AMERICAN COLLEGE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

Work Disability Prevention and Management

Effective April 11, 2022

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1. INTRODUCTION

This guideline offers an evidence-based framework for preventing and mitigating work disability for individual adults in the active workforce. It is designed for use by health care providers who want to minimize the negative impact of health conditions on working peoples' lives and livelihoods.

1.1. Definitions

Impairment is an objectively observable alteration of body structure or function which often is measurable, such as loss of motor function to an extremity due to nerve injury or cognitive dysfunction resulting from neurological injury or illness (1).

Disability is formally defined as "activity limitations and/or participation restrictions in an individual with a health condition, disorder, or disease" (2), and is summarized in the International Classification of Functioning, Disability, and Health (3). The definition may be broader; for example, WHO also includes personal and environmental factors, which include negative attitudes, inaccessible transportation/buildings and limited social support (4). Pragmatically speaking, disability can be considered the impact of an impairment or impairments on activity and/or participation. (These factors may ultimately be interpreted through a contract, statute or regulations that determine whether an individual is found disabled or qualifies as disabled under laws that provide accommodations and/or compensation.)

Work disability can be operationally defined in three ways:

- job loss or worklessness
- absence from work ("absenteeism" or "lost workdays")
- reduced productivity at work. This situation may be due to formally authorized temporary reductions in job demands ("modified duty," "transitional work" or "light duty"), or due to decreased on-the-job performance ("presenteeism") (5), which may be recognized and documented or informal and undocumented .

Impairment and work **disability** are not synonymous. *Impairment* is generally objectively observable and often quantifiable, and usually a medical issue. Work *disability* is a biopsychosocial phenomenon that is a potential outcome resulting from the interactions between medical impairment, psychological features of the impacted individual, job- and employer-related constraints and demands, social and cultural conditions, worker's compensation jurisdictional factors, the economic and legal environment, and other features (see Etiology). There is a limited correlation between illness (or impairment) and disability , whether work-related or otherwise; for example, a person with a significant physical or mental disorder who is working at unrestricted duty and full productivity may be measurably impaired, and disabled in some situations, but not work disabled.

This guideline does not seek to explore, resolve, or make recommendations with respect to all of these aspects of the nature of disability, or their amelioration. In addition, this document does not address several broad considerations, including:

- challenges faced by individuals with lifelong or long-term disabilities, whether developmental or acquired, when beginning or resuming work after years of unemployment;
- chronic unemployment or underemployment;
- disabling conditions and comorbidities (other than musculoskeletal problems) that become more frequent with the advance of age such as stroke, cancer, diabetes mellitus, organ failure, dementia, and frailty, except as they are amenable to the interventions discussed.

The Evidence-Based Practice Work Disability Prevention Panel ("Panel") recognized that the principles included in this guideline may at least partially apply to those patients and situations. However, this guideline more narrowly seeks to evaluate the relevant evidence and provide practical guidance to health care practitioners, with respect to those interventions that are most likely to

facilitate the individual's ability to stay at or return to work whenever possible and clinically appropriate.

1.2. Objectives

Specific interventions for work disability prevention included in literature searches to formulate this guideline included:

- the value of early intervention in workplace disability
- the use of screening measures to identify risk factors for work disability/workplace leaves
- education for the patient/employee and/or management
- exercise, behavioral activation, occupational therapy, and physical therapy
- cognitive behavioral therapy, short-term psychotherapy, mindfulness, hypnosis, support system/peer support, or other psychological interventions
- vocational rehabilitation, work disability prevention programs, work disability management programs and return-to-work programs

Comparative effectiveness is discussed where reliable information is available. This guide does not specifically address:

- comprehensive psychological and behavioral aspects of pain management and various types of pain programs (addressed in the ACOEM Chronic Pain Guideline);
- opioids (in the Opioids Guideline); or
- detailed aspects of psychological treatment related to specific conditions (in the ACOEM Mental Health Guidelines).

The Panel recognizes that there are differences in workers' compensation systems (6), as well as regional differences in treatment approaches (7,8,9).

1.3. Methods and Limitations

The Panel and the Research Team have complete editorial independence from the American College of Occupational and Environmental Medicine and Reed Group, neither of which have influenced the guidelines. The medical and other relevant literature is routinely monitored and searched at least annually for evidence that would modify this guidance. The guideline is planned to be comprehensively updated at least every five years, or more frequently should evidence require it.

A detailed methodology document used for guideline development including evidence selection, scoring, incorporation of cost considerations (10,11), and formulation of recommendations is available online (12). All evidence in the prior low back disorders guidelines garnered from 7 databases (Medline, EBM Online, Cochrane, TRIP, CINAHL, EMBASE, PEDro) was included in this guideline. Additionally, new comprehensive searches for evidence were performed with both Pubmed and Google Scholar up through 2020 to help assure complete capture. There was no limit on year of publication. Search terms are listed with each table of evidence. Guidance is developed with sufficient detail to facilitate assessment of compliance (10) and auditing/monitoring. Alternative options to manage conditions are provided.

This guideline has undergone extensive external peer review. The only AGREE (11) and IOM criteria (10) not adhered to were incorporation of the views of the target population. Certain affected patient groups, including those with common nonspecific low back pain, were not included, although external patient, stakeholder and other inputs through web interfaces is included. In accordance with the IOM's Trustworthy Guidelines, detailed records are kept, including responses to external peer reviewers (10).

1.4. Impact of Work Disability

Prevalence

The World Health Organization (WHO) estimates that over a billion people worldwide live with some form of disability (13,3). Disability affects approximately 22% of US adults in a given year (14); this figure rises to 33% of those age 65 or older (15). Increasing numbers of workers enter (and remain in) disability systems (e.g., private disability insurance, Workers Compensation, and Social Security Disability). Chronic pain, and resultant disability may have multiple negative effects on individuals and their significant others, including changes in employment and economic status; worse health; increased dependence upon medical systems and external care; loss of companionship, and social activities and relationships; social stigma; behavioral health consequences; and increased mortality (16).

