low back, or lower extremity disorders lasting greater than 3 months[140,218,260] to 3 years[106] participated in programs involving exercise, a behavioral component, and education. The studies demonstrated a 90% rate of RTW and work-retention rates of 55% to 91% when compared to work status at initiation of the program.

Studies Showing Conflicting Evidence for Exercise Plus a Behavioral Approach

II A brief exercise plus behavioral intervention approach, involving 1 consultation with a physician and 2 physical therapist visits, based on a noninjury model for LBP was compared to a program using the Interdisciplinary Structured Interview and Visual Educational Tool in a population of workers on a mean sick leave of 147 ± 60.1 days due to musculoskeletal pain.[37] There were no significant differences in the level of RTW between the groups at 12 months or 24 months, but patients in the Interdisciplinary Structured Interview and Visual Educational Tool group returned to work faster than patients in the brief intervention group.

II Compared to behavior-oriented physical therapy alone, women with 1 to 6 months of nonspecific neck or back pain, participating in combined physical therapy (exercise) and CBT provided by a psychologist, returned to work faster compared to the control group (HR = 1.9; 95% CI: 1.1, 3.5).[168] Outcomes for men were not significantly different from treatment as usual.

II Cognitive behavioral treatment with routine musculoskeletal care involving diagnostic tests and physical therapy, initiated between 4 and 8 weeks after the onset of temporary disability, led to a 20% reduction in days of temporary work disability compared to routine rheumatologic (musculoskeletal) care. Relapse episodes were shorter in the intervention groups.[197] However, no significant difference was noted in the rate of RTW between groups. Direct and indirect costs were significantly lower in the intervention group, saving $1796 per patient.

II A stepped-wedge study with gradual introduction of an intervention, including a 12-week program of ergonomics, physical training, and work tasks with an integrated cognitive behavioral approach, by physical and occupational therapists showed a significant reduction in measures of fear-avoidance beliefs, but no significant effects were found for sick leave duration due to LBP or work ability after the intervention.[262]

II No significant differences in health outcomes (quality-adjusted life-years) or costs were found by the addition of a cognitive behavioral program to 3 weeks of daily exercise, massage, electromodalities, and education in a population with LBP lasting 6 months or more.[280] Patients in the intervention group were absent from work an average of 5.4 days (95% CI: –1.4, 12.1) fewer than patients receiving usual treatment. Indirect costs were lower for those in the CBT group: 751 euros (USD$946; 95% CI: 145, 1641).

Studies Showing No Difference With Exercise Plus a Behavioral Approach

II There was no difference in time until sustainable RTW or sickness absence days when comparing an outpatient behavioral approach, using acceptance and commitment therapy, to an inpatient program of physical training, acceptance and commitment therapy, and work-related problem solving.[3]

II There was no difference in the rate of RTW in patients with LBP lasting 4 to 12 weeks when comparing usual care with coordinated multidisciplinary care.[50] Usual care was described as care offered by a single discipline, including passive modalities, exercises, back class, or spinal manipulation. The intervention group participated in a program including aerobic conditioning, strength training, and flexibility exercises and CBT.

II Workers with chronic widespread pain lasting more than 3 months participated in a multimodal program consisting of aerobic training, CBT, relaxation, and body awareness, or the same program with the addition of group training in body awareness and functional training of the body as a whole (Norwegian Psychomotor Physiotherapy) over the next 1.5 years.[11] After 1 year, 65% of the intervention group and 35% of the control group were back at work. The group difference was not statistically significant (P = .09). After 1.5 years, the difference was smaller, as 57% of those in the intervention group and 47% of the controls were working.

Study Refuting Exercise Plus a Behavioral Approach

II A comparison was made between usual care and early assessment by a psychotherapist, physical therapist, and occupational therapist in a population of workers sick listed less than 28 days.[54] The total number of sick leave days was significantly higher in the intervention group.

Addition of Work-Focused Interventions

Studies Supporting Addition of Work-Focused Interventions

I Improved rates of RTW were found using function-centered treatment, work simulation, and strength and endurance training compared to pain-centered treatment, back school, passive and active mobilization, stretching, and low-intensity strength training in a population of workers with at least 6 weeks of sick leave in the previous 6 months due to LBP. Results included RTW at 3-month follow-up of 47% in the function-centered treatment group, compared to 27% in the pain-centered treatment group (P = .037).[187] In a follow-up study comparing the 2 groups, the function-centered treatment group showed an increase in the average number of workdays during the follow-up year.[186] Additionally, more patients returned to work from the function-centered treatment group (59.8%), compared with 41.4% of the pain-centered treatment group (OR = 2.11; 95% CI: 1.15, 3.85).

I A systematic literature review included moderate- to high-quality studies, including 6 studies (594 participants) that concluded work-focused rehabilitation to be more effective at returning people to work (OR = 3.18; 95% CI: 1.41, 7.15; P<.01) than no work-related training (OR = 0.55; 95% CI: 0.24, 1.23; P = .76).[142] Based on the 21 studies included, it was also suggested that effective interventions consider psychosocial factors in addition to medical and occupational factors in the RTW assessment.

II Conventional care was compared to a program based on a cognitive behavioral approach with a work-related emphasis on education and work task simulation. The study included a population having greater than 12 weeks of sick leave in the prior year or expectation of long-term restrictions or health-related unemployment.[27] The intervention group was 2.4 times more likely to have a positive work status than the control group at 3 months. At 12 months, the chance of a positive work status was still higher but was not statistically significant.

II Conventional case management was compared to coordinated, tailored work-focused rehabilitation in a population of workers absent from work 4 to 12 weeks due to musculoskeletal pain.[43] The tailored approach included a social worker for workplace coordination on the team of a physician, psychologist, physical therapist, and chiropractor. Work status outcomes showed that 42% had returned to work at 3-month follow-up (tailored, 45%; case management, 37%). At 6-month follow-up, 69% had returned to work in the tailored approach group, compared to 48% in the case management group. At 12 months, 71% of all participants had returned to work, 78% in the tailored approach group and 62% in the case management group.

II Conversations discussing RTW and making an RTW plan were significantly associated with RTW in a logistic multiple regression analysis, compared to those that did not discuss RTW or make an RTW plan with occupational health professionals.[335] Occupational health professional intervention of "discussing and making a RTW action plan" was reported by only 19% of sick-listed workers. Seventy-four percent of workers reported that no RTW plan was made by the insurance company's occupational health physician.

II A behavioral approach, acceptance and commitment therapy, alone was compared to a program combining acceptance and commitment therapy with physical exercise, work-related problem solving, and development of a written RTW plan.[112] Participants in the more comprehensive program had a median of 85 (IQR, 33-149) sickness absence days at 12-month follow-up, compared to 117 days in the acceptance and commitment therapy–alone group (IQR, 59-189; $P = .034$).

II In a systematic review, multidisciplinary biopsychosocial rehabilitation was defined as an intervention that included a physical component in combination with a psychological, social, or occupational component.[213] Nine studies were included. The occupational component in 8 studies included a worksite visit or a work rehabilitation plan or both. Low- to very low–quality evidence shows that persons experiencing LBP lasting 6 to 12 weeks and receiving this approach demonstrated better outcomes than if they had received the control interventions.

II Strength in work simulation lifting and RTW status improved with an interdisciplinary program including work simulation, cardiovascular activity, overall strengthening, and coordination with employers.[339]

Studies Showing Conflicting Evidence for Addition of Work-Focused Interventions

I A functional restoration program including graded exercise, conditioning, work simulation, and education was compared to active individual therapy (3 exercise sessions each week for 5 weeks and instruction in a home exercise program) in a population of individuals with nonspecific back pain of 3 or more months.[264] There was no significant difference between groups for RTW (86.8% versus 85.7%). The functional restoration program group improved in subjective and objective measures of ability to RTW (95.5% compared to 78.1% in the individual therapy group, $P<.01$).

I A systematic review determined that there is low- to moderate-certainty evidence that a combination of psychological counseling, work-directed counseling, and physical conditioning in a population with coronary heart disease increases RTW rate up to 6 months and reduces the time away from work.[144] These programs may have little or no effect on rate of RTW after 6 months in this population.

Studies Showing No Significant Differences With Addition of Work-Focused Interventions

I The addition of a meeting between the employer, the worker, and the therapist during participation in a multimodal program based on acceptance and commitment therapy did not change work participation in a population sick listed for 2 to 12 months, compared to the multimodal program alone.[285]

I Ordinary care was compared to coordinated and tailored programs offered by a multidisciplinary group including RTW coordinators, a psychologist, a physical therapist, an ergonomist, a social worker, a dietitian, a psychiatrist, and a physician.[261] A positive effect with respect to increasing the recovery rate from long-term sickness absence was driven by location and contextual factors rather than by a specific intervention.

II A Cochrane review found low-quality evidence due to high risk of bias in 7 of 9 studies that neither supported nor refuted the benefits of any specific work-related intervention for relief of neck pain, and moderate-quality evidence that a multiple-component intervention reduced sickness absence in the intermediate term, which was not sustained over time.[2] Work-related interventions included education regarding mental health, ergonomics, anatomy, musculoskeletal disorders, and the importance of physical activity.

II The establishment of an RTW team, introduction of standardized work ability assessment procedures, and a comprehensive RTW training course for all team members did not facilitate RTW more than ordinary sickness management in a population sick listed up to 8 weeks.[228]

II Usual care, compared to an outpatient training program including graded activity training, education to eliminate inappropriate pain behavior, cognitive techniques to set goals and improve coping strategies, and preparation to RTW, showed no significant difference compared to the intervention group (P = .840).[220] The percentage of RTW over time was significant for both groups (P<.001). The multidisciplinary treatment was significantly more expensive than usual care. However, a higher reduction in productivity costs led to insignificant total cost differences after 12 months.

Study Refuting Addition of Work-Focused Interventions

I After 5 years of follow-up, no differences were found in work status when comparing groups participating in standard examination and treatment to a group that included meeting with a case manager, review of an RTW plan by a multidisciplinary medical team, and arranging a meeting with a workplace representative.[258] Participants in the standard examination and treatment groups had spent 1.1 weeks less on permanent support, 4.2 weeks less on temporary support, 5.5 weeks less on sickness absence, and 10.8 weeks more in work compared to participants in the multidisciplinary intervention.

Jobsite Intervention

Studies Supporting the Addition of Jobsite Intervention

I A systematic review of the effectiveness and cost-effectiveness of interventions involving consultation and consensus between the employee, the workplace, and occupational health professionals and subsequent work modifications found them to be more effective at returning to work people on sick leave with back pain for more than 2 weeks than interventions that do not involve such elements.[58]

I Multidisciplinary biopsychosocial rehabilitation with a comprehensive occupational or workplace intervention shows moderate evidence of a positive effect regarding RTW, sick leave duration, and subjective disability, based on 2 relevant trials included in a systematic review of RCTs and nonrandomized controlled clinical trials on multidisciplinary rehabilitation for subacute LBP among working-age adults.[176]

I Based on 16 studies investigating RTW interventions in populations with chronic pain, there was no conclusive evidence to support any specific RTW intervention for workers with chronic pain; however, programs including workplace interventions such as job coaching, coordination with the employer for transitional work, and job redesign and adaptations were more effective than clinic-based rehabilitation in promoting RTW in a population with chronic pain.[343]

II A workplace-based rehabilitation program including job coaching was compared to clinic-based rehabilitation programs in a population with work-related rotator cuff disorders greater than 90 days from claim filing or date of injury.[64] Return to work in the workplace-based program was 71.4%, compared to 37% in clinic-based rehabilitation (P<.01).

II In a systematic review,[73] multidomain interventions had a strong level of evidence showing a positive effect, with 4 high- and 10 medium-quality studies, on the primary outcome of lost time due to musculoskeletal and pain-related conditions. Multidomain interventions included at least 2 of 3 interventions: musculoskeletal and pain-related (health-focused), service coordination, and work-modification interventions. Cognitive behavioral therapy alone offered no effect on time lost due to mental health conditions.

II Integrated care, including service coordination, a workplace intervention, and a graded activity program based on cognitive behavioral principles, was found to be more cost-effective than usual care in a population of patients sick listed greater than 12 weeks due to LBP.[191-193] During the 12 months of follow-up, the median number of days of sick leave in the integrated-care group was 82 (IQR, 51-164 days), compared with 175 (IQR, 91-365) in the usual-care group (P = .003).

II Linking clinical and rehabilitation interventions with an occupational intervention including a participatory ergonomic intervention engaging the worker, employee representatives, and a union representative demonstrated a cost benefit[206] and saved more workday benefits than other models in a population of workers with an absence of more than 4 weeks due to back pain.[205]

II The rate of RTW was improved with the addition of motivational interviewing to a program based on graded activity, therapeutic exercise, and workplace accommodations in a population with a disability duration of 140.3 ± 183.8 days due to musculoskeletal disorders.[255] Successful RTW at program discharge was 12.1% higher for unemployed claimants in the intervention group versus 9.5% in the control group (P = .03), and 3.0% higher for job-attached claimants compared to the control group (P = .10). Successful RTW percentage increased to 47.4% when the motivational interviewing–adherent intervention included RTW as the target behavior.

II A systematic review concluded that clinical interventions combined with workplace-based interventions are effective for RTW.[348] The workplace-based interventions consisted of early RTW, modified work, work-related clinical interventions, ergonomics, lumbar supports, exercises, a workplace visit, and supervisor involvement with RTW. Studies included were of medium to very high quality.

Studies Showing Conflicting Results With the Addition of Jobsite Interventions

I A systematic review showed conflicting evidence addressing exercise, behavioral change, and workplace adaptation, finding that outcomes were more dependent on chronicity and complexity of the injury.[252] Workplace-level approaches included ergonomic changes to the physical environment, job modifications (eg, lighter duties, reduced hours), and interventions directed at managers (education and advice).

Study Showing No Difference With the Addition of Jobsite Interventions

II A program for the prevention of and early intervention for LBP in physically demanding jobs showed no significant difference in sickness absence, costs, or health care utilization related to LBP.[161] The program included group sessions tailored to the actual worksite and immediate treatment of subacute LBP through onsite services.

Evidence Synthesis and Rationale

There is moderate evidence that a behavioral approach with musculoskeletal interventions improves outcomes in the presence of an estimated high risk for prolonged disability.[135,322] There is moderate support for a behavioral approach with musculoskeletal interventions including intensive muscle training,[79] and for graded activity with problem-solving therapy.[322] There is low-level evidence to support exercise, a psychological component, and education.[106,140,218,260] In the absence of risk for delayed recovery, assessment within the first 28 days of injury by a multidisciplinary team including a psychologist, physical therapist, and occupational therapist may increase the length of sick leave.[54]

Moderate evidence supports the inclusion of work-focused goals and interventions in the plan of care to improve work status.[27,43,142,186] The evidence supports a coordinated approach that addresses physical, behavioral, and workplace barriers impacting work status. The estimated level of risk for delayed RTW guides the provider in appropriate treatment planning. Assessment of risk is described in detail in the Examination section. Individuals with an estimated low risk of prolonged disability demonstrate improved outcomes with a combination of a behavioral approach with routine musculoskeletal care and work-focused interventions that include combinations of functional capacity training, graded work activity, RTW planning, case management, and education.

There is moderate evidence that a combination of work-focused care and jobsite intervention improves work status in a population with an estimated higher risk for prolonged work disability.[58,64,176,191-193,205,206,343,348] Studies defined jobsite interventions as any combination of graded RTW, job coaching, biomechanics training, or ergonomic education. Programs including jobsite interventions were more effective than clinic-based rehabilitation to decrease perceived pain and disability, improve functional capabilities, and prevent further work disability in populations with an estimated risk of delayed RTW.

Gaps in Knowledge

There is a need to focus on the cost-effectiveness of interventions with multiple components, including those initiated by the employer, to improve RTW outcomes.[252] Further research related to interventions with multiple components should include topics related to participant waiting times before the start of interventions, matching participants' risk profiles to intervention type and intensity, and incorporating collaborative strategies between the various stakeholders in the RTW process.[343] A large number of the studies cited here were completed in Europe. There is a need for studies based in systems that are common in the jurisdiction of practice.

Recommendations

A Physical therapy providers should treat workers with an estimated low risk of delayed RTW with a combination of condition-specific exercise and clinic-based, work-focused interventions such as work task replication to improve work status.

A Physical therapy providers should treat workers with an estimated high risk of delayed RTW with a combination of clinic-based, work-focused interventions and jobsite interventions to improve work status.

B Physical therapy providers should include a behavioral approach in the treatment plan for individuals with an estimated high risk for delayed RTW to improve work status.