Outcomes and Costs

The ramifications of work disability are enormous. These include lost productivity from workplace absence (absenteeism), decreased productivity from workers who are in the workplace but working at less than full capacity (presenteeism), and administrative and benefit expenses (17). Measuring those costs is complex and depends on the quality of underlying data (18). As an example, an ad hoc analysis of the European Labour Force Survey commissioned by DG Employment and Social Affairs in Brussels (19) found that musculoskeletal disorders (MSDs) accounted for 53% of all work-related diseases in the EU-15 and resulted in the most lost days and permanent incapacity to work. Overall, they accounted for 50% of all absences from work lasting for more than three days, 49% of all absences lasting two weeks or more and about 60% of all reported cases of permanent incapacity. The analysis estimated that the total costs of work-related MSDs were approximately 2% of GDP. MSDs are, according to this analysis, responsible for 40-50% of the costs of all work-related health issues.

Mortality

Unemployment or “worklessness” is associated with a 63% increased risk of mortality, and the risks for men are approximately 37% higher than for women (20); Laditka and Laditka found an interactive relationship among gender/sex, race, and employment status on life expectancy (21,22). Disability is associated with an approximately 50% increased risk of mortality (23); a Netherlands-based study estimated those with disability in activities of daily living and mobility had a 10-year shorter lifespan, of which only 6 years could be explained by differences in lifestyle, sociodemographics, and major chronic diseases (24). Risk factors for mortality among those unemployed include cardiovascular disease, depression, substance abuse, and suicide (20,25,26). Unemployment is also associated with other negative psychological, social, and economic effects on the affected person, his/her family, and the community.

1.5. Etiology of Work Disability

Causation of work disability is complex, with many interacting risk factors and contributing elements. Loisel & Cote (2013) (56) described a model for understanding work disability that accounted for individual (personal), workplace, healthcare-related, and compensation-related characteristics. Building on earlier work by Loisel et al. (2005) (167), Caruso and Kertay (2019) defined several domains of influence contributing to delayed and failed recovery from illness and injury (168). These included administrative procedures associated with managing workplace absence; medical practices that may contribute to shortened or lengthened disability durations; psychological features of the individual; family, community, and sociocultural issues; workplace circumstances; and systemic features such as the workers’ compensation system, regulatory bodies, and the economic climate.

Disability can be temporary or chronic/permanent. Specific causal aspects of work disability follow.

1. Examples of common causes of temporary disability include migraine headaches (169), many surgeries, and pregnancy (although arguably not meeting some common definitions of disability).
2. There are many causes of chronic work disability, especially including single and multiple musculoskeletal disorders. Risk for chronic/permanent disability is at least partially a function of time away from work. Only 50%, 20%, and 10% of workers still out of work at 12, 24, and 36 weeks after illness or injury ever return to gainful employment (170,171).
3. Risk factors in the United States include increasing age, female gender/sex, occupation (also, military service), Black/African-American and Hispanic/Latino race and ethnicity, lower socioeconomic status, and select state residence (e.g., AL, AR, LA, ME, MS, NM, OK, OR, TN, WV) (15) (see Table 1). It should be noted that some of these factors are also linked with the probability of performing jobs with higher job physical demands that are also linked with higher risk of disability. Lifestyle-related health influences include cigarette smoking, diabetes, dyslipidemia, hypertension, obesity, and other chronic health conditions (172). Arthritis, diabetes, and mental health disorders are major sources of general disability in the US general population (14), whereas the most common causes of work disability are back and neck pain, arthritis, multiple musculoskeletal disorders causing chronic pain, depression and other mental health disorders, nervous system disorders, and other musculoskeletal/connective tissues problems (173). Other risk factors for never returning to work include involvement in litigation (e.g., worker's compensation), inadequate skills for competitive employment, and living in an economically poor area (170,171,174).

Table 1. Risk and Associated Factors for Disability*

Increasing age*
Hypertension*
Depression*
Low social support*
Female sex*
Obesity*
Other mental health disorders*
Low job control*
Black/African-American; Hispanic/Latino*
Arthritides*
Back pain*
Time pressure
Single, (non-married)*
Smoking*
Neck pain*
Long overtime hours*
Lower socioeconomic status*
Diabetes mellitus*
Nervous system disorders

Job strain*
Living in a poor region*
Dyslipidemia
Severe asthma*
Relational problems at work*
Lower education level*
Poor cardiorespiratory fitness*
Chronic medical disorders; poor physical health*
High job physical demands*
South central US region
Physical inactivity*
Sleep disturbance*
Computer work*
Litigation*
High annual sickness absence*
Ongoing exposures among those with occupational asthma*
Workplace bullying*

*Supportive evidence includes at least one prospective study.
(14,15,172,173,169,170,171,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189)

1.6. COVID-19

COVID-19 may cause numerous significant adverse effects including pneumonia, respiratory failure, myocardial infarction, dysrhythmias, stroke, thromboemboli, and deaths (27,28,29,30,31,32,33,34,35) (see ACOEM COVID-19 Guideline). Disability attributed to COVID-19 has been reported as, at least partially correlated with measures of case severity. However, among those treated as outpatients, persistent symptoms lasting more than 6 months have reportedly included fatigue, dyspnea, joint pain, chest pain, cough, anosmia, cognitive and executive function impairments. (36,37,38,39).

The overall trajectory of recovery from COVID-19 remains unclear. Prior experience with diseases that have similar manifestations, such as ARDS, suggest there is significant risk of delayed return to work and long-term disability, as approximately 50% of individuals surviving ARDS have not returned to work after 1 year (40,30) (see ACOEM COVID-19 Guideline).

Cardiac, respiratory, and neurological impairment measures are often needed to particularly evaluate those with symptoms in those organ system(s). Rehabilitative strategies targeting impairments are indicated. These rehabilitation programs are typically multi-modal when there are multiple impairments. Some preliminary randomized clinical trials suggest cognitive behavioral therapy is indicated for those with ongoing COVID-19 symptoms, particularly accompanied by anxiety, depression, insomnia, and/or PTSD (41,42,43). While not yet demonstrated for COVID-19, employer support for recovery is believed to be critical by analogy with other conditions.