F Physical therapists should modify the components included in the plan of care based on the estimated level of risk to avoid needless delay in RTW.

CONCLUSION

Limitations

Rehabilitation of the worker after injury or illness is a process that requires consideration of multiple factors, using various approaches to examination, intervention, and outcome measurement. The literature included in this guideline is inconsistent in the use and definition of terminology and in the content of examination and the interventions studied. These variations make direct comparison between interventions difficult. Measures of work-related outcomes are also diverse (eg, duration of absence, level of RTW, costs); however, the studies consistently included some measure of the ability to work to indicate efficacy of the intervention. Because of the limited number of articles directly studying the validity and reliability of outcome measurement tools related to RTW, this CPG does not include recommendations for specific outcome measures. However, an overview of specific outcome measures that are referenced in the cited literature is provided. There is a need for additional high-quality diagnostic studies, prospective studies, RCTs, or systematic reviews (level I) to inform the course of care focused on resolving work participation restrictions and activity limitations.

Some important foundational research has not been included due to the date range of the literature search. The clinician must acknowledge that some research assumptions have a foundation in these earlier studies. This is not to exclude the entirety of research on the subject validated in previous literature but to bring a current understanding as stated in the citations considered here.

The studies included in this review are representative of various cultures and regulatory factors that impact the RTW process. While most of the conclusions are applicable across all settings, the physical therapist will need to consider the local culture and comply with applicable regulatory guidance.

Psychosocial factors were often cited as secondary factors, not a primary treatment focus. Physical therapists involved in the rehabilitation process of a worker after illness or injury are encouraged to consult available evidence and gain understanding of psychologically informed care. Communication with stakeholders regarding referral to other clinicians is advised where progress is slow or absent despite the physical therapy provider's best efforts to address psychosocial factors.

The recommendations in this document are meant to be used in conjunction with other guidelines. The APTA and other organizations maintain a list of relevant guidelines. The physical therapist is encouraged to use condition-specific guidelines in addition to the recommendations included in this CPG to achieve RTW goals.

Summary

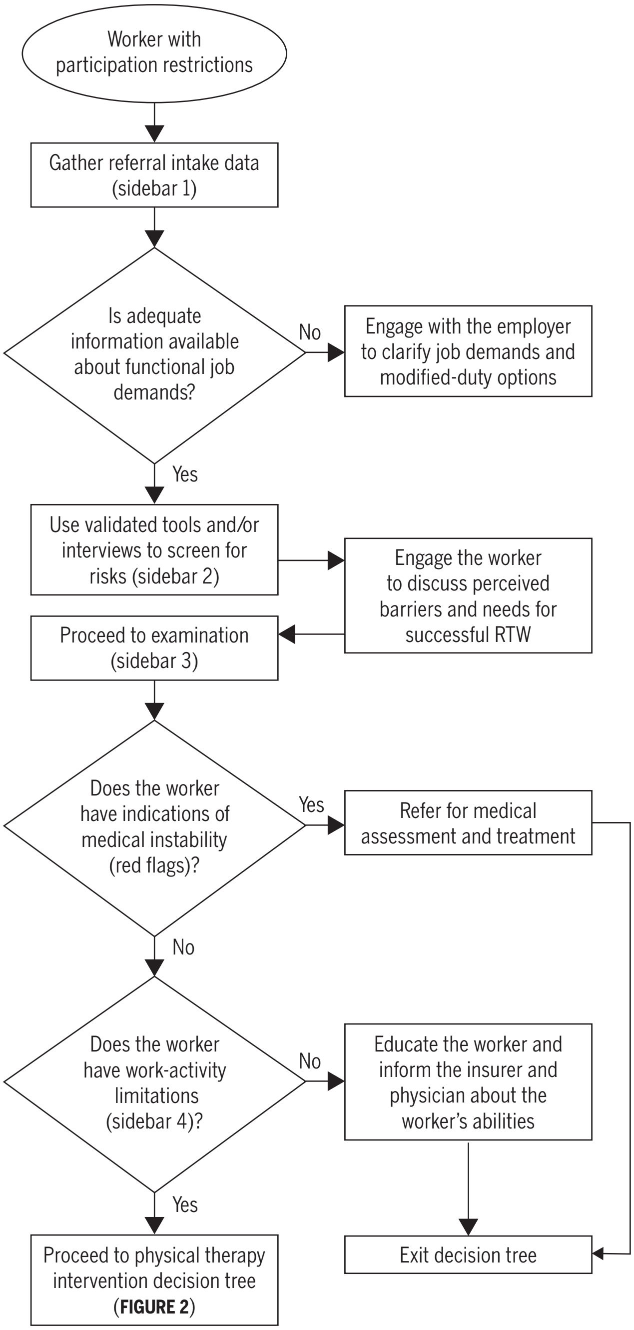
Implementation of these recommendations will benefit the worker, the clinician, and the employer in terms of achieving RTW goals, managing the associated costs, and improving productivity. A decision tree (**FIGURES 1** and **2**) and a professional development checklist (**FIGURE 3**) are provided to assist with clinical decision making related to the recommendations in this CPG. Improvements in the duration of restricted work participation or limited activity can be expected when physical therapists develop a treatment plan based on specific work demands and address the assessed risks for needless delays in RTW using validated tools. Additionally, the therapy provider must develop an alliance with the worker in achieving work-related goals, relying on both subjective status reports and objective measures to guide the rehabilitation process. Improved achievement of RTW goals will be realized when intervention includes using an active, function-centered approach rather than a passive, pain-centered approach, especially 6 weeks after injury.

Future Direction

Primary prevention strategies aimed at improving or maintaining the health of workers and promoting workplace safety and productivity are an important area of occupational health and safety that is outside the scope of this document. Components of primary prevention strategies may include topics such as sleep hygiene, nutrition, and consideration of the social determinants of health. In addition to primary prevention goals, these factors also impact recovery following injury or illness. Additional insight is needed regarding the effect of primary prevention programs on the rate of injury and duration of work absence.

This CPG has focused on the rehabilitation process of the worker after injury or illness that resulted in activity limitation and restricted work participation. Entry into the workforce and sustaining work by persons with developmental disability fall outside the scope of this document. Recommendations related to the process of optimizing work participation in populations with developmental disability or non–work-related chronic disability should be considered.

Further investigation is needed regarding the effect of the timing of initial physical therapy contact after injury or illness on costs and time to RTW. Additionally, outcome studies that consider worker satisfaction and employer costs relative to physical therapy involvement are needed to validate strategies used to achieve RTW.



Sidebar 1: Gather Referral Intake Data
- Type of injury/health condition and body areas affected
- Job category/occupation and current work status
- Onset date of injury/illness or job performance difficulty
- Job description/demands and current work restrictions
- Prior claims history

Missing intake data are clarified during the worker interview

Sidebar 2: Screen for Psychosocial/Workplace Risks

Psychosocial Risks (Yellow Flags)
- High pain severity (low pain acceptance)
- Catastrophizing
- High perceived functional disability
- High fear-avoidance beliefs or kinesiophobia
- Low recovery expectations
- Low self-efficacy (low perceived control over situations)
- Observed pain behaviors

Workplace Risks (Blue/Black Flags)
- Poor job satisfaction
- Poor relationship with supervisors or coworkers
- Job stress
- Nonavailability of RTW programs or ergonomic changes
- High job demands
- Workplace culture and policies that discourage RTW

Sidebar 3: Examination
- Examine body functions and structures
- Identify comorbidites (obesity, depression, anxiety)
- Physical performance tests should be administered within the safe confines of a worker's health conditions
- Administer standardized, valid, and reliable physical performance tests to assess work abilities and limitations

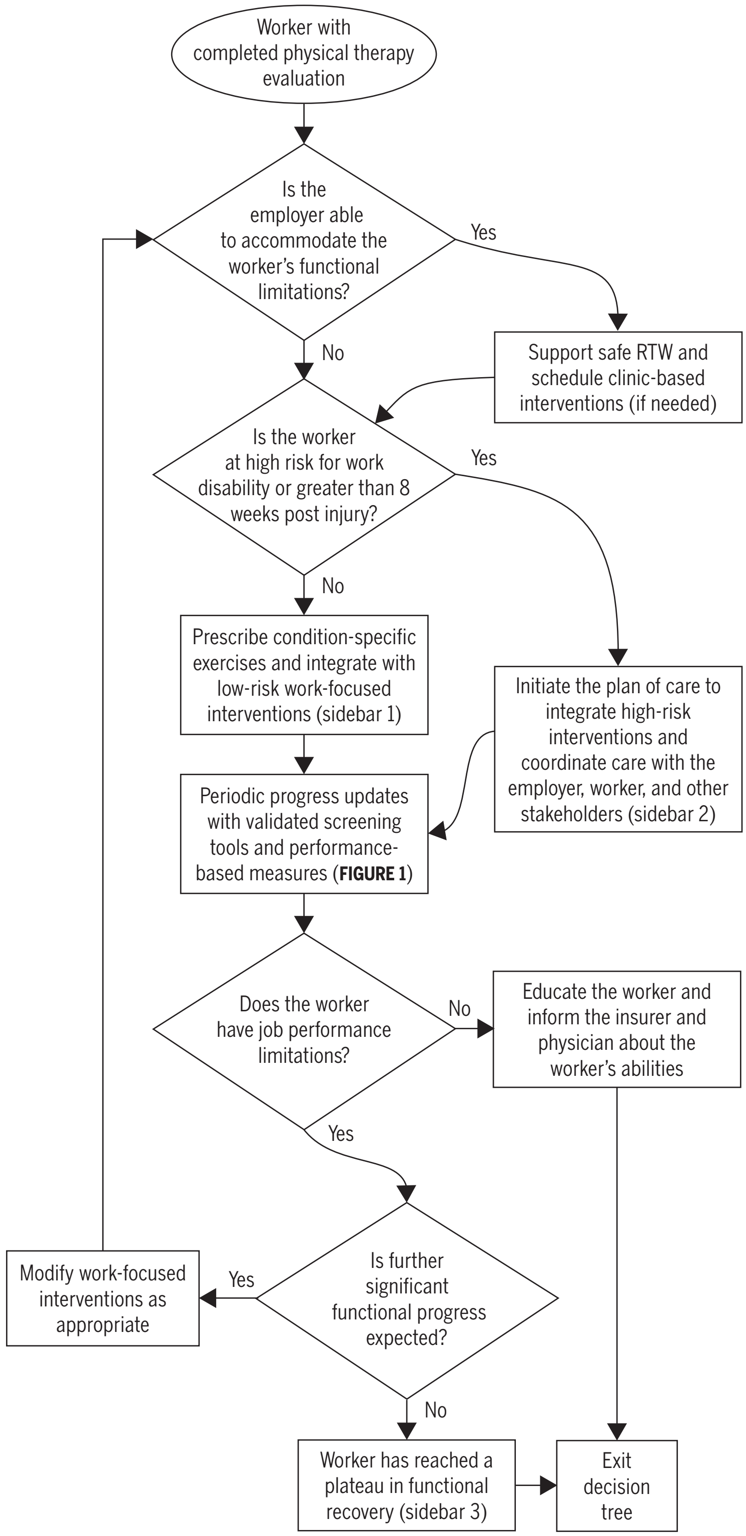
Sidebar 4: Evaluate Work-Activity Participation

Compare Worker Abilities to Job Demands
- Identify job demands or tasks that exceed worker abilities
- Recommend job modifications, clarify work limitations, or indicate that the worker is capable of return to full duty

Diagnosis/Prognosis/Goal Setting
- Use relevant ICF domains to diagnose activity limitations, participation restrictions, and prognosis when setting goals
- Diagnose underlying movement system impairments that contribute to job performance barriers
- Integrate the therapy plan with relevant health-condition CPGs

Risk Classification
- Determine relative risk level (low or high)
- The presence of multiple risk factors increases the risk for delayed RTW and work disability

FIGURE 1. Physical therapy evaluation of workers with participation restrictions after injury or illness. Abbreviations: CPG, clinical practice guideline; ICF, International Classification of Functioning, Disability and Health; RTW, return to work.



Sidebar 1: Low-Risk Interventions

- Actively engage the worker to return to activity, to improve his or her work ability, and to limit time away from work
- Use a combination of exercise and clinic-based, work-focused interventions for workers at low risk
- Provide recommendations to injured workers, employers, and other stakeholders for graded, modified, or transitional RTW
- Offer participatory ergonomics to the worker and communicate with stakeholders when job demands exceed the worker's ability
- Do not rely on written material to engage the worker in strategies to return to activity
- Do not use light exercise as an isolated intervention to address RTW goals, except when there is an explicit reason documented

Sidebar 2: High-Risk Interventions

- Incorporate psychologically informed practice when psychosocial barriers are present
- Offer participatory ergonomics to the worker and communicate with stakeholders when job demands exceed the worker's ability
- Prescribe intense graded exercise, including work-oriented functional activities and strengthening, cardiopulmonary, endurance, and motor control exercises after 6 weeks post injury
- Consult with the employer about the worker's abilities and job-modification options to improve work status
- Communicate with the employer about the worker's functional abilities and offer recommendations to potentially improve work engagement
- Use a combination of clinic-based, work-focused interventions and jobsite interventions
- Do not use light exercise as an isolated intervention, except when there is an explicit reason documented
- If the worker is greater than 8 weeks post injury, initiate a multidisciplinary assessment to determine appropriate interventions

Sidebar 3: Final Disposition

- Identify job-specific functional abilities for safe RTW (job-specific FCE or progress update)
- Identify workplace accommodation options to support safe RTW
- If a job change is necessary, report the worker's functional abilities, limitations, barriers, and strengths for RTW
- If medical and therapy reporting is inconsistent, consider recommendation for a comprehensive FCE to facilitate vocational planning or administrative claim closure

FIGURE 2. Managing physical therapy interventions to optimize work participation after injury or illness. Abbreviations: FCE, Functional Capacity Evaluation; RTW, return to work.

Optimizing Work Participation: Professional Development Checklist and Audit

This professional development checklist and audit is designed to help physical therapists develop awareness and skill related to best practices for optimizing work participation. The tool provides a simple and objective method to help clinicians integrate key examination and intervention recommendations into clinical practice, while also fostering self-reflection.

After reviewing the CPG, the checklist can help remind clinicians of key examination and intervention elements to include in developing a plan of care. Over time, clinicians can assess progress in their scores as an individual or as part of a comprehensive group continuous improvement process that includes outcomes evaluation. Clinicians are encouraged to use the checklist as an internal audit to evaluate areas where they may want/need to seek additional professional development and/or mentoring. The checklist can be paired with body structure and function–specific CPGs for a tailored approach to care that is based on specific conditions.

For each item, score as present or included (√), depending on use as a checklist or audit; missing (⊖); or NA.

Score	History
__________	1. Type of injury
__________	2. Job title/occupational category
__________	3. Previous work-limiting injury or illness[ab]
__________	4. Extended work absence prior to referral[ab]
__________	5. Comorbidities[ab]
__________	6. Availability of transitional or modified work duties (lack of policies is a risk factor)
__________	7. Presence of attitudes, beliefs, and behaviors reflecting high levels of perceived or self-reported functional disability, high levels of pain, low recovery expectations, or low self-efficacy[ab]
__________	8. Perceptions of high work demands and/or limited support at work[ab]
__________	9. Worker concerns related to diagnosis, care, or work participation are documented[bc]
	Examination
__________	10. Use of valid/reliable self-report measures that address RTW, such as the WAI, ÖMPSQ, or DASH work subscale[d]
__________	11. Use of valid/reliable self-report measures that assess fear avoidance, psychosocial risk, and/or readiness for change[d]
__________	12. Description of work demands: essential functions and exertional job-demand information[e]
__________	13. Patient report of work-related psychosocial factors related to work demands and/or limited support noted[b]
__________	14. Body functions and structures are examined to identify red flags, safety considerations, or impairments[b]
__________	15. Ability to engage in work activities is assessed using standardized, valid, and reliable physical performance tests[f]
	Assessment, Diagnosis, and Prognosis
__________	16. Worker goals and care preferences are identified[bc]
__________	17. RTW barriers and facilitators are identified[b]
__________	18. Estimated level of risk for delayed RTW is described[g]
__________	19. Work-limiting diagnoses and RTW goals are included[bh]
__________	20. RTW prognosis and plan of care are linked to occupational demands and identified risk factors
	Plan of Care/Interventions
__________	21. Recommendations for graded, modified, or transitional duties to promote work reintegration, unless contraindications or barriers are identified[i]
__________	22. Plan-of-care components were appropriate for the risks identified (respond to 1 or more areas as appropriate) a. Psychologically informed practice was included when psychosocial barriers were identified[j] b. When a <u>low risk</u> for delayed RTW or work absence was estimated, the plan of care involved: - a combination of condition-specific exercise and clinic-based, work-focused interventions c. When a <u>high risk</u> of delayed RTW or work absence was estimated, the plan of care involved: - a combination of clinic-based, work-focused interventions and jobsite interventions - a behavioral approach - communication and coordination of services with the patient, employer, and other medical providers
__________	23. Education included information on physical findings, pain neuroscience, the benefits of physical activity in the healing process, and strategies to return to activity
__________	24. Ergonomic consultation and recommendations were offered to the employee/workplace when work demands exceeded worker ability[k]
__________	25. Light exercise was not used as an isolated intervention except when there was an explicit reason documented
__________	26. The therapist recommended multidisciplinary assessment at 6 to 8 weeks post injury[l]
	Outcomes and Program Evaluation
__________	27. Functional performance and activity tolerance were documented to support RTW recommendations[m]
__________	28. If the physical therapist is the first health care provider, was the initial consultation completed within 7 days of injury?

Number of points _______/total possible points for this case_______ = _______%

FIGURE 3. Optimizing work participation after injury or illness: professional development checklist and audit.
[a]This risk factor may impact RTW.
[b]Relevant information is documented (or none noted).
[c]Associated with a positive therapeutic alliance.

Figure continues on page CPG57.

[d]One or more are documented.
[e]Data are present and the source is identified as ergonomic analysis, company documents, and/or interviews.
[f]Using the Functional Capacity Evaluation test battery, a short-form Functional Capacity Evaluation, job-specific functional testing, or semi-structured interviews, based on worker presentation, job demands, and rehabilitative status. Findings identify abilities and performance deficits or gaps.
[g]Risk level is based on 1 or more self-report instruments, client history, or interview/observation. Several low-level risks may be addressed in the course of physical therapist management, using psychologically informed practice. The risks of a traumatic injury may be addressed through appropriate care management. Risk factors such as moderate fear avoidance, anxiety, and/or catastrophizing could be cumulative and may need to be monitored for impact on care/communication with the referrer.
[h]Including lift/carry, posture/positional changes, walking/moving around, hand/arm use, self-care/transfers, ability to use transportation, and interpersonal relationship skills.
[i]If transitional work is not available, then this should be documented and intentional graded activity goals should be noted.
[j]Content includes relevant interventions such as individual goal setting, motivational interviewing, education regarding activity pacing, problem solving, relaxation, and coping techniques, and/or communication with the referrer.
[k]Timing and content of ergonomics assessment and RTW examination may vary, based on the type of problem and client presentation. Testing may not necessarily occur at the first visit, although basic understanding of functional performance for transfers, walking, lifting, carrying, etc will also help the therapist advise on modifications and optimizing activities of daily living/instrumental activities of daily living/work task performance, as well as program updates during care. Testing protocols may be modified during the acute phase or when a client is unable to perform a task.
[l]Complete only when care extends beyond 8 weeks post injury and when postsurgical or practice guidelines do not outline condition-specific extended care plans.
[m]Return-to-work recommendations were not made solely based on impairment data.
Abbreviations: CPG, clinical practice guideline; DASH, Disabilities of the Arm, Shoulder and Hand questionnaire; NA, not applicable; ÖMPSQ, Örebro Musculoskeletal Pain Screening Questionnaire; RTW, return to work; WAI, Work Ability Index.

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APPENDIX A

SEARCH STRATEGIES FOR ALL DATABASES

PsycINFO

((MAINSUBJECT.EXACT.EXPLODE("Work Related Illnesses") OR MAINSUBJECT.EXACT.EXPLODE("Occupational Health") OR (MAINSUBJECT.EXACT("Occupations") OR MAINSUBJECT.EXACT.EXPLODE("Occupations")) OR MAINSUBJECT.EXACT.EXPLODE("Industrial Accidents")) OR (ti(worker* OR employee* OR professional* OR manpower) OR ab(worker* OR employee* OR professional* OR manpower))) AND ((MAINSUBJECT.EXACT.EXPLODE("Employment Status") OR MAINSUBJECT.EXACT.EXPLODE("Employability") OR MAINSUBJECT.EXACT.EXPLODE("Reemployment") OR MAINSUBJECT.EXACT.EXPLODE("Retirement") OR MAINSUBJECT.EXACT.EXPLODE("Supported Employment") OR MAINSUBJECT.EXACT.EXPLODE("Unemployment") OR MAINSUBJECT.EXACT.EXPLODE("Work Adjustment Training") OR MAINSUBJECT.EXACT.EXPLODE("Personnel Termination") OR MAINSUBJECT.EXACT.EXPLODE("Occupational Adjustment") OR MAINSUBJECT.EXACT.EXPLODE("Career Change")) OR (MAINSUBJECT.EXACT.EXPLODE("Job Performance") OR MAINSUBJECT.EXACT.EXPLODE("Job Satisfaction") OR MAINSUBJECT.EXACT.EXPLODE("Employee Retention")) OR (MAINSUBJECT.EXACT.EXPLODE("Employee Engagement") OR ti("back to work" OR "return to work" OR RTW OR reemply* OR "stay at work" OR "remain at work" OR "sustain work*") OR ab("back to work" OR "return to work" OR RTW OR reemply* OR "stay at work" OR "remain at work" OR "sustain work*") OR ti(presenteeism OR "work* productiv*" OR "work place*") OR ab(presenteeism OR "work* productiv*" OR "work place*"))) AND (((MAINSUBJECT.EXACT.EXPLODE("Vocational Rehabilitation") OR MAINSUBJECT.EXACT.EXPLODE("Disability Evaluation") OR MAINSUBJECT.EXACT.EXPLODE("Human Factors Engineering") OR MAINSUBJECT.EXACT.EXPLODE("Ability Level")) OR (ti("recovery of function" OR "functional recovery" OR "back school" OR "graded activit*" OR "work harden*") OR ab("recovery of function" OR "functional recovery" OR "back school" OR "graded activit*" OR "work harden*") OR ti("vocation* rehab*" OR "work rehab*" OR "job* rehab*" OR "employ* rehab*") OR ab("vocation* rehab*" OR "work rehab*" OR "job* rehab*" OR "employ* rehab*"))) OR (MAINSUBJECT.EXACT.EXPLODE("Physical Therapy") OR MAINSUBJECT.EXACT.EXPLODE("Massage") OR MAINSUBJECT.EXACT.EXPLODE("-Physical Treatment Methods") OR ti("physical therap*" OR physiotherap* OR PT) OR ab("physical therap*" OR physiotherap* OR PT) AND pd(19990101-20190206))) AND la.exact("ENG")

Ovid/MEDLINE

1. exp occupational groups/ (555072)
2. exp Occupational Diseases/ (126395)
3. exp Accidents, Occupational/ (17064)
4. exp Occupational Injuries/ (2339)
5. exp OCCUPATIONS/ (33020)
6. exp Health Occupations/ (1612521)
7. exp Health Manpower/ (12226)
8. ma.fs. (64345)
9. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 (2157811)
10. worker$.ti,ab. (164585)
11. employee$.ti,ab. (41434)
12. professional$.ti,ab. (255987)
13. manpower.ti,ab. (6867)
14. 10 or 11 or 12 or 13 (443372)
15. 9 or 14 (2420699)
16. exp Rehabilitation, Vocational/ (9993)
17. exp Disability Evaluation/ (49115)
18. exp Ergonomics/ (53874)
19. exp "Recovery of Function"/ (46104)
20. 16 or 17 or 18 or 19 (153765)
21. "back school".tw. (241)
22. "graded activit$".tw. (210)
23. "work harden$".tw. (261)
24. ("vocation$ rehab$" or "work$ rehab$" or "job$ rehab$" or "employ$ rehab$").tw. (2538)
25. 21 or 22 or 23 or 24 (3222)
26. 20 or 25 (155097)
27. exp EMPLOYMENT/ (80077)
28. exp Sick Leave/ (5375)
29. exp Absenteeism/ (8620)
30. exp Work Performance/ (515)

APPENDIX A

31. exp Job Satisfaction/ (23275)
32. exp "Cost of Illness"/ (24443)
33. exp Work Schedule Tolerance/ (6476)
34. exp Work Engagement/ (129)
35. 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 (136794)
36. ("back to work" or "return to work" or RTW or reemploy$).tw. (8941)
37. "stay at work".tw. (62)
38. "remain at work".tw. (36)
39. "sustain work*".tw. (38)
40. presenteeism.tw. (931)
41. "work$ productiv$".tw. (2054)
42. "work place$".tw. (2578)
43. 36 or 37 or 38 or 39 or 40 or 41 or 42 (14200)
44. 35 or 43 (145986)
45. exp Physical Therapy Modalities/ (140472)
46. exp Physical Therapists/ (1385)
47. (physiotherap$ or "physical therap$").tw. (41555)
48. PT.ti,ab. (46876)
49. 45 or 46 or 47 or 48 (210133)
50. 15 and 26 and 44 (5492)
51. 49 and 50 (219)

Cochrane Database of Systematic Reviews

("Physical Therapy Modalities" OR "Physical Therapists" OR "physiotherapy*" OR "physical therap*" OR "PT") AND ("Rehabilitation, Vocational" OR "vocation* rehab*" OR "work* rehab*" OR "back school" OR "job* rehab*" OR "employ* rehab*") AND ("Return to Work" OR "back to work*" OR "return to work*" or "reemploy*")

CINAHL

Search Options	Actions
S35	S10 AND S28 AND S34
S34	S16 OR S33
S33	S29 OR S30 OR S31 OR S32
S32	TX (balneology or cryotherapy or electrotherap* or "infrared therap*" or "joint mobilization" or "manual therapy" or massage or exercis* or "muscle strengthening" or "resistance training") OR TX (pilates or plyometrics or "ultraviolet therapy")
S31	TX ("exercise therap*" or "continuous passive motion therap*" or "muscle stretching exercis*" or "plyometric exercis*" or "resistance train*") OR TX ("extracorporeal shockwave therap*" or hydrotherap* or "therapeutic irrigat*" or "musculoskeletal manipulat*") OR TX ("applied kinesiolog y" or "orthopod* manipulat*" or "osteopathic manipulat*" or "spinal manipulat*" or "soft tissue therap*" or "continuous passive motion therap*" or "myofunctional therap*")
S30	TX (physiotherap* or "physical therap*" or PT) OR TX ("animal assisted therap*" or "equine assisted therap*" or "postural drain*" or "electric stim* therap*" or electroacupuncture) OR TX ("pulsed radiofrequency treatment*" or "spinal cord stim*" or "transcutaneous electric nerve stim*" or qigong or "dance therap*" or "tai ji" or yoga or "tai chi")
S29	(MM "Physical Therapy+")
S28	S24 OR S25 OR S26 OR S27
S27	(MM "Work+")
S26	(MM "Job Re-Entry")
S25	TX ("back to work" or "return to work" or RTW or reemploy*) OR TX ("stay at work" or "remain at work" or "sustain work*") OR TX (presenteeism or "work* productiv*" or "work place*")
S24	S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23
S23	(MM "Work Engagement")
S22	(MM "Economic Aspects of Illness")
S21	(MM "Job Satisfaction+")
S20	(MM "Job Performance")
S19	(MM "Absenteeism")
S18	(MM "Sick Leave")

Table continues on page CPG74.

APPENDIX A

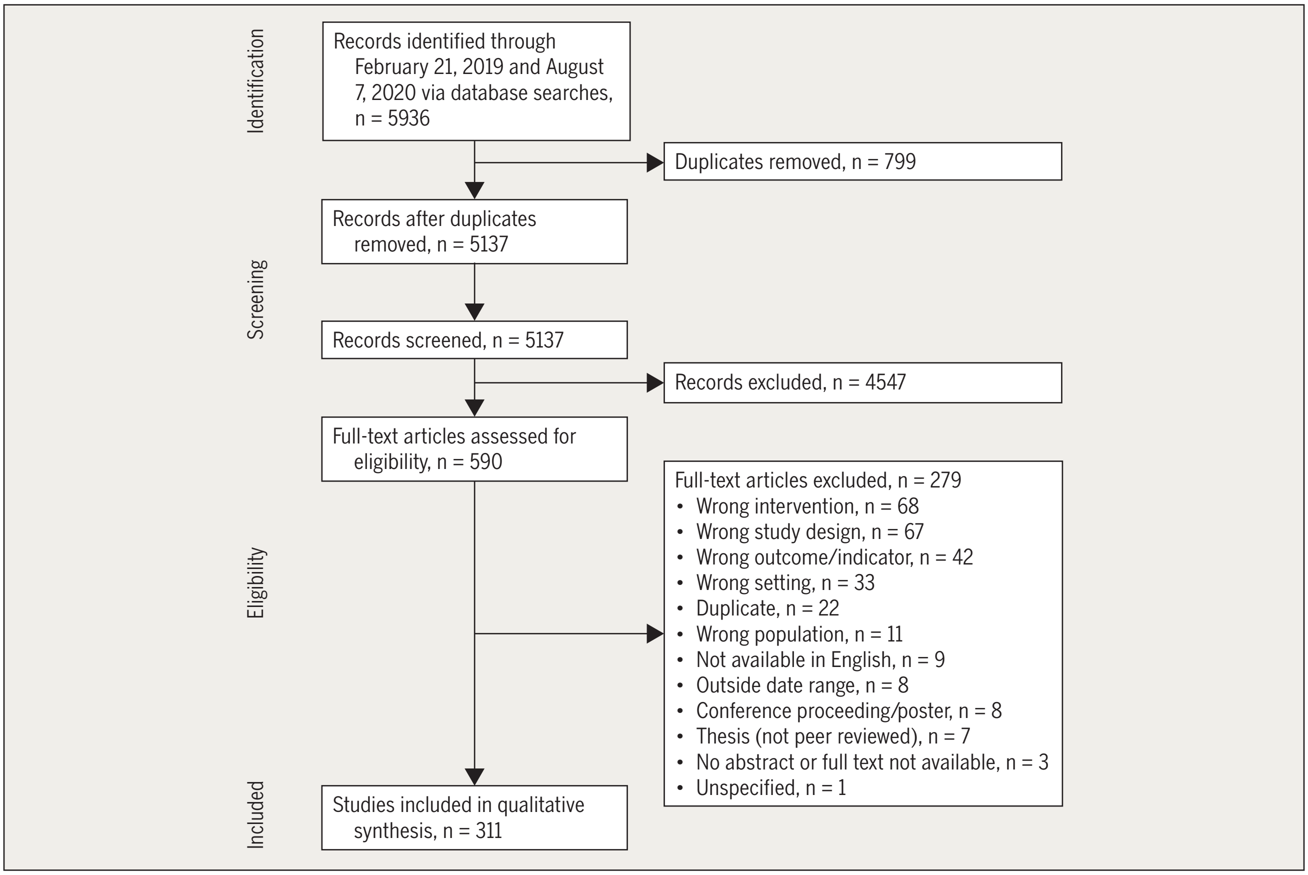
Search Options	Actions
S17	(MM "Employment+")
S16	S14 OR S15
S15	S11 OR S12 OR S13
S14	TX "recovery of function" OR TX ("back school" or "graded activit*" or "work harden*") OR TX ("vocation* rehab*" or "work* rehab*" or "job* rehab*" or "employ* rehab*")
S13	(MM "Ergonomics+")
S12	(MM "Disability Evaluation+")
S11	(MM "Rehabilitation, Vocational+")
S10	S8 OR S9
S9	TX worker* or employee* or professional* or manpower
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7
S7	(MM "Health Manpower+")
S6	(MM "Health Occupations+")
S5	(MM "Occupations and Professions+")
S4	(MM "Occupational-Related Injuries")
S3	(MM "Accidents, Occupational+")
S2	(MM "Occupational Diseases+")
S1	(MM "Named Groups by Occupation+")

PEDro

"Use only one Boolean operator at a time to combine multiple concepts. Combine unique concepts (Job re-entry, return to work, work hardening) out of the Work Rehabilitation concepts with the Subdiscipline capability of "Ergonomics and Occupational Health", while using the "AND" operator. The identification of concepts was informed by other databases included in this review."