2. GENERAL APPROACH TO WORK DISABILITY PREVENTION

2.1. Basic Considerations

The first step in work disability prevention is to understand the job(s) and job task(s), as this is essential for tailoring recommendations and improving stay at work and earlier return to work. A preliminary assessment should be undertaken in the clinical evaluation; a definitive assessment typically requires workplace analyses and objective exposure data. This especially includes job factors that are either generic risks for disability and/or are specific risk factors for a given injured worker. Factors to understand include job physical factors (e.g., force, repetition, posture, vibration), chemical exposures (e.g., for occupational asthma), and work organizational factors. Beyond a generic approach of the presence of a risk factor, it is best to understand whether the exposure(s) exceed recommended limits (e.g., ACGIH TLV for Hand Activity Level; Revised NIOSH Lifting Equation; permissible exposure limits for chemical(s)) which typically require involvement of ergonomists and industrial hygienists for exposure quantification and guidance regarding potential prevention.

The classical levels of prevention in occupational medicine, focused on deterrence of permanent impairment, are *primary* (e.g., avoidance of workplace illness or injury before it arises), *secondary* (e.g., prevention of permanent impairment and disability in workers with illness or injury through early detection of impairment potential and treatment), and *tertiary* (e.g., management of impairment and disability to reduce residual dysfunction and functional deficit) (190). Quaternary prevention, or avoiding the iatrogenic effects of evaluation and treatment, has emerged as an important additional concern in work disability (191), as there are many potential tests and interventions where the harms outweigh the potential benefits (e.g., spine fusion for non-specific low back pain; benzodiazepines for anxiety disorders; opioids for chronic pain).

Preventing work disability is generally a more complex biopsychosocial construct than preventing injury (e.g., through safety measures) or appropriately managing specific workplace illnesses and injuries (as discussed in specific ACOEM treatment guidelines). As noted under Etiology above, work disability may be influenced by medical process and practice; personal characteristics (physical and psychophysiological); sociocultural and economic conditions; administrative factors (insurance and legislation); and workplace conditions, policies and culture. All these factors interact in complicated ways, and effective intervention may be both less obvious and markedly more difficult than for more straightforward clinical challenges. In some cases, progress is being made, such as in managing the effects of individual psychological factors (192,193), where cognitive behavioral therapy has been shown to be a central component in the successful and durable management of chronic spine pain, anxiety, depression, and PTSD (194,195,196,197,198)(199). However other elements, such as sociocultural influences and the prevailing legislative climate, are currently beyond the scope of clinical practices, although they should generally be documented when identified (e.g., no time to engage in therapeutic exercise and/or attendance of physical therapy because of childcare). This Guideline focuses on evidence for preventive interventions which are currently reasonably attainable for most practitioners,

Work disability prevention measures may encompass the discrete levels described above and may extend beyond the typical clinical role to include several aspects of administrative and clinical practice (168). The overarching role of the treating clinician is simple and twofold: first, to provide appropriate evidence-based treatment (including referral to other properly trained health professionals), and second, to do no harm, avoiding all sources of iatrogenicity. Several recent publications have provided detailed, practical overviews of disability prevention (200,201,202), and use of the SPICE and BICEPS models as a framework for management is usually appropriate (203,204).[a] The following general precepts may contribute to positive outcomes:

- ***Avoiding Illness or Injury***: Primary prevention involves evading or circumventing impairing and potentially disabling illness and injury, particularly using specific preventive measures as discussed in the ACOEM Guidelines.
- ***Identifying At-Risk Individuals***: The healthcare clinician should identify ill or injured individuals who are at risk for eventual work disability as early as possible and should intervene where appropriate. (See discussion of Early Intervention in next section.)
- ***Establishing the Appropriate Diagnosis***: Clinicians need to establish an underlying diagnosis, especially for musculoskeletal conditions (which may have evidence-based and well-established management or few effective therapeutic options, e.g., for disc herniation) and mental health conditions (which may merit focused treatment such as cognitive behavioral therapy, exercise, and select medications, e.g., for a major depressive disorder). The diagnosis must be accurate and follow established principles of good medicine, correlating history, physical examination findings, and appropriately interpreted testing and imaging. Screening alone does not establish a diagnosis. Psychometric and psychological screening instruments such as the Beck Anxiety and Depression Inventories, Generalized Anxiety Disorder, Patient Health Questionnaire, and the Mini-Mental State Exam or Montreal Cognitive Assessment are useful initial assessment tools for symptoms of anxiety, depressed mood, and cognitive dysfunction, but should only be used to recognize potential problems and identify those individuals who may need more detailed assessment by a qualified clinician. Screening for substance use disorders is often also indicated as the use may be surreptitious, yet contribute to disability. Adverse impacts of injuries which inhibit and/or contribute to delayed recovery especially including sleep disturbance should be addressed (205,206,177,207,208,209,210).
- ***Stratifying Risk***: The clinician should attempt to stratify risk and offer stepped care for illness and injury where appropriate (211,212).
- ***Understanding the Affected Worker***: The clinician should strive to comprehend the impact of the condition(s) on the individual and tailor management to their specific circumstances. This requires a biopsychosocial (BPS) approach often using a multimodal approach (139), incorporating appreciation of the biological (e.g., tissue injury and effects of treatment), psychological (behavioral health elements, including addressing fear avoidant beliefs), and sociocultural (environmental) influences on the person (167,213,214). This process should also seek to identify barriers to Stay-at-Work and Return-to-Work, including issues in the workplace (performance concerns, difficulties with supervisor or co-workers), personal issues (family burdens or conflicts), psychiatric diagnoses (including Axis II), and involvement with litigation. These issues should be identified and addressed at the earliest opportunity, rather than waiting until there are signs of delayed recovery. The treating practitioner may also need to modify or augment standard treatment to address particular factors that may contribute to eventual work disability in that worker. In addition, the clinician needs to appreciate that work disability is likely to be a dynamic condition that changes over time, with a corresponding need to adjust intervention, including the early and ongoing identification, adequacy and addressing of coping strategies (215).
- ***Promoting Stay-at-Work and Return-To-Work (SAW/RTW)***: It is essential to normalize the affected worker's activity and participation levels, including maintaining them in the workplace in some capacity (Stay-at-Work and Return-to-Work), whenever possible and practical during recovery. Healthcare providers have important roles in minimizing unnecessary lost time, which should begin at the first appointment (216). Functional assessment and outcomes should be primary foci (see Table 2) (217,218). This can be greatly facilitated by use of the CLRRT paradigm (219). In this approach, ***capacity*** and ***limitation*** refer to what an individual is physically or mentally able and unable to do; ***risk*** and ***restriction*** refer to potential or actual hazards to the affected person and others posed by their condition, and necessary activity restrictions to alleviate or minimize that hazard; and