APPENDIX B

PRISMA FLOW CHART OF ARTICLES



APPENDIX C

INCLUSION AND EXCLUSION CRITERIA

Inclusion Criteria	Exclusion Criteria
• Articles published in peer-reviewed journals using the following study designs: systematic reviews, meta-analyses, experimental and quasi-experimental, cohort, case series, and cross-sectional studies • Articles that considered work rehabilitation in clinical or workplace settings that included elements consistent with physical therapist examination/intervention and management (as well as articles related to patient/stakeholder perspectives that impact delivery of care by physical therapists) • Must have an intentional work-related or RTW component or goals (assessment, measures, intervention risk factors, prognosis, role of therapist) • The study population included workers aged 16 to 65 years, regardless of sex • Studies that focused on conditions that limit activity and participation in work (across all areas of physical therapist practice) • Primary outcomes that are work related, such as RTW, days on sick leave, postinjury employment status, stay at work, work engagement, and costs related to RTW or longevity of work (prevention interventions were included when outcomes included measures of work retention, avoiding time loss, or restricted duty) • Qualitative studies were retained for full-text review, tagging, and extraction, but were only included in the evidence synthesis if they added new information or provided expanded understanding of quantitative studies	• Meeting abstracts, press releases, theses, case reports, and articles not in English • Studies published outside of the date range of January 1999 to August 2020 • Nonhuman studies • Topics outside the scope of physical therapist practice (ie, severe psychological conditions as the primary diagnosis, neurocognitive/neuropsychological management, or surgical management of work-related conditions) • Studies outside the context of work or employment • Studies that did not have an intentional RTW outcome/focus (studies where work is considered just incidentally, work entry for individuals with developmental disabilities, etc) • Reviews that were not systematic (scoping or narrative reviews)

Abbreviation: RTW, return to work.

APPENDIX D

EVIDENCE TABLES

RISK

PICO question: "In a population with limitation in work participation due to injury or illness, what are the risk factors that need to be considered during the evaluation by a physical therapist to estimate the risk of delayed achievement of work-related goals?"

CLIENT PRESENTATION

Age

Study	Study Design	LoE	Supporting[a]	Refuting[b]	Conflicting
Abegglen et al[5]	Prospective cohort	I	X		
Clausen et al[67]	Prospective cohort	I		X	
Hou et al[157]	SLR of RCTs	I		X	
Øyeflaten et al[251]	Prospective cohort	I	X		X
Roesler et al[267]	Prospective cohort	I		X	
Stapelfeldt et al[289]	RCT analysis	I		X	
Abásolo et al[4]	RCT analysis	II			X
Armijo-Olivo et al[14]	Retrospective validation study	II		X	
Busse et al[48]	Retrospective cohort	II	X		
de Buck et al[76]	RCT analysis	II		X	
Hebert and Ashworth[143]	Retrospective cohort	II			X
Heymans et al[146]	Prospective cohort	II		X	
Joy et al[170]	Cohort observational study	II		X	
Kuijpers et al[189]	Prospective cohort	II		X	
Lydell et al[208]	Prospective cohort	II	X		
Marchand et al[210]	RCT	II	X		
Milidonis and Greene[223]	Retrospective cohort	II	X		
Rinaldo and Selander[263]	SLR	II	X		
Street and Lacey[297]	SLR	II	X		
Salzwedel et al[273]	Prospective observational	II	X		
Grossi et al[132]	Cross-sectional	III	X		
Awang et al[16]	Retrospective cohort	III	X		
Moshe et al[231]	Retrospective cohort	III		X	
Poulain et al[260]	Prospective cohort	III	X		
Turi et al[307]	Retrospective cohort	III	X		

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.
[a]*Older age negatively impacts outcomes.*
[b]*No difference with age.*

Sex

Study	Study Design	LoE	Supporting[a]	Refuting[b]	Conflicting
Abegglen et al[5]	Prospective cohort	I	X[c]		
Øyeflaten et al[251]	Prospective cohort	I			X
Stapelfeldt et al[289]	RCT analysis	I		X	
Storheim et al[296]	Prospective cohort	I		X	
Aas et al[1]	Prospective cohort	II	X[c]		
Abásolo et al[4]	RCT analysis	II	X[d]		
Heymans et al[146]	Prospective cohort	II	X[d]		
Keeney et al[177]	Prospective cohort	II	X[c]		
Kvam et al[190]	Prospective cohort	II			X
Lydell et al[208]	Prospective cohort	II			X
Milidonis and Greene[223]	Retrospective cohort	II	X[d]		

Table continues on page CPG78.

APPENDIX D

Study	Study Design	LoE	Supporting[a]	Refuting[b]	Conflicting
Rinaldo and Selander[263]	SLR	II			X
Street and Lacey[297]	SLR	II	X[d]		
Grossi et al[132]	Cross-sectional	III	X[c]		
Awang et al[16]	Retrospective cohort	III	X[d]		
Moshe et al[231]	Retrospective cohort	III		X	
Poulain et al[260]	Prospective cohort	III			X
Turi et al[307]	Retrospective cohort	III		X	

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.
[a]*Sex negatively impacts work outcomes.*
[b]*No difference with sex.*
[c]*Negative impact for male sex.*
[d]*Negative impact for female sex.*

History of Restricted Work and Prior Sick Leave

Study	Study Design	LoE	Supporting[a]
Øyeflaten et al[251]	Prospective cohort	I	Long-term sick leave prior to referral; diagnosis other than mental or musculoskeletal
Schultz et al[279]	Prospective cohort	I	Pain behavior, pain, disability, expectation of recovery

Abbreviation: LoE, Level of Evidence.
[a]*Risk impacts work outcomes.*

Injury Type and Severity

Study	Study Design	LoE	Supporting[a]	Refuting or Conflicting
Hou et al[157]	Prospective cohort	I		Injury severity, hospital stay (traumatic upper/lower extremity)
Aas et al[1]	Prospective cohort	II	Comorbid conditions	Mild to moderate cognitive impairment
Hebert and Ashworth[143]	Retrospective cohort	II	Amputation level, number of surgical procedures, days of acute care stay	
Street and Lacey[297]	SLR	II	Higher injury severity, mechanism of injury (lifting, muscular stress, repetitive lifting, sitting), negative outcome perceptions	

Abbreviations: LoE, Level of Evidence; SLR, systematic literature review.
[a]*Risk impacts work outcomes.*

Pain and Symptom Patterns

Study	Study Design	LoE	Supporting[a]	Refuting or Conflicting
Heymans et al[148]	RCT analysis	I	Back pain, radiating pain, pain intensity, function, kinesiophobia	
Schultz et al[279]	Prospective cohort	I	Pain behavior, pain, disability, expectation of recovery	
Storheim et al[296]	Prospective cohort	I	Cardiovascular fitness, pain, physical performance	
van der Weide et al[323]	Prospective cohort	I	Radiating pain, high functional disability	
Werneke and Hart[344]	Consecutive cohort	I	Pain-pattern classification (observed over time); leg pain/centralization predicts chronic pain/disability	
Baldwin et al[21]	Prospective cohort	II	Severity measures such as degree of leg pain, baseline physical/health function (musculoskeletal)	Back pain intensity (mental health problems)
Cougot et al[71]	Prospective cohort	II	Duration of absence, smoking, range of motion (chronic back pain)	
Fransen et al[101]	Prospective cohort	II	Radiating lower-limb pain, moderate ODI severity	
Gauthier et al[110]	Prospective cohort	II	Pain catastrophizing, pain severity	
Mngoma et al[225]	Prospective cohort	II	Pain profiles	
Heymans et al[146]	Prospective cohort	II	Higher pain intensity at baseline, longer-duration complaints	
Lydell et al[208]	Prospective cohort	II	Duration of sick leave before intervention (at 5 years but not 10 years)	Self-rated physical capacity/pain at 10 years
Rinaldo and Selander[263]	SLR	II	More pain, function disability, more time since injury (neck, shoulder, back)	

Abbreviations: LoE, Level of Evidence; ODI, Oswestry Disability Index; RCT, randomized controlled trial; SLR, systematic literature review.
[a]*Risk impacts work outcomes.*

APPENDIX D

Comorbid Psychological Conditions

Study	Study Design	LoE	Supporting
Dersh et al[82]	Retrospective cohort	II	X

Abbreviation: LoE, Level of Evidence.

Workers' Expectations and Beliefs

Study	Study Design	LoE	Supporting	Conflicting
Palmlöf et al[253]	Prospective cohort	I	X	
Schultz et al[279]	Prospective cohort	I	X	
Schultz et al[278]	Prospective cohort	I	X	
Xu et al[352]	Prospective cohort	I	X	
Abegglen et al[5]	Prospective cohort	I	X	
Clausen et al[67]	Prospective cohort	I		X
Carlsson et al[55]	Prospective cohort	II	X	
Gross and Battié[125]	Prospective cohort	II		X
Rinaldo and Selander[263]	SLR	II	X	
Salzwedel et al[273]	Prospective observational	II	X	
Street and Lacey[297]	SLR	II	X	

Abbreviations: LoE, Level of Evidence; SLR, systematic literature review.

Self-reported Function

Study	Study Design	LoE	Supporting[a]	Refuting or Conflicting
Margison and French[211]	Prospective cohort	I	Those with an ÖMPQ score >147 were "not fit to work"	
Baldwin et al[21]	Prospective cohort	II	Severity measures such as degree of leg pain, baseline physical/health function (musculoskeletal)	Back pain intensity (mental health problems)
Butler and Johnson[49]	Prospective cohort	II	Satisfaction with health provider	
Fransen et al[101]	Prospective cohort	II	Radiating lower-limb pain, moderate ODI severity	
Heymans et al[149]	Retrospective cohort	II		Short duration of complaint, better functional ability initially
Lydell et al[208]	Prospective cohort	II	Duration of sick leave before intervention (at 5 years but not 10 years)	Self-rated physical capacity/pain at 10 years
Milidonis and Greene[223]	Retrospective cohort	II	Difficulty lifting 10 and 25 lb, climbing 10 steps, walking 0.25 mile, number of activities limited	Pain not strongly associated with work status

Abbreviations: LoE, Level of Evidence; ODI, Oswestry Disability Index; ÖMPQ, Örebro Musculoskeletal Pain Questionnaire.
[a]*Risk impacts work outcomes.*

Fear of Movement

Study	Study Design	LoE	Supporting
Fritz and George[102]	Prospective cohort	I	X
Staal et al[287]	RCT	I	X
Storheim et al[296]	Prospective cohort	I	X
Wideman and Sullivan[347]	Prospective cohort	I	X

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial.

Nonorganic Signs/Symptom Magnification

Study	Study Design	LoE	Refuting	Conflicting
Fritz et al[103]	Prospective cohort	I	X	
Chapman-Day et al[61]	Prospective cohort	II		X

Abbreviation: LoE, Level of Evidence.

APPENDIX D

Multiple Concurrent Risks

Study	Study Design	LoE	Supporting[a]
Abegglen et al[5]	Prospective cohort	I	Age, sex, job design, somatic condition/pain
Haahr and Andersen[133]	RCT	I	High level of pain/dysfunction
Heymans et al[148]	RCT analysis	I	Pain intensity/radiation, workers' self-predicted timing of RTW, job satisfaction, expectations
Hunt et al[160]	Prospective cohort	I	Nonmedical factors (psychosocial, work, and economic) were more powerful than medical factors
Roesler et al[267]	Prospective cohort	I	Traumatic hand problems
van der Weide et al[323]	Prospective cohort	I	Radiating pain, high functional disability
Vendrig[329]	Prospective cohort	I	Perceived disability, pain
Abásolo et al[4]	RCT analysis	II	Peripheral osteoarthritis, inflammatory disease, sciatica, and duration
Armijo-Olivo et al[14]	Retrospective validation study	II	Factors following upper extremity injury: prior claims, extensive visits, pain and disability scores
de Buck et al[76]	RCT analysis	II	Complete sick leave
Ernstsen and Lillefjell[89]	Retrospective cohort	II	Musculoskeletal pain, depression, self-reported physical functioning (muscle strength, mobility, endurance capacity, and balance)
Kuijpers et al[189]	Prospective cohort	II	Longer sick leave prior to consultation, higher pain intensity, overuse strain
Stromberg et al[298]	Cross-sectional psychometric study	III	Duration of posttraumatic amnesia at 3-4 weeks negatively impacts employment outcomes following closed brain injury
Turi et al[307]	Retrospective cohort	III	Stroke patients had worse RTW rates if they were older, depressed, or anxious

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; RTW, return to work.
[a]*Risk impacts work outcomes.*

SOCIOECONOMIC AND WORK ENVIRONMENT FACTORS

Education Level

Study	Study Design	LoE	Supporting[a]	Refuting	Conflicting
Hou et al[157]	Prospective cohort	I	X		
Storheim et al[296]	Prospective cohort	I		X	X
Armijo-Olivo et al[14]	Retrospective validation study	II		X	
Kvam et al[190]	Prospective cohort	II		X	
Lydell et al[208]	Prospective cohort	II			X
Milidonis and Greene[223]	Retrospective cohort	II			X
Street and Lacey[297]	SLR	II	X		
Grossi et al[132]	Cross-sectional	III	X		
Hankins and Reid[137]	Cross-sectional	III	X		
Moshe et al[231]	Retrospective cohort	III		X	

Abbreviations: LoE, Level of Evidence; SLR, systematic literature review.
[a]*Education impacts work outcomes.*

APPENDIX D

Work Demands and Policy

Study	Study Design	LoE	Supporting[a]	Refuting	Conflicting
Haahr and Andersen[133]	RCT	I	High physical strain, manual tasks (negative impact)		
Heymans et al[147]	RCT	I			Bending, rotation at the univariate level
Kapoor et al[173]	Prospective cohort	I	More physical work (negative impact)		
Kuijpers et al[189]	Prospective cohort	I		No impact of workload	Overuse, decision authority
Øyeflaten et al[251]	Prospective cohort	I	Manual work (negative impact)		
Roesler et al[267]	Prospective cohort	I		Job classification	
Schultz et al[279]	Prospective cohort	I	Workplace factor(s) (negative impact)	Less physical demand and skill discretion	
Schultz et al[278]	Prospective cohort	I	Low coworker support, low skill discretion (negative impact)		
Stapelfeldt et al[289]	RCT analysis	I	Low job satisfaction, low influence on work planning, high perception of risk of losing job (negative impact)		
van der Weide et al[323]	Prospective cohort	I	Problems with colleague relationships, high work tempo and work quality (negative impact)		
Abásolo et al[4]	RCT	II	Unemployed or self-employed (negative impact)		
Armijo-Olivo et al[14]	Retrospective cohort	II	Modified work (positive impact)		
Busse et al[48]	Retrospective cohort	II	RTW programs (positive impact)		
Franche et al[100]	SLR	II	Work modification, contact with health team, early ergonomics, RTW coordination (positive impact)		
Fransen et al[101]	Prospective cohort	II	Need to lift three quarters of the day, no light duty at the workplace (negative impact)		
Heymans et al[146]	Retrospective cohort	II	Low satisfaction (negative impact)		
Keeney et al[177]	Prospective cohort	II	High amounts of heavy lifting, physical demands, vibration (negative impact)		
Lydell et al[208]	Prospective cohort	II		Sitting, bending, heavy lifting	Light physical labor (predicts RTW at 5 years but not at 10 years)
Muenchberger et al[232]	SLR	II	Workplace policies and accommodations, modified work (negative impact)		
Rinaldo and Selander[263]	SLR	II	Less locus of control (negative impact)	Being able to influence RTW	
Street and Lacey[297]	SLR	II	Manual job, lower wages, less time with employer, or fewer than 50 employees (negative impact)		
Grossi et al[132]	Cross-sectional	III	Manual job, higher job strain (negative impact)		
Hankins and Reid[137]	Cross-sectional	III		Longer job tenure, higher weekly wage	

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; RTW, return to work; SLR, systematic literature review.
[a]Factor impacts RTW outcomes.

Work-Related Psychosocial Factors

Study	Study Design	LoE	Supporting
Brouwer et al[38]	Prospective cohort	I	X
Clausen et al[67]	Prospective cohort	I	X
Abegglen et al[5]	Prospective cohort	I	X
Stapelfeldt et al[289]	RCT analysis	I	X
Svedmark et al[302]	RCT longitudinal study	II	X

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial.

APPENDIX D

COURSE OF CARE

PICO question: "In a population with work participation limitations, what can the physical therapy provider do in the course of care to mitigate delayed achievement of work-related goals?"

Care Delivery Patterns

Study	Study Design	LoE
Blanchette et al[30]	Retrospective cohort	II
Stephens and Gross[294]	Retrospective cohort	II
Carlsson et al[54]	RCT	II
Bernacki et al[24]	Retrospective cohort	III

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial.

Therapeutic Alliance

Study	Study Design	LoE	Supporting[a]	Conflicting
Kapoor et al[173]	Prospective cohort	I	X	
Butler and Johnson[49]	Prospective cohort	II		X
Kilgour et al[182]	SLR	II	X	
Muenchberger et al[232]	SLR	II	X	
Azoulay et al[17]	Prospective cohort	II		X
Kirsh and McKee[184]	Cross-sectional	IV	X	

Abbreviations: LoE, Level of Evidence; SLR, systematic literature review.
[a]*Worker experience impacts outcomes.*

Temporary Workers as a Vulnerable Population

Study	Study Design	LoE
Vermeulen et al[335]	Prospective cohort	II
Vermeulen et al[332]	RCT	II
Vermeulen et al[333]	Intervention mapping	V

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial.

EXAMINATION

PICO question: "In individuals who have experienced work-related injury/work-impacting illness, what reliable and valid body function and structure tests predict return to work?"

Body Functions and Structures

Study	Study Design	LoE	Conflicting
Hunt et al[160]	Prospective cohort	I	X
Werneke and Hart[345]	Prospective cohort	I	X

Abbreviation: LoE, Level of Evidence.

APPENDIX D

PICO question: "In individuals who have experienced work-related injury/work-impacting illness, what self-report questionnaires have reliability and validity regarding predicting return to work?"

Self-report Measures

Study	Study Design	LoE	Supporting	Conflicting
Abegglen et al[5]	Prospective cohort	I	X	
Bergström et al[22]	Prospective cohort	I	X	
Gabel et al[105]	Prospective cohort	I	X	
Gatchel et al[109]	Prospective cohort	I	X	
Roelen et al[265]	Prospective cohort	I		X
Roy et al[270]	Prospective cohort	I		X
Shaw et al[282]	Prospective cohort	I	X	
Trippolini et al[305]	Prospective cohort	I	X	
Armijo-Olivo et al[14]	Retrospective cohort	II	X	
Backman et al[19]	Prospective cohort	II	X	
Dale et al[74]	Prospective cohort	II	X	
Ross et al[269]	Prospective cohort	II		X
van Schaaijk et al[326]	Consecutive cohort	II	X	
Wästberg et al[342]	Cohort for psychometrics	II		X
Bethge et al[28]	Cross-sectional	III	X	
Braathen et al[35]	Cross-sectional	III	X	
Denis et al[81]	Cross-sectional	III	X	
Haraldsson et al[139]	Multiple-location cross-sectional	III	X	
Kinnunen and Nätti[183]	Cross-sectional	III	X	
Moshe et al[231]	Retrospective cohort	III	X	
Notenbomer et al[241]	Cross-sectional	III	X	
Park et al[256]	Cross-sectional	III	X	
Velozo et al[328]	Cross-sectional	III		X

Abbreviation: LoE, Level of Evidence.

PICO question: "In individuals who have experienced work-related injury/work-impacting illness, what is the reliability, validity, and usefulness of performance tests and models in predicting return to work and sustained return to work when used as part of care planning and return-to-work planning?"

Physical Performance Measures

Study	Study Design	LoE	Supporting	Refuting	Conflicting
Gross and Battié[122]	Prospective longitudinal cohort	I			X
Gouttebarge et al[115]	Prospective cohort	I		X	
Kuijer et al[188]	Prognostic cohort	I		X	
Lechner et al[194]	Prospective cohort	I	X		
Branton et al[36]	Prospective cohort	I			X
Caron et al[56]	Retrospective cohort	II	X		
Chapman-Day et al[61]	Prospective cohort	II			X
Cheng and Cheng[63]	Retrospective cohort	II		X	
Gross et al[129]	Retrospective cohort	II	X		
Gross et al[130]	Prospective cohort	II	X		
Gross and Battié[124]	Prospective cohort	II		X	
Gross et al[128]	Cluster RCT	II	X		
Gross and Battié[123]	Prospective cohort	II		X	
Gross et al[121]	Cluster RCT	II	X		
Gross et al[120]	Cluster RCT	II	X		

Table continues on page CPG84.

APPENDIX D

Study	Study Design	LoE	Supporting	Refuting	Conflicting
Haldorsen et al[135]	RCT	II	X		
Lemstra et al[196]	RCT	II		X	
Matheson et al[216]	Retrospective cohort	II			X
Scheman et al[275]	Prospective cohort	II		X	
Brubaker et al[40]	Cross-section of RCT	II	X		
Denis et al[81]	Cross-sectional	III	X		
Gross et al[127]	Psychometric study	III	X		
Gross and Battié[126]	Psychometric study, test-retest cohort	IV	X		
Mitchell et al[224]	Cross-sectional	IV			X
Tuckwell et al[306]	Prospective cohort, test-retest	IV			X
Gross[119]	Nonsystematic literature review	V			X

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial.

PICO question: "In individuals who have experienced work-related injury/work-impacting illness, what questionnaires and examination procedures have demonstrated reliability and validity for identifying workers with a risk of delayed return to work due to psychosocial factors?"

Psychosocial Factors

Study	Study Design	LoE	Supporting	Refuting
Abegglen et al[5]	Prospective cohort	I	X	
Fritz et al[103]	Prospective cohort	I		X
Fritz and George[102]	Prospective cohort	I	X	
Margison and French[211]	Prospective cohort	I	X	
Schultz et al[276]	Prospective cohort	I	X	
Shaw et al[282]	SLR	I	X	
Wideman and Sullivan[346]	Prospective cohort	I	X	
Carleton et al[53]	Retrospective cohort	II	X	
Ernstsen and Lillefjell[89]	Retrospective cohort	II		X
Franche et al[99]	SLR	II	X	
Haldorsen et al[135]	RCT	II	X	
Iles et al[163]	Prospective cohort	II	X	
Holden et al[154]	Retrospective cohort	II	X	
Park et al[256]	Cross-sectional	III	X	
Velozo et al[328]	Cross-sectional	III		X
Gross[119]	Nonsystematic literature review	V		X

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.

PICO question: "In individuals who have experienced work-related injury/work-impacting illness, what job-demand measures have reliability and validity for use in return-to-work decision making?"

Job Demands

Study	Study Design	LoE
Baker and Jacobs[20]	Prospective cohort	I
Backman et al[19]	Prospective cohort	II
Velozo et al[328]	Cross-sectional	III
Escorpizo et al[90]	Psychometric study	IV
Michel et al[222]	Descriptive	V

Abbreviation: LoE, Level of Evidence.

APPENDIX D

PICO question: "What measures show effectiveness and efficiency of physical therapy management/treatment of individuals or groups of individuals with work participation limitations following injury or illness?"

Economic and Administrative Outcomes

Study	Study Design	LoE
Cheng et al[65]	Retrospective cohort	III
Vogel et al[337]	Psychometric cross-sectional	IV
Wasiak et al[341]	Literature review	II

Abbreviation: LoE, Level of Evidence.

INTERVENTIONS

PICO question: "What interventions are shown to be effective in achieving work participation/work-related goals when included in treatment of persons with work participation limitations after injury or illness?"

Communication and Coordination of Services

Study	Study Design	LoE	Supporting	Refuting or No Difference	Conflicting
Loisel et al[206]	RCT	I	X		
Myhre et al[233]	RCT	I		X	
Jensen et al[166]	RCT	I		X	
Jensen et al[167]	RCT analysis	I		X	
Moll et al[227]	RCT	I		X	
Ntsiea et al[242]	RCT	I	X		
Pedersen et al[258]	RCT	I		X	
Stapelfeldt et al[289]	RCT	I			X
van Vilsteren et al[327]	SLR	I			X
Vogel et al[338]	SLR	I		X	
Vermeulen et al[334]	RCT	I	X		
Arnetz et al[15]	RCT	II	X		
Bültmann et al[43]	RCT	II	X		
Franche et al[100]	SLR	II	X		
Lambeek et al[192]	RCT	II			X
Marchand et al[210]	RCT	II		X	
Saha et al[271]	RCT	II	X		
Schultz et al[277]	Prospective cohort	II			X
Vermeulen et al[332]	RCT	II	X		
Bernacki et al[23]	Cross-sectional	III	X		

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.

Graded, Modified, or Transitional Work as Part of the Plan of Care

Study	Study Design	LoE	Supporting	Refuting	Conflicting
Ntsiea et al[242]	RCT	I	X		
Roels et al[266]	SLR	I	X		
van Vilsteren et al[327]	SLR	I			X
Bethge[26]	Retrospective cohort	II	X		
Khan et al[181]	SLR	II		X	
van Duijn et al[325]	Prospective cohort	II		X	
van Duijn and Burdorf[324]	Prospective cohort	II	X		
Viikari-Juntura et al[336]	RCT	II	X		
Williams et al[348]	SLR	II			X

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.

APPENDIX D

Ergonomics/Participatory Ergonomics

Study	Study Design	LoE	Supporting	Conflicting
Anema et al[13]	RCT	I	X	
Arnetz et al[15]	RCT	II	X	
Franche et al[100]	SLR	II	X	
Martimo et al[214]	RCT	II		X
Steenstra et al[292]	RCT	II	X	
Verhagen et al[330]	SLR	II		X

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.

Psychologically Informed Practice

Study	Study Design	LoE	Supporting	Refuting	Conflicting
Anema et al[13]	RCT	I		X	
Gross et al[131]	Cluster RCT	I	X		
Hara et al[138]	RCT	I	X		
Kool et al[187]	RCT	I	X		
Kool et al[186]	RCT	I	X		
Li et al[198]	RCT	I	X		
Linton et al[200]	RCT	I	X		
Meyer et al[221]	RCT	I		X	
Palmer et al[252]	SLR	I			X
Staal et al[288]	RCT	I			X
Staal et al[287]	RCT	I	X		
Vendrig[329]	Prospective cohort	I	X		
Bethge et al[27]	RCT	II			X
Brendbekken et al[37]	RCT	II			X
Campello et al[50]	RCT	II			X
Doda et al[84]	RCT	II			X
Godges et al[113]	RCT	II	X		
Heinrich et al[145]	RCT	II		X	
Jensen et al[168]	RCT	II			X
Lambeek et al[191]	RCT economic evaluation	II	X		
Leon et al[197]	RCT	II			X
Marchand et al[210]	RCT	II		X	
Marin et al[213]	SLR	II			X
Park et al[255]	RCT	II	X		
Rasmussen et al[262]	RCT	II			X
Schweikert et al[280]	RCT	II	X		
Steenstra et al[292]	RCT	II		X	
Steenstra et al[291]	RCT	II		X	
Suni et al[301]	RCT	II	X		
van den Hout et al[322]	RCT	II	X		
Verhagen et al[330]	SLR	II			X
Wisenthal et al[349]	Prospective cohort	II	X		
Hartzell et al[140]	Consecutive cohort	III	X		
Sullivan and Stanish[299]	Prospective cohort	III	X		
Taylor et al[304]	Prospective cohort	III	X		
de Jong et al[78]	Case series	IV	X		

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.

APPENDIX D

Education

Study	Study Design	LoE	Supporting	Refuting or No Difference	Conflicting
Chaléat-Valayer et al[60]	RCT	I		X	
Macedo et al[209]	RCT	I	X		
Esmaeilzadeh et al[93]	RCT	II			X
Hagen et al[134]	RCT	II	X		
Molde Hagen et al[226]	RCT	II			X
Hazard et al[141]	RCT	II		X	
Ketelaar et al[179]	RCT	II		X	
Rasmussen et al[262]	RCT	II			X

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial.

Progressive/Graded Exercise

Study	Study Design	LoE	Supporting	Refuting	Conflicting
Andersen et al[9]	RCT	I	X		
Andersen et al[10]	RCT	I		X	X
Schaafsma et al[274]	SLR of RCTs	I			X
Sundstrup et al[300]	RCT	I	X		

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.

Care Involving Multiple Components[a]

Study	Study Design	LoE	Supporting	Refuting	Conflicting
Andersen et al[8]	RCT	I		3	
Carroll et al[58]	RCT	I	3		
Heathcote et al[142]	RCT	I	2		
Hegewald et al[144]	SLR	I			2
Karjalainen et al[176]	SLR	I	3		
Kool et al[187]	RCT	I	2		
Kool et al[186]	RCT	I	2		
Loisel et al[206]	RCT economic evaluation	I	3		
Palmer et al[252]	SLR	I			2
Pedersen et al[258]	RCT	I		2	
Poulsen et al[261]	RCT	I			2
Roche et al[264]	RCT	I			2
Skagseth et al[285]	RCT	I		2	
Verhoef et al[331]	SLR	I	2		
Wegrzynek et al[343]	SLR	I			2
Aas et al[2]	SLR of RCTs	II			2
Aasdahl et al[3]	RCT	II		1	
Anderson et al[11]	RCT	II			1
Bethge et al[27]	RCT	II			2
Brendbekken et al[37]	RCT	II			1
Bültmann et al[43]	RCT	II	2		
Campello et al[50]	RCT	II			1
Carlsson et al[54]	RCT	II		1	
Cheng and Hung[64]	RCT	II	3		
Cullen et al[73]	SLR	II	3		
Dellve et al[79]	RCT	II	1		
Gismervik et al[112]	RCT	II	2		
Haldorsen et al[135]	RCT	II			1
IJzelenberg et al[161]	RCT	II		3	

Table continues on page CPG88.

APPENDIX D

Study	Study Design	LoE	Supporting	Refuting	Conflicting
Jensen et al[168]	RCT	II			1
Lambeek et al[191]	RCT economic evaluation	II	3		
Lambeek et al[193]	RCT	II	3		
Lambeek et al[192]	RCT process evaluation	II	3		
Leon et al[197]	RCT	II			1
Loisel et al[205]	Prospective cohort	II	3		
Marin et al[213]	SLR	II	2		
Meijer et al[220]	RCT	II			2
Momsen et al[228]	RCT	II		2	
Park et al[255]	RCT	II	3		
Rasmussen et al[262]	RCT	II			1
Schweikert et al[280]	RCT	II			1
van den Hout et al[322]	RCT	II	1		
Vermeulen et al[335]	Prospective cohort	II	2		
Voss et al[339]	Outcome study	II	2		
Williams et al[348]	SLR	II	3		
Hartzell et al[140]	Consecutive cohort	III	1		
Gagnon et al[106]	Retrospective cohort	III	1		
Mayer et al[218]	Prospective cohort	III	1		
Poulain et al[260]	Prospective cohort	III	1		

Abbreviations: LoE, Level of Evidence; RCT, randomized controlled trial; SLR, systematic literature review.
[a]*1, Exercise plus behavioral interventions are clinic based and may include education; general or nonspecific exercise such as strengthening, stretching, or conditioning; and a psychosocial or behavioral component. 2, Work-focused interventions are clinic based and target achieving goals related to return to work, such as the inclusion of graded work-specific activities (ie, lift, push, carry, squat, etc), and developing a return-to-work plan, which may include contact with the workplace. 3, Jobsite interventions include active involvement of the worker, the employer, and rehabilitation professionals in the workplace.*

Abbreviation: PICO, population/problem, intervention, comparison, outcome.

APPENDIX E

LEVELS OF EVIDENCE TABLE[a]

Level	Intervention/Prevention	Pathoanatomic/Risk/Clinical Course/Prognosis/Differential Diagnosis	Diagnosis/Diagnostic Accuracy	Prevalence of Condition/ Disorder	Exam/Outcomes
I	Systematic review of high-quality RCTs High-quality RCT[b]	Systematic review of prospective cohort studies High-quality prospective cohort study[c]	Systematic review of high-quality diagnostic studies High-quality diagnostic study[d] with validation	Systematic review, high-quality cross-sectional studies High-quality cross-sectional study[e]	Systematic review of prospective cohort studies High-quality prospective cohort study
II	Systematic review of high-quality cohort studies High-quality cohort study[c] Outcomes study or ecological study Lower-quality RCT[f]	Systematic review of retrospective cohort study Lower-quality prospective cohort study High-quality retrospective cohort study Consecutive cohort Outcomes study or ecological study	Systematic review of exploratory diagnostic studies or consecutive cohort studies High-quality exploratory diagnostic studies Consecutive retrospective cohort	Systematic review of studies that allows relevant estimate Lower-quality cross-sectional study	Systematic review of lower-quality prospective cohort studies Lower-quality prospective cohort study
III	Systematic reviews of case-control studies High-quality case-control study Lower-quality cohort study	Lower-quality retrospective cohort study High-quality cross-sectional study Case-control study	Lower-quality exploratory diagnostic studies Nonconsecutive retrospective cohort	Local nonrandom study	High-quality cross-sectional study
IV	Case series	Case series	Case-control study		Lower-quality cross-sectional study
V	Expert opinion	Expert opinion	Expert opinion	Expert opinion	Expert opinion

Abbreviation: RCT, randomized clinical trial.
[a]*Adapted from Phillips et al.*[259] *See also* **APPENDIX F**.
[b]*High quality includes RCTs with greater than 80% follow-up, blinding, and appropriate randomization procedures.*
[c]*High-quality cohort study includes greater than 80% follow-up.*
[d]*High-quality diagnostic study includes consistently applied reference standard and blinding.*
[e]*High-quality prevalence study is a cross-sectional study that uses a local and current random sample or censuses.*
[f]*Weaker diagnostic criteria and reference standards, improper randomization, no blinding, and less than 80% follow-up may add bias and threats to validity.*

APPENDIX F

PROCEDURES FOR ASSIGNING LEVELS OF EVIDENCE

Quality Assessment

The quality and strength of evidence for each study included for data extraction were analyzed. The Centre for Evidence-Based Medicine (Oxford, UK) has outlined a strategy for assessing the level of evidence for studies. The Centre for Evidence-Based Medicine Levels of Evidence are assigned based on the nature of the research question and study design. The Levels of Evidence range from I to V, with I representing the highest Level of Evidence (eg, a systematic review of high-quality randomized clinical trials) and V representing the lowest Level of Evidence (eg, expert opinion).[259] Articles may be downgraded, according to the Centre for Evidence-Based Medicine criteria, when the quality of the study is poor. Decisions regarding the assignments of Levels of Evidence were determined through discussion and consensus between members of the Guideline Development Group.