tolerance refers to the person's willingness to engage in a given activity at a given time. Capacity, limitation, risk, and restriction can reasonably be determined by health professionals, but tolerance is not a medical construct and cannot. Collaborations between workplace medical, safety, production supervisors, therapists, ergonomists, industrial hygienists, and human resources is often helpful with SAW/RTW. Participatory ergonomics programs focused on patients with musculoskeletal disorders especially spine pain may help SAW/RTW status (see ACOEM Low Back Disorders Guideline). Ongoing monitoring for the development of other disorders, especially mental health, is indicated to minimize added disability (220).

- ***Avoiding Administrative and Medical Iatrogenicity***: Avoiding iatrogenic effects, including advocagenicity,[b] medicalization and iatrogenicity (e.g., inappropriate imaging such as for non-specific spine pain; non-evidence based treatments that increase risk of disability, anxiolytics and hypnotics, lumbar fusion for degenerative disease), excessive focus on symptom relief versus functional restoration (218), and disregard for the critical nature of time in recovery from work related illness and injury (221,222,223,224,225). Any intervention should be appropriately delivered, e.g., educating the patient on the purpose and limits of the treatment (e.g., CBT, ESI, OT/PT).

Table 2. Examples of Objective Function-based Goals and Secondary Goals to Track During Treatment*

Primary Functional Goals

- Return to work from non-working status
- Return to full duty work from modified working status
- Advancement of activity, especially observed in therapy

a. Increased weight lifted

b. Increased numbers of repetitions

c. Increased distance walked

Secondary Goals

- Resumptions of activities of daily living (e.g., clothing, bathing, showering)
- Resumption of household chores
- Resumption of sports
- Validated functional instruments. **

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*Adapted from the ACOEM, Initial Approaches to Treatment Guideline.

**Generally, functional instruments are subjective and lack objective measures.

[a] The SPICE model comprises Simplicity (keeping management as simple as possible), Proximity (maintaining the individual as close as possible to the workplace throughout recovery), Immediacy (initiation of treatment as soon as possible to the time of illness or injury), Centrality (focus of all stakeholders towards the common goal of functional restoration for the affected individual), and Expectancy (anticipation of recovery and functional restoration; see also https://www.rtwknowledge.org/browse.php?article_id=110&view_type=research). The BICEPS model was adopted in military applications, and added Brevity, or the concept of stepped care, with initial treatment lasting 1-3 days before movement of the affected individual to the next higher level of care.

[b] An *advocagenic illness* is a response to legal counsel or legal system, induced or magnified by the counsel or system itself; usually used for unfavorable responses.

2.2. Early Intervention

Having identified the target of an intervention designed to return the patient to work, does earlier intervention result in superior outcomes? It seems intuitive that the sooner a proven intervention is utilized for treatment of a patient, the less disability would ensue. Though this is a commonly held belief, a systematic review for this guideline failed to find any high- or moderate-quality trials testing the theory that earlier intervention per se is effective at minimizing and/or avoiding long- or intermediate-term disability. In more narrow questions of specific interventions, e.g., early physical therapy for low back pain or discectomy for radiculopathy, support for early intervention to prevent disability was also weak and/or poor.

However, although only low-quality evidence is available at present, the extant information generally supported the concept that that the sooner effective treatments are administered, the sooner the patient should recover (44,45,46,47,48,49,50,51). Clinicians may need to address disability prevention early in the course of a work-related illness or injury. For example, even when a clear diagnosis is not established, the following may help mitigate extended workplace absence: exploring perceived barriers to recovery and RTW, educating the worker on realistic care and RTW expectations, proposing alternative duty, communicating with other stakeholders, engaging case management, and assessing barriers to SAW/RTW. There is also some evidence for the potential value of early behavioral health assessment when signs of delayed recovery are identified (52,53,54,55). When a treatable behavioral health condition is identified, the timely application of suitable interventions is likely to improve the condition, which may in turn facilitate return to work recover (44,45,46,47,48,49,50,51). See the Mental Health Guidelines, as well as the evidence presented below regarding behavioral interventions specifically targeted to returning patients to work.

2.3. The Critical Need for Further Study

Review of the literature on both general and specific aspects of disability prevention and management has shown there is a fairly dramatic lack of quality evidence. Thus, there is a pressing need for qualitative and quantitative research on many aspects of work disability, including epidemiology, direct and indirect costs, causation (particularly psychosocial influences), screening tools that are validated as showing interventions result in reduced disability, interventions, and outcomes.

2.4. Summary

The goal of this guideline is not a comprehensive discussion of the philosophy of disability prevention, or the importance of managing it, which can be obtained from other sources (56). The overarching principle is essentially that productive activity is generally in the best interests of patients, whether that activity is work-related or not. Health care practitioners play an important role in disability management. The intent of this document is to help clinicians appreciate some of the factors affecting impairment and disability, and understand the evidence that supports (or fails to support) interventions that can help their patient's ability to remain at or return to work.

3. TREATMENT RECOMMENDATIONS

3.1. Overview

A basic focus of disability prevention and management is to establish diagnosis and begin definitive treatment for a given condition as soon as possible in the course of the illness. Detailed diagnostic and treatment algorithms have been developed for many body parts and disorders in other ACOEM

Guidelines, as listed below. These are expert assessments utilizing integrated and sequential approaches inclusive of relative values, and the authors recommend that they be consulted to ensure that an individual patient has undergone appropriate diagnosis and treatment for underlying conditions before proceeding to the following interventions focused on disability prevention. Telehealth options are also available and recommended (see Initial Approach to Treatment Guideline).