Each recommendation was assigned a grade based on the Level of Evidence for the studies that were used to formulate the guidance statement. Strength of recommendation is graded A through F, with A representing the highest Level of Evidence (eg, consistent level I studies) and F representing the lowest Level of Evidence (level V studies or inconclusive evidence).[219] Grades of recommendation were utilized to determine how well the scientific literature collectively supports (or refutes) the guidance statements.

Heuristic Decision Making

An heuristic decision-making approach was used to guide the process of formulating recommendations, assessing the quality of evidence, and assigning the grades of recommendation. While this is an imperfect method, it is both practical and sensible for a number of reasons, including the fact that patient values and preferences and clinician expertise and experience are the foundation of evidence-based practice. Quality was not specifically scored, but rather weighted based on the low or high quality in each Level of Evidence, with consideration of relevant elements such as follow-up, attrition rate, sample size, design, data variance, and consensus.

Grades of recommendation were based on the preponderance of evidence that either supported or refuted the guidance statement. A preponderance of evidence had to be either supporting or refuting the guidance statement in question. Because the goal of this research was to help guide physical therapy practice rather than provide a prescription for treatment, an heuristic-driven approach was determined to be the best way to present the outcomes.

Internal Group Review Phase

The recommendation statements were sent to the Guideline Development Group for internal review. A series of teleconferences to review the guidance statements were held. Team members performed quality assurance by means of having 2 people independently review and provide comments on each guidance statement and the corresponding set of evidence.

APPENDIX G

GENERAL STUDY INFORMATION AND LEVEL OF EVIDENCE TABLE

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Aas et al[2]	Norway	SLR of RCTs	Neck pain	II	Intervention effectiveness, low-quality RCTs due to lack of blinding (via GRADE)
Aas et al[1]	Norway	Prospective cohort	Stroke, including subarachnoid hemorrhage	II	Prognosis, follow-up data not included, risk factor study, n = 137, lower quality
Aasdahl et al[3]	United States	RCT	Musculoskeletal, psychological, and general unspecified disorders	II	Intervention, RCT with parallel groups, decent sample size, low quality
Abásolo et al[4]	Spain	Analysis of RCT	Musculoskeletal disorders	II	Prognosis, not an RCT, no blinding in the original study, large sample size
Abegglen et al[5]	Switzerland	Prospective cohort	Workplace accidents	I	Exam/validation psychometric study and prognosis, greater than 80% follow-up, large sample size, screening tool
Alexy and Webb[6]	United States	Psychometric study	Musculoskeletal injuries	II	Validation, prognosis, consecutive cohort, greater than 80% follow-up, n = 109, high quality
Andersen et al[10]	Denmark	RCT	Upper back or upper-body pain	I	Intervention, greater than 80% follow-up, single blind
Andersen et al[9]	Denmark	RCT	Upper back or upper-body pain	I	Intervention, efficacy, greater than 80% follow-up, single blind, n = 141
Andersen et al[8]	Denmark	RCT	Chronic musculoskeletal pain	I	Intervention, greater than 80% follow-up, examiner blind, n = 66, allocation concealment
Anderson et al[11]	Norway	RCT	Chronic pain	II	Intervention, less than 80% follow-up, n = 52 (predominantly women)
Anema et al[12]	the Netherlands	Prospective cohort	Back pain	III	Intervention, less than 80% follow-up (77% at 2 years), n = 1631
Anema et al[13]	the Netherlands	RCT	Back pain	I	Intervention, greater than 80% follow-up, single blind, n = 196
Armijo-Olivo et al[14]	Canada	Validation study	Upper extremity musculoskeletal	II	Prognosis, retrospective study, n = 3036, greater than 80% data available, high quality
Arnetz et al[15]	Sweden	RCT	Musculoskeletal	II	Intervention, no blinding, less than 80% follow-up, n = 137
Azoulay et al[17]	Canada	Prospective cohort	Back pain	II	Clinical course, greater than 80% follow-up, n = 35, concealed assessment of the control group (not possible for those with musculoskeletal disorders), high quality
Backman et al[19]	Canada	Prospective cohort	Inflammatory arthritis	II	Exam development, n = 19
Baker and Jacobs[20]	United States	Psychometric study	Discomfort with computer use	I	Exam, prospective cohort, n = 30
Baldwin et al[21]	United States	Prospective cohort	Back pain	II	Prognosis, validation study, less than 80% follow-up, large sample size, low quality
Bergström et al[22]	Sweden	Psychometric study	Back pain	I	Exam, validity study, prospective cohort, 89% follow-up with the cohort at 2 years, n = 105, high quality
Bernacki et al[23]	United States	Outcome study	Work-related conditions	III	Comparative intervention effectiveness, cross-sectional, use of retrospective data for comparison, no attrition noted
Bernacki et al[24]	United States	Retrospective cohort	All workers' compensation conditions for 10 years with lost-time claims	III	Course of care, comparison cohort, high sample size, but limited study design/relevance
Besen et al[25]	United States	Retrospective cohort	Back pain	III	Prognosis, less than 50% of initial cohort, n = 241, low quality
Bethge et al[27]	Germany	RCT	Musculoskeletal disorders	II	Intervention, less than 80% follow-up, n = 118
Bethge[26]	Germany	Retrospective cohort	Individuals with work disability absence	II	Intervention, no dropouts, large sample size, high quality

Table continues on page CPG92.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Bethge et al[28]	Germany	Cross-sectional study	Individuals with work absence who may need rehabilitation	III	Prognosis/clinical course, large sample size, high quality
Bhatia et al[29]	United States	Retrospective cohort	Rotator cuff tears	III	Prognosis, less than 80% follow-up, n = 78, low quality
Blanchette et al[30]	Canada	Retrospective cohort	Back pain	II	Course of care, large sample size, approximately 3% loss to follow-up, high quality
Blangsted et al[31]	Denmark	RCT	Neck and shoulder musculoskeletal problems	II	Intervention, 71% follow-up, large sample size
Bogefeldt et al[32]	Sweden	RCT	Back pain with or without radiation	I	Intervention, randomization, blinding, 100% follow-up, n = 160
Bondesson et al[33]	Sweden	Cross-sectional study	Breast cancer (women)	III	Course of care, 83% follow-up, large sample size, high quality
Bontoux et al[34]	France	Prospective cohort	Chronic back pain	III	Intervention, 70% follow-up, n = 87, low quality
Braathen et al[35]	Norway	Psychometric study	Musculoskeletal disorders, common mental health problems, fatigue or burnout	III	Examination, cross-sectional study, greater than 80% follow-up, n = 193, high quality
Branton et al[36]	Canada	Psychometric study	Trunk, upper extremity, and lower extremity problems	I	Examination, prospective cohort, greater than 80% follow-up, n = 147, high quality
Brendbekken et al[37]	Norway	RCT	Musculoskeletal pain (including fibromyalgia)	II	Intervention, no blinding, n = 284, greater than 80% follow-up
Brouwer et al[38]	the Netherlands	Prospective cohort	Musculoskeletal, limb, and mental health conditions and "other" (included circulatory, digestive, neurological, and respiratory system diseases)	I	Prognosis, clinical course, greater than 80% follow-up, large sample size
Brox and Frøystein[39]	the Netherlands	RCT	Not available	II	Intervention, less than 80% follow-up, n = 119
Brubaker et al[40]	United States	Psychometric study	Musculoskeletal pain	III	Exam (subset of RCT), randomized, single blind, n = 49, cross-sectional/test-only outcome design
Brusco et al[41]	Australia	Analysis of RCT	Orthopaedic or neurologic diagnoses	I	Intervention, greater than 80% follow-up, single blind, n = 137, adequate randomization
Buijs et al[42]	the Netherlands	Qualitative study	Chronic back pain	V	Course of care, expert opinion, n = 20
Bültmann et al[43]	the Netherlands	RCT	Musculoskeletal disorders	II	Intervention, economic analysis, less than 80% follow-up, n = 119
Burns et al[44]	United States	Prospective cohort	Back and extremity pain	II	Risk, clinical course, less than 80% follow-up, n = 71 (predominantly male)
Busch et al[47]	Sweden	Retrospective cohort	Musculoskeletal pain	III	Intervention, less than 80% follow-up, large sample size
Busse et al[48]	Canada	Retrospective cohort	Acute back injury	II	Clinical course, greater than 80% follow-up, large sample size, systematic review of prospective cohorts/outcomes
Butler and Johnson[49]	United States	Prospective cohort	Back pain	II	Course of care, less than 80% follow-up, large sample size
Campello et al[50]	United States	RCT	Nonspecific low back pain	II	Intervention, less than 80% follow-up, n = 33, single blind
Cancelliere et al[51]	Canada	SLR	Musculoskeletal conditions, mental health disorders, traumatic and acquired brain injury, stroke, cardiovascular conditions, MS	I	Prognosis/clinical course, SLR of 56 SLRs
Carlesso et al[52]	Canada	Cross-sectional study	Chronic back pain	III	Prognosis, large sample size, high quality
Carleton et al[53]	Canada	Retrospective cohort	Chronic back pain	II	Prognosis/clinical course, adequate follow-up, n = 108, high quality
Carlsson et al[54]	Sweden	RCT	Psychiatric and musculoskeletal diagnoses	II	Course of care, no blinding, n = 36

Table continues on page CPG93.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Carlsson et al[55]	Sweden	Prognosis	Chronic pain or mild to moderate mental health conditions	II	Longitudinal design from 2 RCTs, prospective cohort, large sample size, randomization, no mention of blinding, less than 80% follow-up, low quality
Caron et al[56]	France	Psychometric study	Musculoskeletal disorders of the spine and upper extremity and acquired brain injury	II	Exam/diagnosis, retrospective cohort, nonconsecutive, n = 149, lower quality
Carriere et al[57]	Canada	Prospective cohort	Back or neck pain	II	Prognosis, less than 80% follow-up (109/140 had full data)
Carroll et al[58]	United Kingdom	SLR	Back pain and musculoskeletal conditions	I	Intervention, economic evaluation, predominantly RCTs (8/13; others were of moderate quality), heterogeneity of interventions, no meta-analysis
Chaléat-Valayer et al[60]	France	RCT	Low back pain for more than 3 months	I	Intervention, 2 arms, single blind, greater than 80% follow-up, large sample size
Chapman-Day et al[61]	United States	Prospective cohort	Soft tissue spinal injuries, upper and lower extremity injuries	II	Prognosis, n = 99, 63% follow-up, low quality
Chen et al[62]	Taiwan	Case-control study	Forearm, wrist, hand trauma	III	Prognosis, n = 80
Cheng et al[65]	United States	Retrospective cohort	Upper extremity diagnosis	III	Outcomes, less than 80% follow-up, n = 221
Cheng and Cheng[63]	China	Psychometric study	Distal radius fracture	II	Exam, validation study, retrospective cohort, greater than 80% follow-up, n = 194
Cheng and Hung[64]	China	RCT	Rotator cuff tendinitis	II	Intervention, no blinding, n = 94
Chopp-Hurley et al[66]	Canada	RCT	Hip and knee osteoarthritis	I	Intervention, greater than 80% follow-up, n = 24, assessor blinded
Clausen et al[67]	Denmark	Prospective survey cohort	Consecutive individuals with work-limiting problems for more than 8 weeks	I	Clinical course/risk factor, large sample size, administratively followed all those with extended work absence
Cochrane et al[68]	Ireland	SLR	Musculoskeletal back, neck, or extremity pain	I	Intervention, SLR of RCTs with meta-analysis, large sample size
Cochrane et al[69]	Ireland	Cross-sectional study	Musculoskeletal disorders	III	Prognosis, risk, cross-sectional, n = 155
Comper et al[70]	Brazil	RCT	Musculoskeletal disorders	I	Intervention, adequate randomization/blinding, n = 491, greater than 80% follow-up
Cougot et al[71]	France	Prospective cohort	Chronic low back pain	II	Prognosis, 78% follow-up, n = 217, low quality
Cullen et al[73]	Canada	SLR	Musculoskeletal and pain-related conditions and mental health conditions	II	Intervention, medium- to high-quality RCTs (36 studies)
Dale et al[74]	United States	Psychometric study	Workers at risk for carpal tunnel syndrome	II	Examination, prospective cohort, less than 80% follow-up, n = 551
de Buck et al[77]	the Netherlands	SLR	Rheumatic diseases	II	Intervention effectiveness, no RCTs (n varied from 52 to greater than 4 million)
de Buck et al[76]	the Netherlands	Analysis of RCT	Chronic arthritis and rheumatic diseases	II	Prognosis, no blinding (n = 140 at start), 80% follow-up
de Jong et al[78]	the Netherlands	Case series	Upper extremity disorders	IV	Intervention, case series, n = 8, sequential randomized and replicated single-case experimental-phase design
Dellve et al[79]	Sweden	RCT	Chronic neck pain	II	Intervention, no blinding, less than 80% follow-up, n = 633, predominantly female
Demou et al[80]	United Kingdom	Prospective cohort	Musculoskeletal and mental health	III	Intervention, less than 80% follow-up, large sample size
Denis et al[81]	Canada	Cross-sectional study	Low back pain	III	Prognosis, n = 100 (nursing, all female)
Dersh et al[82]	United States	Consecutive retrospective cohort	Chronic disabling back conditions and psychiatric disorders	II	Prognosis, large sample size, 91% completion
Desmeules et al[83]	Canada	SLR	Rotator cuff tendinopathy	II	Intervention, 10 RCTs (no meta-analysis), low quality

Table continues on page CPG94.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Doda et al[84]	Australia	RCT	Musculoskeletal pain and discomfort	II	Intervention, n = 242, 40% attrition, low quality
Donceel et al[85]	Belgium	RCT	Herniated lumbar disc problems post surgery	II	Course of care, large sample size, no mention of blinding, no dropouts
Driessen et al[87]	the Netherlands	Cluster RCT	Back or neck pain	II	Intervention, less than 80% follow-up, large sample size
Driessen et al[86]	the Netherlands	RCT	Back or neck pain	II	Intervention, less than 80% follow-up, large sample size
Ernstsen and Lillefjell[89]	Norway	Retrospective cohort	Chronic musculoskeletal pain	II	Intervention, greater than 80% follow-up, n = 92
Escorpizo et al[90]	Switzerland	Psychometric study	Not available	IV	Exam, SLR for measures related to productivity matched to the ICF: content validity, utility, reliability agreement of measures and the ICF (kappa and CI)
Esmaeilzadeh et al[93]	Turkey	RCT	Upper extremity musculoskeletal disorders	II	Intervention, less than 80% follow-up, n = 84
Evanoff et al[94]	United States	Prospective cohort	Musculoskeletal disorders	III	Intervention, follow-up varied from 66% to 80% (less than 80%)
Faber et al[95]	the Netherlands	SLR	Rotator cuff impingement syndrome/tears	II	Intervention, all RCTs (6/18 were high-quality studies)
Feuerstein et al[98]	United States	Prospective cohort	Upper extremity disorders	II	Intervention, less than 80% follow-up, n = 131
Franche et al[99]	Canada	Psychometric study	Musculoskeletal and other pain-related conditions	II	Examination, prospective cohort, less than 80% follow-up, large sample size
Franche et al[100]	Canada	SLR	Back or upper extremity musculo-skeletal disorders	II	Intervention effectiveness, less than 50% were RCTs, large sample size
Fransen et al[101]	New Zealand	Prospective cohort	Chronic back pain	II	Prognosis, less than 80% follow-up, large sample size
Fritz et al[103]	United States	Psychometric study	Acute back pain	I	Examination, prospective cohort, 100% follow-up at 4 weeks, n = 69
Fritz and George[102]	United States	Prospective cohort	Low back pain	I	Examination, prognosis, prospective cohort, greater than 80% follow-up, n = 78
Gabel et al[105]	Australia	Psychometric study	Acute musculoskeletal injuries	I	Examination, prospective cohort, greater than 80% follow-up, n = 143
Gagnon et al[106]	United States	Retrospective cohort	Chronic conditions (including back pain)	III	Intervention, less than 80% completion, n = 101
Ganesh et al[108]	India	Prospective cohort	Back pain	III	Intervention, less than 80% follow-up, n = 51
Gatchel et al[109]	United States	Prospective cohort	Chronic disabling musculoskeletal disorders	I	Prognosis, clinical course, n = 150, greater than 80% follow-up
Gauthier et al[110]	Canada	Prospective cohort	Soft tissue injuries	II	Risk, prognosis, n = 255, greater than 80% follow-up
Gismervik et al[112]	Norway	RCT	Musculoskeletal, psychological, or general diagnoses	II	Intervention, open-label parallel RCT, n = 166, 78% follow-up, intention to treat, partial blinding
Godges et al[113]	United States	RCT	Low back pain	II	Intervention, no randomization or blinding noted, n = 36, low quality
Gouin et al[114]	Canada	Analysis of case studies	Musculoskeletal or common mental health disorders	V	Course of care, secondary analysis, interviews, n = 27
Gouttebarge et al[116]	the Netherlands	Psychometric study	Musculoskeletal disorders	IV	Examination, validation study, cross-sectional, n = 72, low quality
Gouttebarge et al[115]	the Netherlands	Psychometric study	Musculoskeletal disorders	I	Examination, prospective cohort, prognosis/out-comes, n = 60, 83% follow-up
Gram et al[117]	Denmark	RCT	Musculoskeletal pain	II	Intervention, no blinding, n = 67
Gray and Howe[118]	United Kingdom	SLR	Not available	II	Course of care, 15 studies, generally low quality (2 RCTs), risk of bias in some studies, and a number of low-quality studies included

Table continues on page CPG95.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Gross et al[130]	Canada	Prospective cohort	Musculoskeletal disorders	II	Prognosis, exam, 69% had functional data, n = 582, low quality
Gross et al[129]	Canada	Retrospective cohort	Low back pain	III	Prognosis, 76% from initial sample had complete data sets
Gross et al[128]	Canada	Psychometric study	All work injury claims except brain injury or disease	II	Examination, n = 372, cluster RCT, less than 80% follow-up, no blinding
Gross et al[127]	Canada	Psychometric study	Back pain	II	Exam/outcome, good sample size, retrospective cohort study, high follow-up
Gross and Battié[125]	Canada	Prospective cohort	Musculoskeletal conditions	II	Prognosis, n = 1040, 56% had complete data, 100% data for those included, lower quality
Gross and Battié[122]	Canada	Longitudinal cohort	Upper extremity disorders	I	Prognosis/risk, prospective, n = 336, 85% with complete data, high quality
Gross and Battié[123]	Canada	Prospective cohort	Chronic back pain	II	Prognosis, n = 130, 54% response rate, low quality
Gross and Battié[124]	Canada	Retrospective cohort	Back injury	II	Prognosis, n = 226, 81% with complete data
Gross and Battié[126]	Canada	Psychometric study	Back pain	IV	Examination, cohort, n = 28, 75% participation in both days (test-retest), low quality
Gross et al[121]	Canada	Prognosis/outcome	Musculoskeletal disorders	II	Examination, n = 225, cluster RCT, 73% complete follow-up
Gross et al[120]	Canada	Cluster RCT	Musculoskeletal disorders	II	Outcomes, examination, n = 203, cluster RCT, 54% participation in follow-up interviews
Gross[119]	Canada	Literature review	Not available	V	Examination, nonsystematic literature review, expert opinion
Gross et al[131]	Canada	Cluster RCT	Musculoskeletal conditions	I	Intervention, adequate follow-up, large sample size, randomization, blinded assessors
Grossi et al[132]	Sweden	Cross-sectional	Musculoskeletal pain	III	Prognostic, n = 586, high quality
Haahr and Andersen[133]	Denmark	RCT	Lateral epicondylitis	I	Prognostic, n = 266, greater than 80% follow-up
Molde Hagen et al[226]	Norway	RCT	Back pain	II	Intervention, economic, no blinding, n = 457
Hagen et al[134]	Norway	RCT	Low back pain	II	Intervention, no blinding, n = 457, less than 80% follow-up
Haldorsen et al[135]	Norway	RCT	Musculoskeletal pain	II	Prognosis, risk, economic, large sample size, no blinding
Awang et al[16]	Malaysia	Retrospective cohort	General injuries, lower limbs, illness/diseases, upper limbs	III	Prognosis, n = 9850, fewer than 80% included in analysis
Hankins and Reid[137]	United States	Cross-sectional	General work-related injuries	III	Prognostic, large sample size, high quality
Hara et al[138]	Norway	RCT	Mental disorders, musculoskeletal disorders, chronic pain, chronic fatigue	I	Intervention, single blind, randomization, n = 213, greater than 80% follow-up, high quality
Haraldsson et al[139]	Sweden	Psychometric study	Not available	IV	Exam, tool development, validation study, convenience study, limited response rate (content validity index), large sample size
Hartzell et al[140]	United States	Consecutive cohort	Chronic neck and back pain	III	Intervention, n = 1113, 76% follow-up
Hazard et al[141]	United States	RCT	Low back injury	II	Intervention, no blinding, n = 489
Heathcote et al[142]	Australia	SLR	Acute traumatic injury presenting to hospital for acute management and rehabilitation	I	Intervention, SLR and meta-analysis, primarily RCTs (19/21 were high quality)
Hebert and Ashworth[143]	Canada	Retrospective cohort	Lower extremity amputation	II	Prognosis, n = 88, high quality
Hegewald et al[144]	Germany	SLR	Coronary artery disease	I	Intervention, Cochrane meta-analysis, 39 SLRs (primarily RCTs, although some were of lower quality), certainty of evidence was low to moderate for various interventions/outcomes
Heinrich et al[145]	the Netherlands	RCT	Musculoskeletal disorder	II	Intervention, n = 254, no blinding, greater than 80% follow-up
Heymans et al[149]	the Netherlands	Retrospective cohort	Low back pain	II	Intervention/prognosis, 100% data available, large sample size, high quality

Table continues on page CPG96.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Heymans et al[148]	the Netherlands	Analysis of RCT	Low back pain	I	Prognosis, high quality, greater than 80% follow-up, large sample size
Heymans et al[147]	the Netherlands	RCT	Low back pain	I	Intervention, prognosis, greater than 80% for primary outcomes (return to work)
Heymans et al[146]	the Netherlands	Prospective cohort	Low back pain	II	Prognosis, clinical prediction rule validation study, n = 628, less than 80% follow-up
Hirth et al[150]	Australia	Retrospective cohort	Hand/finger tendon repairs	II	Intervention, n = 134, greater than 80% follow-up, high quality
Hlobil et al[153]	the Netherlands	RCT	Back pain	I	Intervention, costs, blinding, greater than 80% follow-up, randomization
Hlobil et al[152]	the Netherlands	RCT	Back pain	I	Intervention, n = 134, blinding, greater than 80% follow-up, randomization
Hlobil et al[151]	the Netherlands	SLR	Back pain	I	Intervention, SLR of RCTs (high and low quality)
Holden et al[154]	Australia	Psychometric study	Musculoskeletal disorders	II	Examination, prognosis, retrospective cohort, n = 117, high quality
Hoosain et al[155]	South Africa	SLR	Upper-limb conditions including traumatic injury, degenerative conditions, or nonspecific upper-limb pain	I	Intervention, SLR (primarily RCTs; 9 high quality, 7 medium quality, 1 low quality)
Hou et al[157]	Taiwan	Prospective cohort	Upper- and lower-limb orthopaedic trauma requiring hospitalization	I	Prognosis, n = 154, greater than 80% follow-up at 6 months
Hou et al[156]	Taiwan	SLR of RCTs	Traumatic upper extremity injuries	I	Intervention, Cochrane review
Houben et al[158]	the Netherlands	Psychometric study	Not available	IV	Examination, prognosis, cross-sectional study, low quality, n = 297, 49% response rate
Hoving et al[159]	the Netherlands	SLR	Breast cancer	II	Intervention, noncontrolled studies, 100% female/breast cancer
Hunt et al[160]	Canada	Prospective cohort	Low back injury	I	Prognosis, n = 159, 83% follow-up
IJzelenberg et al[161]	the Netherlands	RCT	Low back pain	II	Intervention, n = 489, less than 80% follow-up
Ikezawa et al[162]	Canada	Psychometric study	Not available	IV	Reliability study, n = 36, cross-sectional, 31% response rate
Iles et al[163]	Australia	Prospective cohort	Conditions involved in workers' compensation claims population	II	Risk evaluation/exam, less than 80% follow-up, large sample size
Jensen et al[168]	Sweden	RCT	Spinal pain	II	Intervention, n = 214, less than 80% follow-up
Jensen et al[166]	Denmark	RCT	Low back pain	I	Intervention, large sample size, 100% follow-up for primary outcome (return to work) and 71% follow-up for secondary outcomes (pain, perceived disability, fear avoidance)
Jensen[165]	Denmark	Prospective cohort	Musculoskeletal conditions and/or common mental illness	III	Course of care, intervention, nonrandomized, large sample size, 74% follow-up, low quality
Jensen et al[167]	Denmark	Analysis of RCT	Back pain	I	Intervention, economic analysis, large sample size, greater than 80% follow-up
Jousset et al[169]	France	RCT	Chronic low back pain	II	Intervention, no blinding, n = 84
Joy et al[170]	United States	Descriptive cohort study	Low back pain	II	Prognosis, n = 115, observational data from a cohort, 100% follow-up
Kajiki et al[172]	Japan	RCT	Low back pain	I	Intervention, blinding, randomization, large sample size, greater than 80% follow-up
Kapoor et al[173]	United States	Prospective cohort	Acute back pain	I	Course of care, large sample size, greater than 80% follow-up
Karjalainen et al[176]	Finland	SLR	Back pain	I	Intervention, SLR of high-quality RCTs
Karjalainen et al[175]	Finland	SLR	Back pain	II	Intervention, SLR of low-quality RCTs
Karjalainen et al[174]	Finland	RCT	Back pain	II	Intervention, n = 164, adequate follow-up, no blinding

Table continues on page CPG97.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Keeney et al[177]	United States	Prospective cohort	Back injury	II	Prognosis, large sample size, less than 80% follow-up, low quality
Ketelaar et al[179]	the Netherlands	RCT	Not available	II	Intervention, large sample size, less than 80% follow-up, low quality
Keyes et al[180]	United States	Low-quality cohort	General workers' compensation injuries	III	Course of care, prognosis, large sample size, response rate less than 80% (44%), low quality
Khan et al[181]	Australia	SLR	MS	II	Intervention, 1 RCT, 1 controlled trial
Kilgour et al[182]	Australia	SLR	Not available	II	Course of care, SLR of non-RCT, qualitative studies
Kinnunen and Nätti[183]	Finland	Psychometric study	Not available	III	Exam, prognosis, cross-sectional, large sample size, administrative data, high quality
Kirsh and McKee[184]	Canada	Participatory research study	Generalized workers' compensation claimants	IV	Prognosis, survey, cross-sectional, limited response, n = 290, nonrandom
Kishino et al[185]	United States	Prospective cohort	Back pain	I	Intervention, n = 68, 100% follow-up, high quality
Kool et al[186]	Switzerland	RCT	Back pain	I	Intervention, randomization, blinding, n = 174, greater than 80% follow-up
Kool et al[187]	Switzerland	RCT	Nonacute back pain	I	Intervention, randomization, single blinding, greater than 80% follow-up
Kuijer et al[188]	the Netherlands	Psychometric study	Chronic back pain	I	Exam, prognosis, explorative prognostic cohort, small (n = 18), high quality
Kuijpers et al[189]	the Netherlands	Prospective cohort study	Shoulder pain	II	Prognosis, risk, n = 350, 30% response rate at 6-month follow-up
Kvam et al[190]	Norway	Prospective cohort study	Musculoskeletal pain that may be in combination with mild psychological problems	II	Prognosis, n = 270, less than 80% follow-up (69%)
Lambeek et al[192]	the Netherlands	Process evaluation within RCT	Low back pain	II	Intervention, 65% to 100% follow-up, low quality
Lambeek et al[193]	the Netherlands	RCT	Low back pain	II	Intervention, greater than 80% follow-up, no blinding
Lambeek et al[191]	the Netherlands	Economic evaluation alongside RCT	Low back pain	II	Intervention, cost-effectiveness, n = 134, greater than 80% follow-up, no blinding
Lechner et al[194]	United States	Psychometric study	Injuries involving the spine and upper and lower extremities	II	Examination, prospective cohort, consecutive sample of convenience, low quality
Lemstra et al[196]	Canada	Randomized trial	Low back pain	II	Diagnostic/exam, blinding, n = 90
Leon et al[197]	Spain	RCT	Musculoskeletal disorders	II	Intervention, no blinding, n = 181
Li et al[198]	China	RCT	Musculoskeletal injuries	I	Intervention, blinding, randomization, n = 582, greater than 80% follow-up
Linton et al[200]	Sweden	RCT	Nonspecific neck and back pain	I	Intervention, n = 185, 85% follow-up, randomization
Loisel et al[205]	Canada	Part of RCT: prospective cohort	Subacute back pain	II	Intervention, n = 37, greater than 80% follow-up, high quality
Loisel et al[206]	Canada	Economic evaluation alongside RCT	Subacute back pain	I	Course of care, intervention, n = 104, greater than 80% follow-up
Loisel et al[204]	Canada	Case series	Musculoskeletal disorders	IV	Course of care, qualitative review of 22 charts to determine process review values
Lötters et al[207]	the Netherlands	Prospective cohort	Musculoskeletal disorders and back pain	I	Prognosis, n = 252, greater than 80% follow-up
Lydell et al[208]	Sweden	Prospective cohort	Musculoskeletal disorders	II	Prognosis, n = 110, less than 80% follow-up
Macedo et al[209]	Australia	RCT	Rheumatoid arthritis	I	Prognosis/intervention, blinding, n = 32, randomization, greater than 80% follow-up
Marchand et al[210]	Norway	RCT	Neck and back pain	II	Intervention, n = 405, less than 80% follow-up
Margison and French[211]	Canada	Prospective cohort	Work injuries with no specific injury/condition	I	Prognosis, n = 211, no loss to follow-up, high quality
Marhold et al[212]	Sweden	RCT	Musculoskeletal pain	II	Intervention, no blinding, n = 72, follow-up not specified