See also the algorithms in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, Traumatic Brain Injury, Interstitial Lung Disease, Occupational Asthma, and COVID-19 Guidelines.

3.2. Disability Screening

Disability screening has been advocated as predictive of the development of disability with the potential to intervene and reduce morbidity (57,58).

Disability Screening

Recommended

Disability screening is recommended for those whose clinical course diverges from expected and/or those with a confirmed diagnosis who fail to improve and/or respond as expected to evidence-based treatments and/or have a medical unexplained illness or work absence.

Strength of evidence: Recommended, Insufficient Evidence (I)

Level of confidence: Moderate

Indications

Individuals whose clinical course diverges from expected. Includes those with a confirmed diagnosis but fail to improve as expected.

Benefits

Identify the need to augment or alter treatment protocols including exercise, CBT, and/or psychologically-informed therapy, etc.; mostly theoretical improvement in outcomes, although one trial suggested marked benefits attributable to pain reprocessing therapy treatment while relying on Orebro to adjust the treatment regimen.(Ashar et al., 2022)

Harms

May be negligible but may medicalize or worsening of otherwise benign condition.

Frequency/Dose/Duration

Generally single screen early in the clinical course. A second screen may be appropriate for those whose initial clinical course is good, but whose course subsequently diverges from expected. There are various screening tests and batteries which may be used that are typically developed for specific

disorders, especially spine, which include Orebro, STarT Back, and Shaw. There is no clear evidence of superiority of any specific tool.

As well, qualitative analysis, including number and extent, of clinical red (serious pathology medical problems, iatrogenic factors), clinical yellow (beliefs, coping strategies, distress, illness behavior, willingness to change, family reinforcement), occupational blue (work status; job satisfaction, working conditions, work characteristics,), and socioeconomic black (health benefits, insurance, litigation, social policy) flags is also sometimes utilized for disability screening (Nicholas et al., 2011) (see Table 1).

Rationale

There are many studies of outcomes measures including Orebro, STarT, Roland Morris Disability, Shaw, Walter Reed Functional Impairment Scale, Maslach Burnout Inventory, and Abilita Rehabilitation Index (Linton et al., 2005, Garton et al., 2016, Herrell et al., 2014, Chapman et al., 2011, van der Meer et al., 2013, Grotle et al., 2005, Bai et al., 2018, Lemeunier et al., 2017, Stienen et al., 2019, Holly et al., 2009)(Beneciuk et al., 2014, Katzan et al., 2019, Lheureux et al., 2019, Schmidt et al., 2016) (Khan et al., 2019). However, while there are a few exception (Beneciuk et al., 2014, Katzan et al., 2019)(Khan et al., 2019), the literature on validation of these measures is almost entirely without a demonstrated predictive nature, rather it is overwhelmingly associative regarding, e.g., the current measure of pain, function and/or disability (Schultz et al., 2005). Importantly, the literature is further limited with respect to showing that early identification of those purportedly at increased risk of disability can undergo successful interventions with resultant reduced disability (Linton et al., 2005). Yet, there are a few studies suggesting the potential benefits of early screening and intervention (Hahne et al., 2017) (Ford et al., 2016). Yet, attempts to reproduce results using the StarT method failed to validate (Cherkin et al., 2018, Delitto et al., 2021) raising cautions about any one approach until results are independently replicated.

A moderate quality RCT in England found psychologically-augmented physiotherapy, including greater education regarding active exercise and addressing fear avoidant beliefs, in high risk patients to be modestly superior to usual care at 4- and 12-months (Hill et al., 2011), although a similar study in the US did not find comparable benefits (Cherkin et al., 2018). Another moderate quality RCT found 10 individualized physical therapy appointments superior to 2 appointments consisting of generalized guideline advice among those with higher back pain levels and poorer coping (Hahne et al., 2017); another trial found no difference although use of opioids and imaging were 22-26% despite advice against use (Delitto et al., 2021). A moderate sized study of 518 acute low back pain patients at occupational clinics found factors of job tenure, physical job demands, availability of modified duty, earlier reporting to the employer, pain ratings and mood ratings predicted functional improvement and return to work (Shaw et al., 2005). One small study of 159 subacute low back pain patients found modest correlations between medical history, physical examination, range of motion; however, the variables did not correlate with return-to-work status (Hunt et al., 2002). Burnout has been shown to predict disability pensions in a small study (Ahola et al., 2009).

There are no quality studies of the utility of disability screening measures in a broad array of patients to facilitate intervention which reduce disability. However, disability screening is recommended in the absence of quality evidence to reassess and attempt to redirect care to provide for better clinical outcomes.

3.3. Education

Education for Prevention of Work Disability

Recommended

Education is recommended for patients at increased risk of disability.

Strength of evidence: Recommended, Insufficient Evidence (I)

Level of confidence: High

Indications

All patients at increased risk of disability.

Benefits

Improvements in understanding of work disability, drivers of disability, improving compliance with interventions and reducing disability.

Harms

Negligible

Frequency/Dose/Duration

Generally at least one time, typically at the beginning of evaluation and treatment. Then, education may be reinforced as the course progresses and/or deviates from an expected course. Re-direction may be required as new problems are identified.

Rationale

There are some articles on the value of education in select disorders. However, most of these used the education arm of a trial as the control group. This limits the ability to draw an evidence-based conclusion. Regardless, education provides the patient with information to understand aspects of care, such as the need to comply and/or work through pain to realize potential benefits. Thus, education is recommended.

See also the recommendations and tables in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury Guidelines.

Evidence

See the tables of evidence in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee

Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury Guidelines.

3.4. Exercise

Exercise is considered among the most important therapeutic interventions for the treatment and prevention of musculoskeletal disorders, hypertension, diabetes mellitus, lipid disorders, cardiovascular disease, some cancers, and mental health disorders (73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120). Exercise may reduce eventual work disability in nonspecific low back pain (73,109) and neck and upper extremity disorders (121). This guideline evaluates exercise in broad groupings of:

3. aerobic exercise,
4. stretching, and
5. strengthening.

Additional subsequent sections include reviews of aquatic therapy, yoga, tai chi, and Pilates.

Exercise Prescriptions for Prevention of Work Disability

Recommended

An exercise prescription is recommended for primary, secondary, and tertiary prevention of work disability.

Strength of evidence: Recommended, Insufficient Evidence (I)

Level of confidence: High

Indications

All patients with common impairments (e.g., musculoskeletal, mental health, cardiopulmonary disorders) have been shown to benefit from an exercise prescription. Formal programs with the institution of supervised, progressive exercise regimens are generally indicated for moderate to severely affected patients. Supervised exercise programs by a physical or occupational therapist are often helpful for those vocalizing fear avoidant beliefs, many post-operative or post-traumatic injuries, complex and/or complicated individuals with many comorbidities, those not progressing as expected and/or having difficulties advancing an exercise regimen. Simultaneous coordination with cognitive behavioral therapy is often helpful. Exercise programs also appear to have primary preventive benefits. See individual body part guidelines for specific details.

Benefits

Improvements in work disability, function, symptoms, and cardiovascular fitness.

Harms

None reported in quality studies. Theoretical risk of myocardial infarction, angina and musculoskeletal injury especially in a severely deconditioned patient. Among those with certain

disorders, there may be cautions and/or contraindications to an exercise prescription, such as COVID-19-related cardiomyopathy which may require either modification or postponement of an exercise prescription until it is determined to be safe.

Frequency/Dose/Duration

If a supervised program is felt to be needed, see specific disorder-related guidance in other ACOEM Guidelines as there is increasing evidence of specific exercise regimens having efficacy for specific disorders. In general, recommended frequency is 1 to 3 sessions a week for up to 4 weeks, and may be longer as long as progressive, objective functional improvement and symptom reduction is occurring. If self-directed, daily exercise is recommended. An exercise prescription should address specific treatment goals and be time limited with transition to an independent exercise program as part of a healthy lifestyle (no longer considered treatment). The purpose of supervised exercise therapy is reduction in the degree of impairment, symptom reduction, functional improvement, and educating the patient so that they can independently manage the program. Evaluation for an exercise prescription related to work disability prevention involves consideration of four components:

- stage of (theoretical) tissue healing (acute, subacute, chronic),
- severity of symptoms (mild, moderate, severe),
- degree and type of deconditioning (flexibility, strength, aerobic, muscular endurance), and
- psychosocial factors (e.g., medication dependence, fear-avoidance, secondary gain, mood disorders).

For purposes of work disability prevention, progressive aerobic and strengthening exercises are generally the preferred emphases. Stretching exercise is mainly indicated for acute pain and/or improving range of motion especially when the range of motion is abnormally reduced and non-fixed. There is some evidence that extensor deconditioning may be a risk for acute LBP and thus a specific target for prevention (Steele et al., 2014). When a specific diagnosis is made, there are evidence-based exercise modalities that are of benefit e.g., eccentric stabilization exercises for tendinopathies. Tailoring an exercise program to work demands may be helpful.

To achieve an aerobic program for most patients, a graded walking program is generally desired, often using distance or time as minimum benchmarks – e.g., start with 10 to 15 minutes twice a day for 1 week, increase in 10-to-15-minute increments per week until ≥30 minutes walking a day is achieved. A reasonable eventual target for patients is walking at least 4 times a week at 60% of predicted maximum heart rate (220-age = predicted maximum heart rate) (Varatharajan et al., 2014).

Rationale

There are hundreds of RCTs that primarily used various exercise regimens for treatment of disorders, the vast majority of which have shown evidence of efficacy. For specific guidance, please see the recommendations and tables in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury Guidelines.

Evidence

See the Tables of evidence in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee

Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury Guidelines.

3.5. Cognitive Behavioral Therapy

Cognitive behavioral therapy (CBT) is a short-term, goal-oriented psychotherapy treatment that takes a practical approach to problem solving. CBT attempts to change the patient's attitudes and behavior by focusing on the thoughts being held (122). It may include a variety of component therapies, including cognitive therapy, relaxation therapy, and various types of exposure therapy.

As cognitions often occur as in a rapid and automatic manner, the individual may not be explicitly aware of cognitions or the distorted perceptions created by these thoughts. CBT is the process of examining these cognitions and replacing those that are distorted or dysfunctional (e.g. catastrophizing (123,124,125,126,127) or kinesiophobia[a] (128,129,130) with cognitions that are accurate and more functional (131,132). This is thought to be important as, e.g., catastrophization is associated with poorer ability to have perceived the biopsychosocial message at 6 weeks after the start of treatment (133).

Types of cognitive and behavior therapies may be considered to include: Cognitive Processing Therapy, Cognitive Therapy, Dialectical Behavior Therapy, Rational Emotive Behavior Therapy, Self-Instructional Training, Stress inoculation Training, and Acceptance and Commitment Therapy.

More recently, empirical research has examined the impact of CBT for workplace interventions. This type of CBT is called work-focused CBT (w-CBT or CBT-w) (134). There are common barriers that individuals with may perceive that impede the individual's return to work. These barriers can be divided into distinct categories:

- *individual issues* (e.g., personality or coping issues, individual perception of the workplace, a severe disorder with comorbid health conditions);
- *work* (e.g., workplace conflict, lack of supervisor/coworker support, and lack of guidance or training at work); and
- *healthcare* (e.g., insufficient mental health care, insufficient care from the physician, and provision of non-evidence-based care). With w-CBT, the individual's problematic thoughts and feelings are identified.

The individual is taught cognitive restructuring regarding identified, perceived negative workplace situations, such as workplace conflict, as well as the individual's perceptions of inability to continue to work. Cognitive restructuring is helpful in assisting individual's stay at work or in returning to work.

Besides CBT, there is some evidence that psychiatric consultation for sick-listed employees in the Netherlands was associated with faster RTW (135). There is inconsistent evidence that supervisor training influences employee well-being (136).