Table continues on page CPG98.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Marin et al[213]	Canada	SLR	Subacute low back pain	II	Intervention, low-quality RCTs (via GRADE)
Martimo et al[214]	Finland	RCT	Upper extremity disorders	II	Intervention, no blinding, n = 177, predominantly female
Matheson et al[216]	United States	Psychometric study	Work-related functional limitations	II	Examination, retrospective cohort, large sample size, 100% follow-up
Mayer et al[218]	United States	Prospective cohort	Cervical spine disorders (with or without fusion)	III	Intervention, large sample size, less than 80% follow-up
Mayer et al[217]	United States	Prospective cohort	Lower extremity disorders and low back pain	II	Intervention, n = 202, greater than 80% follow-up
Meijer et al[220]	the Netherlands	RCT	Nonspecific upper extremity musculoskeletal complaints	II	Intervention, no blinding, n = 34
Meyer et al[221]	Switzerland	RCT	Musculoskeletal disorders	I	Intervention, blinding, randomization, n = 33, greater than 80% follow-up
Michel et al[222]	France	Descriptive study	Chronic low back pain	V	Course of care, descriptive
Milidonis and Greene[223]	United States	Retrospective cohort	Arthritic conditions	II	Risk, n = 286, 92% response rate for phase 1 and 91% for phase 2
Mitchell et al[224]	United Kingdom	Psychometric study	Not available	IV	Examination, prevalence, cross-sectional study, case series, small sample (n = 12), low quality
Mngoma et al[225]	Canada	Prospective cohort	Back pain	II	Prognosis, n = 147, less than 80% completion
Moll et al[227]	Denmark	RCT	Neck or shoulder pain	I	Intervention, n = 168, less than 80% follow-up for secondary outcomes: 1 for the primary outcome of return to work and 2 for secondary outcomes (pain, disability)
Momsen et al[228]	Denmark	RCT	All work absence beneficiaries not likely to return to work in 12 weeks	II	Intervention, large sample size, less than 80% follow-up, no blinding
Moshe et al[231]	Israel	Retrospective cohort	Upper-limb disorders	III	Prognosis/interdisciplinary, low sample size, primarily men
Muenchberger et al[232]	Australia	SLR/prognostic study	Musculoskeletal disorders	II	Prognosis, high-quality SLR process (some retro-spective studies) and text analysis, followed by expert rating of identified categories related to practical use with interrater agreement
Myhre et al[233]	Norway	RCT	Neck and back pain	I	Intervention, large sample size, blinding, random-ization, greater than 80% follow-up
Nemes et al[236]	Romania	Prospective cohort	Musculoskeletal disorders	III	Intervention/outcomes, large sample size, less than 80% follow-up
Nicholas et al[237]	Australia	Prospective cohort	Soft tissue injuries of the back or limbs	III	Intervention, controlled, nonrandomized prospec-tive design, n = 113, intention to treat, 82% in the final analysis by intention-to-treat analysis
Nilsson et al[238]	Sweden	Prospective, noncontrolled	Lateral epicondylitis	II	Prognosis, n = 366, greater than 80% follow-up
Norbye et al[239]	Norway	RCT	Low back pain	II	Intervention, n = 48, less than 80% follow-up (75%), no blinding
Norlund et al[240]	Sweden	SLR	Low back pain	II	Intervention, predominantly RCTs (low quality)
Notenbomer et al[241]	the Netherlands	Cross-sectional study	Conditions resulting in work absence	III	Prognosis, large sample size
Ntsiea et al[242]	South Africa	RCT	Post stroke	I	Intervention, single blind, randomized, n = 80, greater than 80% follow-up
Nurminen et al[243]	Finland	RCT	Not available	I	Intervention, large sample size, greater than 80% follow-up
Odeen et al[244]	Norway	RCT	Back pain	I	Intervention, single blind, randomized, greater than 80% follow-up
Oleske et al[248]	United States	RCT	Low back pain	I	Intervention, prognosis, large sample size, single blind, randomized

Table continues on page CPG99.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Olsson et al[249]	Sweden	Prospective cohort	Ill health with complex problems and risk of sick leave (pain, mental ill health, relatively frequent health care visits), readiness for change	II	Intervention, longitudinal single cohort, n = 86, greater than 80% follow-up for questionnaire, less than 80% for final analysis
Oude Hengel et al[250]	the Netherlands	RCT	Musculoskeletal symptoms	II	Intervention, prevalence, cluster RCT, no blinding, large sample size, less than 80% follow-up, predominantly male
Øyeflaten et al[251]	Norway	Prospective cohort	Musculoskeletal or mental health conditions	I	Course of care, prognosis, large sample size, greater than 80% follow-up
Palmer et al[252]	United Kingdom	SLR	Musculoskeletal disorders	I	Intervention, 42 studies, predominantly RCTs
Palmlöf et al[253]	Sweden	Prospective cohort	Poor self-perceived physical and mental work ability	I	Risk, clinical course/outcomes, n = 7868, follow-up data not available
Park et al[255]	Canada	RCT	Musculoskeletal disorders	II	Intervention, no blinding, large sample size, greater than 80% follow-up
Park et al[256]	Canada	Psychometric study	Musculoskeletal disorders	III	Exam, prognosis, cross-sectional, large sample size
Paulsen et al[257]	Denmark	RCT	Low back pain with surgical intervention	I	Intervention, randomization, blinding, greater than 80% follow-up, n = 146
Pedersen et al[258]	Denmark	RCT	Low back pain	I	Intervention, adequate blinding, randomized, greater than 80% follow-up
Poulain et al[260]	France	Prospective cohort	Chronic low back pain	III	Intervention/prognosis, n = 105, less than 80% follow-up
Poulsen et al[261]	Norway	RCT	Sick leave beneficiaries	I	Intervention, large sample size, greater than 80% follow-up
Rasmussen et al[262]	Denmark	RCT	Low back pain	II	Intervention, stepped-wedge cluster RCT, large sample size, less than 80% follow-up
Rinaldo and Selander[263]	Sweden	SLR	Musculoskeletal disorders	II	Prognosis, mix of high- and low-quality studies, methods not of high quality
Roche et al[264]	France	RCT	Chronic back pain	I	Intervention outcomes, good sample size, greater than 80% follow-up
Roelen et al[265]	the Netherlands	Psychometric study	Not available	I	Examination, prospective cohort, good sample size, greater than 80% follow-up
Roels et al[266]	the Netherlands	SLR	Spinal cord injuries	I	Intervention, SLR of an RCT
Roesler et al[267]	Australia	Prospective cohort	Hand injuries	I	Prognosis/risk, clinical course, greater than 80% follow-up
Ross et al[269]	United States	Prospective, nonrandomized	Back, upper extremity, or lower extremity injury	II	Outcome, less than 80% follow-up, n = 179
Roy et al[270]	Canada	Psychometric study	Upper extremity conditions	I	Exam/diagnosis (CPG), prospective cohort, large sample size, greater than 80% follow-up
Saha et al[271]	Sweden	RCT	Acute and subacute neck and/or back pain	II	Intervention, cluster RCT, no blinding, greater than 80% follow-up, n = 352
Saltychev et al[272]	Finland	Prospective cohort	Musculoskeletal disorders	I	Course of care/prognosis, risk, large sample size, no loss to follow-up reported
Salzwedel et al[273]	Germany	Prospective observational	Post acute coronary syndrome or coronary bypass grafting	II	Prognosis, clinical course, greater than 80% follow-up, bicentric design, n = 401
Schaafsma et al[274]	the Netherlands	SLR	Low back pain	I	Intervention, SLR of RCTs reporting on 25 RCTs (n = 4404 combined)
Scheman et al[275]	United States	Psychometric study	Lumbosacral sprain/strain	II	Examination, prospective cohort, n = 130, 60% follow-up
Schultz et al[277]	Canada	Prospective cohort	Nonspecific back injury	II	Intervention, n = 72, 100% follow-up, lacking full RCT, deviations from standard protocol, high quality

Table continues on page CPG100.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Schultz et al[279]	Canada	Prospective cohort	Subacute and chronic back pain	I	Prognosis, n = 247, 83% follow-up
Schultz et al[278]	Canada	Prospective cohort	Subacute and chronic back pain	I	Prognosis/risk, n = 253, 83% follow-up
Schultz et al[276]	Canada	Prospective cohort	Subacute back pain	I	Prognosis, longitudinal, n = 111, 90.9% follow-up at 3 months
Schweikert et al[280]	Germany	RCT	Low back pain	II	Outcomes, prospective economic evaluation, large sample size, no blinding, less than 80% follow-up
Shaw et al[282]	United States	Psychometric study	Acute low back pain	I	Exam/prognosis/outcomes, prospective cohort, n = 519, greater than 80% follow-up
Shaw et al[281]	United States	SLR	Acute back pain	I	Intervention/risk, SLR of reviews
Sheehan et al[284]	Australia	Cross-sectional survey	Musculoskeletal conditions, traumatic injuries, mental health conditions, and occupational diseases	III	Course of care, response rate of 80% in 2013 and 2014 and 82% in 2016, n = 8808
Skagseth et al[285]	Norway	RCT	Musculoskeletal, unspecified, or common mental health disorders	I	Intervention, single blind, randomized, greater than 80% follow-up, n = 175
Staal et al[288]	the Netherlands	RCT	Low back pain	I	Intervention, greater than 80% follow-up, blinding, randomization
Staal et al[287]	the Netherlands	RCT	Low back pain	I	Prognosis, risk, n = 134, greater than 80% follow-up, blinding, randomization
Stapelfeldt et al[289]	Denmark	RCT analysis	Back pain	I	Prognostic, subgroup RCT analysis, randomization, n = 351
Steenstra et al[292]	the Netherlands	RCT	Low back pain	II	Intervention, no blinding, n = 112
Steenstra et al[291]	the Netherlands	RCT	Low back pain	II	Intervention, less than 80% follow-up, limited blinding (not for allocation, worker informed after first data collection, questionnaires mailed to minimize bias), n = 112
Steenstra et al[293]	the Netherlands	RCT	Low back pain	II	Intervention moderators, n = 196, no blinding
Stephens and Gross[294]	Canada	Retrospective cohort	Soft tissue injuries	II	Intervention/course of care, large sample size, greater than 80% full-data follow-up, high quality
Storheim et al[296]	Norway	Prospective cohort	Nonspecific back pain	I	Prognosis/risk, n = 93, greater than 80% follow-up
Street and Lacey[297]	Australia	SLR	Heterogeneous workplace injuries	II	Risk, prognosis, 6 of 9 studies were retrospective cohorts
Stromberg et al[298]	United States	Psychometric study	Moderate or severe closed traumatic brain injury	III	Exam/prognosis, classification tree methodology and validation, cross-sectional, n = 7861 in year 1, n = 4927 in year 3, follow-up of 86% at 1 year and 60% at 5 years
Sullivan and Stanish[299]	Canada	Prospective cohort	Soft tissue injuries	III	Intervention, n = 104, less than 80% follow-up
Sundstrup et al[300]	Denmark	RCT	Chronic pain and work disability conditions	I	Intervention, blinding, n = 66, greater than 80% follow-up, randomization
Suni et al[301]	Finland	RCT	Low back pain	II	Intervention, large sample size, less than 80% follow-up
Svedmark et al[302]	Sweden	Longitudinal study of prior RCT	Nonspecific neck pain	II	Intervention, outcomes, n = 97, no blinding specified
Swaen et al[303]	the Netherlands	Prospective cohort	Heterogeneous occupational accidents	I	Risk, 80% follow-up at 12 months, n = 108
Taylor et al[304]	New Zealand	Prospective cohort	Musculoskeletal back, neck, arm pain	III	Intervention, 79% follow-up, n = 62, low quality
Trippolini et al[305]	Switzerland	Psychometric study	Musculoskeletal disorder	I	Exam, prospective cohort, diagnostic, n = 62, greater than 80% follow-up

Table continues on page CPG101.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Tuckwell et al[306]	Australia	Psychometric study	Musculoskeletal disorders	II	Exam, test-retest, reliability, prospective, convenience sample, n = 24, greater than 80% follow-up
Turi et al[307]	United States	Retrospective cohort	Subarachnoid hemorrhage	III	Prognosis, secondary analysis, retrospective cohort, follow-up not clear (appears to be 100%), n = 121
van den Hout et al[322]	the Netherlands	RCT	Low back pain	II	Intervention, n = 84, less than 80% retention
van der Weide et al[323]	the Netherlands	Prospective cohort	Low back pain	I	Prognosis, 89% follow-up, good sample size, high quality
van Duijn and Burdorf[324]	the Netherlands	Prospective cohort	Musculoskeletal conditions including the back and extremities	II	Clinical course/prognosis/risk, longitudinal, n = 167, greater than 80% follow-up
van Duijn et al[325]	the Netherlands	Prospective cohort	Musculoskeletal disorders	II	Clinical course/intervention, greater than 80% follow-up
van Schaaijk et al[326]	the Netherlands	Psychometric study	Not available	II	Examination, reliability study, consecutive cohort, greater than 80% follow-up, n = 104, good quality, convenience sample
van Vilsteren et al[327]	the Netherlands	SLR of RCTs	Musculoskeletal and mental health disorders	I	Intervention, 14 RCTs with mixed qualities of evidence and variable risks of bias were assessed (moderate quality of evidence for musculoskeletal disorders, low quality for individuals with mental health problems and cancer; 6 of the studies had low risk of bias)
Velozo et al[328]	United States	Psychometric study	Low back injuries, upper and lower extremity diagnoses	III	Examination, prospective cohort for studies 1 and 2 (for this study, retrospective cross-section of n = 42), less than 80% follow-up, low quality
Vendrig[329]	the Netherlands	Prospective cohort	Chronic back pain	I	Prognosis, n = 143, 3% dropout, high quality
Verhagen et al[330]	the Netherlands	SLR	Upper-limb disorders, repetitive strain and overuse injuries	II	Intervention, large sample size, 35 of 44 (79.5%) studies had high risk of bias
Verhoef et al[331]	the Netherlands	SLR	Chronic physical condition other than back pain lasting more than 3 months	I	Intervention, SLR of higher-quality RCTs
Vermeulen et al[335]	the Netherlands	Prospective cohort	A variety of cardiovascular, mental health, and musculoskeletal health conditions	II	Course of care, prognosis, large sample size, low response rate (34%)
Vermeulen et al[333]	the Netherlands	Intervention mapping	Musculoskeletal disorders	V	Expert opinion
Vermeulen et al[332]	the Netherlands	RCT	Musculoskeletal disorders	II	Intervention, no blinding, greater than 80% follow-up
Vermeulen et al[334]	the Netherlands	Economic evaluation alongside RCT	Musculoskeletal disorders	I	Clinical course/intervention/cost-effectiveness, greater than 80% follow-up, no blinding in the initial study, n = 163
Viikari-Juntura et al[336]	Finland	RCT	Musculoskeletal health conditions	II	Intervention, no blinding, n = 62, primarily female
Vogel et al[337]	Australia	Psychometric study	Moderate-severity health conditions following transport injury; primarily musculoskeletal injuries	IV	Exam/outcomes, n = 414, 73% response rate
Vogel et al[338]	Switzerland	SLR	Musculoskeletal and mental health problems	I	Intervention, RCTs (10/14 with low risk of bias)
Voss et al[339]	United States	Outcome study	Musculoskeletal injuries	II	Intervention, greater than 80% follow-up data, lack of control/randomization, good sample size (n = 495)
Wasiak et al[341]	United States	SLR	Not available	II	Outcome, identified whether outcome dimension had been instrumented, review of 2500 abstracts

Table continues on page CPG102.

APPENDIX G

Study	Country	Study Design	Condition(s) Included	LoE	LoE Rationale Synopsis
Wästberg et al[342]	Sweden	Psychometric study	Varied diagnostic groupings, including internal medical, mental and behavioral, neurological and sensory, and musculoskeletal and connective tissue problems	II	Examination, psychometric assessment (reliability, validity, utility, internal consistency), sensitive to change, slight ceiling effect noted, some dropouts in group, n = 106
Wegrzynek et al[343]	United Kingdom	SLR	Chronic pain	I	Intervention; 16 papers, 13 RCTs; study heterogeneity; risk-of-bias analysis was completed but it was unclear what the overall outcome of the quality analysis was per study; overall, it appears there were more low-risk-of-bias factors, but there were a number of unknown/unable to assess
Werneke and Hart[345]	United States	Psychometric study	Low back pain	I	Exam, validation study, prospective cohort, n = 171, greater than 80% follow-up, blinded data collected (1 year)
Werneke and Hart[344]	United States	Psychometric study	Acute nonspecific low back pain	I	Exam/prognosis, validation study, consecutive cohort, 83.9% follow-up, large sample size
Wideman and Sullivan[346]	Canada	Psychometric study	Musculoskeletal back or neck injury	I	Exam/risk/prognosis, prospective cohort, 14% lost to follow-up, large sample size
Wideman and Sullivan[347]	Canada	Psychometric study	Musculoskeletal back or neck injury	I	Exam/prognosis, prospective cohort, 14% lost to follow-up, large sample size
Williams et al[348]	Canada	SLR	Low back pain	II	Intervention, primarily prospective cohort studies
Wisenthal et al[349]	Canada	Prospective cohort	Depression	II	Intervention, greater than 80% follow-up, small sample (n = 21)
Xu et al[352]	China	Prospective cohort	Chronic pain	I	Prognosis, greater than 80% follow-up, n = 67
Young et al[353]	United States	Retrospective cohort	Bone fracture	II	Clinical course, 100% data follow-up, large sample size

Abbreviations: CI, confidence interval; CPG, clinical practice guideline; GRADE, Grading of Recommendations Assessment, Development and Evaluation; ICF, International Classification of Functioning, Disability and Health; LoE, Level of Evidence; MS, multiple sclerosis; RCT, randomized controlled trial; SLR, systematic literature review.