Note: The Panel acknowledges that there may be confusion regarding recommendations for CBT. In the ACOEM Workplace Mental Health guideline, the recommendations for CBT are stronger, consistent with the evidence for each discrete disorder. As a treatment modality in general, CBT has been demonstrated to be efficacious with B-level evidence for certain discrete disorders. Here, however, the question was narrower, and was specifically focused on prevention of, and/or reduced duration of, work disability. The literature is less strong for both work-focused CBT and CBT generally. As a result, CBT is recommended in both Guidelines, but with differing levels of evidence.

[a] Kinesiophobia has been defined as "an excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability due to painful injury or reinjury" (137).

Cognitive Behavioral Therapy for Prevention of Work Disability

Recommended

Cognitive behavioral therapy (CBT), especially including a work-focus, is recommended for the prevention of work disability.

Strength of evidence: Recommended, Evidence (C)

Level of confidence: Moderate

Indications

Impairing disorder sufficient to require treatment. Work-focused CBT is generally preferable for RTW and stay-at-work purposes. CBT may be first line treatment and may be used with an exercise and or progressive increase in activity prescription.

Benefits

Improvement in symptoms, work disability, RTW, presenteeism, absenteeism and stay-at-work.

Harms

Negligible.

Frequency/Dose/Duration

Variable regimens have been used, such as weekly appointments for a period a few months, of approximately 4/month up to 12 total sessions. Additional appointments should be rarely needed, and based on documentation of ongoing functional gains among the more severely affected individuals. A telehealth intervention has also been successfully used (Lerner et al., 2015). One recent study of pain reprocessing therapy reported marked benefits of 60% who became pain-free or nearly pain-free at one year (Ashar et al., 2022).

Indications for discontinuation

Symptom resolution, developed ability to self-manage, non-compliance, lack of efficacy or adverse effects.

Rationale

There are many types of CBT and many moderate quality studies suggesting efficacy of CBT for many disorders, particularly including pain conditions and mental health disorders. There are only a few RCTs of a work-focused CBT program and its impacts on outcomes measures, with results to date showing the largest study demonstrating benefits (Reme et al., 2015) and a telehealth intervention for depression also suggesting efficacy (Lerner et al., 2015, Adler et al., 2015). Uses in inpatient settings show conflicting results (Muschalla et al., 2016, Skagseth et al., 2019, Aasdahl et al., 2017, Aasdahl et al., 2018). One type of program that includes features of CBT is the Progressive Goal Attainment Program (PGAP) (Raftery et al., 2013, Adams et al., 2007, Sullivan et al., 2006, Sullivan et al., 2012). However, quality evidence for any specific CBT type is variable, ranging from good to insufficient. CBT components with quality evidence allowing evidence-based guidance include

Computer-Assisted Cognitive Therapy, Interpersonal Therapy & Acceptance and Commitment Therapy. CBT has low adverse effects, is of moderate cost depending upon treatment type and duration, has evidence of efficacy for the treatment of many pain disorders and mental health disorders, and thus, CBT is recommended.

See the recommendations and tables in the Low Back Disorders, Cervical and Thoracic Disorders, Chronic Pain, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury Guidelines.

Evidence

A comprehensive literature search was conducted using PubMed, Scopus, CINAHL, Cochrane Library, and Google Scholar without date limits using the following terms: work focused psychotherapy; disability prevention, work disability, occupational disability, disability management; controlled clinical trial, controlled trials, randomized controlled trial, randomized controlled trials, random allocation, random*, randomized, randomization, randomly; systematic, systematic review, retrospective, prospective studies. We found and reviewed 50 articles in PubMed, 72 in Scopus, 29 in CINAHL, 18 in Cochrane Library, 62,300 in Google Scholar, and 7 from other sources†. We considered for inclusion 3 from PubMed, 7 from Scopus, 0 from CINAHL, 4 from Cochrane Library, 1 from Google Scholar, and 7 from other sources. Of the 22 articles considered for inclusion, 10 randomized trials and 12 systematic reviews met the inclusion criteria.

† The results for databases are sorted by relevancy based on customized search term algorithms. Algorithms for each database determine relevancy. The first 100 articles are reviewed in each search, and if relevant literature appears in the first 100 articles, we review an additional 100 articles. If relevant articles appear in these additional 100 articles, we then review another 100. We continue this pattern of review until we review a batch of 100 articles that contains no relevant literature. When this happens then the remaining articles are not reviewed due to a lack of relevancy.

Medical and Psychological Treatments for Symptom Reduction

No Recommendation

There is no recommendation regarding psychotherapies that do not specifically address work disability.

Strength of evidence: No Recommendation, Insufficient Evidence (I)

Level of confidence: Low

Rationale

In contrast with work-focused CBT, the evidence for psychotherapies that are not specifically work-focused, including CBT for symptom reduction, is considerably less. While many individuals are referred for non-work-focused psychotherapies, the referral may not be beneficial and may needlessly prolong the case with a potentially non-beneficial. We again note that this differs from some recommendations in the Workplace Mental Health Guidelines (PTSD, Depressive Disorders, and Anxiety Disorders). Whereas there is good quality evidence to support CBT and some other psychotherapies for the treatment of mental health disorders, the evidence to support the use of

psychotherapies that are not work-focused, including CBT, as a means to prevent or mitigate work disability, is insufficient.

Evidence

A comprehensive literature search was conducted using PubMed, Scopus, CINAHL, Cochrane Library, and Google Scholar without date limits using the following terms: non-work-focused medical and psychological treatments; disability prevention, work disability, occupational disability, disability management; symptom reduction; controlled clinical trial, controlled trials, randomized controlled trial, randomized controlled trials, random allocation, random*, randomized, randomization, randomly; systematic, systematic review, retrospective, prospective studies. We found and reviewed 1435 articles in PubMed, 42 in Scopus, 70 in CINAHL, 19 in Cochrane Library, 7710 in Google Scholar, and 0 from other sources†. We considered for inclusion 9 from PubMed, 0 from Scopus, 5 from CINAHL, 1 from Cochrane Library, 7 from Google Scholar, and 0 from other sources. Of the 22 articles considered for inclusion, 7 randomized trials and 10 epidemiological studies met the inclusion criteria.

† The results for databases are sorted by relevancy based on customized search term algorithms. Algorithms for each database determine relevancy. The first 100 articles are reviewed in each search, and if relevant literature appears in the first 100 articles, we review an additional 100 articles. If relevant articles appear in these additional 100 articles, we then review another 100. We continue this pattern of review until we review a batch of 100 articles that contains no relevant literature. When this happens then the remaining articles are not reviewed due to a lack of relevancy.

3.6. Medications

There are medications with specific indications for each disorder which may assist in secondary and tertiary work disability prevention, including minimizing the degree of work disability. There are no generic medications used for prevention of all work disability, thus the reader is encouraged to review the links to the specific guideline related to the disorder of concern.

As well, some medications appear to increase risk of disability. These prominently include opioids and benzodiazepines. Please see specific guidance in the ACOEM Opioids and Workplace Mental Health guidelines, as there are many other options for treatment which typically focus on cognitive behavioral therapy, exercise and other options.

Recommendations and Evidence for the Use of Medications

See the recommendations and tables in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, Traumatic Brain Injury, Interstitial Lung Disease, Occupational Asthma, and COVID-19 guidelines.

3.7. Injection Therapies

Some injections have quality evidence of efficacy for the treatment of specific disorders (e.g., glucocorticoid injections for carpal tunnel syndrome, trigger digit, and radiculopathy from a herniated disc), most typically in the secondary work disability prevention phase which is after a disorder has occurred. In such cases, injections may either be curative or help to reduce pain and inflammation to facilitate participation in active rehabilitative programs focused on functional

restoration. Occasionally, they may be used to merely to delay surgery (e.g., glucocorticosteroid injection for knee osteoarthrosis).

However, injections are generally thought to have relatively little value in tertiary prevention of work disability. They may inadvertently increase work disability by externalization, reliance on others for treatment, avoidance of performing an active rehabilitative program and lack of development of an active rehabilitative strategy and mindset.

If an individual has not had an injection therapy that also has quality evidence of efficacy for his/her specific disorder, an injection to ascertain potential benefits may be indicated including for secondary or tertiary prevention. Attention to objective functional improvement is important.

Recommendations and Evidence for the Use of Injection Therapies

See the recommendations and tables in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury guidelines.

3.8. Surgical Treatments

Surgeries may be restoratively curative for some disorders (e.g., hip arthroplasty for severe osteoarthrosis, discectomy for severe radiculopathy). However, some surgical procedures and implanted devices have been shown to have relatively little value and may inadvertently increase work disability by externalization, reliance on others for treatment, avoidance of performing an active rehabilitative program and lack of development of an active rehabilitative strategy and mindset.

If an individual has not had a surgical treatment that also has quality evidence of efficacy for his/her specific disorder, there should be consideration for whether that patient may benefit from the surgery. Well-informed, shared decision making may be an approach to utilize, especially to help establish understandings of risks, benefits and surgical goals.

Recommendations and Evidence for the Use of Surgical Treatments

See the recommendations and tables in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury guidelines.

3.9. Other Modalities

Electrical Therapies, Devices, Heat Therapies, Cryotherapies, Massage, Manipulation, Acupuncture, Relaxation, Meditation

All of these treatments are classified as passive treatments (e.g., in contrast with aerobic and strengthening exercises or cognitive behavioral therapy). Some of these treatments have quality evidence of efficacy for the treatment of specific disorders, most typically in the secondary work disability prevention phase which is after a disorder has occurred, and thus may contribute to work disability prevention. However, as these are passive modalities, they are generally thought to have relatively little value in tertiary prevention of work disability. Instead, they may inadvertently increase work disability by externalization, reliance on others for treatment, avoidance of performing an active rehabilitative program, and lack of development of an active rehabilitative strategy and mindset.

If an individual has not had one of these treatments that also has quality evidence of efficacy for his/her specific disorder, a short course to ascertain potential benefits may be indicated including for secondary or tertiary prevention. Attention to objective evidence of significant function and symptom improvements is important.

Recommendations and Evidence for the Use of Electrical Therapies, Devices, Heat Therapies, Cryotherapies, Massage, Manipulation and Acupuncture

See the recommendations and tables in the Low Back Disorders, Cervical and Thoracic Disorders, Hand, Wrist, Forearm Disorders, Elbow Disorders, Shoulder Disorders, Chronic Pain, Ankle/Foot Disorders, Knee Disorders, Hip and Groin Disorders, Posttraumatic Stress Disorder, Depressive Disorders, Anxiety Disorders, and Traumatic Brain Injury guidelines.

Work Conditioning, Work Hardening, Early Intervention Programs, Interdisciplinary Work Rehabilitation Programs, Back Schools, Chronic Pain Management Programs, Multidisciplinary Rehabilitation Pain Programs, Interdisciplinary Pain Rehabilitation Programs, Functional Restoration Programs, Participatory Ergonomic Programs.

The quality of these programs range widely. In general, programs that emphasize active treatments (e.g., progressive exercises and CBT) are more successful. Long-term objective patient outcomes (e.g., rate of return to work) are a good measure of the overall success of a given program.

Graded RTW after multimodal rehabilitation was found to be associated with higher RTW in a Cochrane review that noted the overall evidence was of low quality (138).

See Chronic Pain Guideline.

3.10. Nurse Case Management

Nurse Case Management for Reducing Work Disability

Recommended

Nurse case management (NCM) is selectively recommended for reducing work disability durations.

Strength of evidence: Recommended, Insufficient Evidence (I)

Level of confidence: Moderate

Indications

Patients who are either off work, or on modified duty status without trending towards returning to the usual job an in expected timeframe. With selective moderate to severe conditions, early nurse case management may be indicated before work disability durations are exceeded (e.g., a patient had prior work disability status, prior prolonged work disability duration(s), absence of modified/light duty, vocalized fear avoidant beliefs with stated intention to remain off work for a prolonged time, etc.). NCM is also helpful where there are repeated barriers that need assistance in surmounting (e.g., recurring difficulties scheduling medical appointments, complex consultation visits, communication barriers/breakdowns, language barriers).

Benefits

Shortened work disability durations, earlier RTW.

Frequency/Dose/Duration

NCM visits are typically based on the duration of the work disability and/or time off work.

Indications for discontinuation

Return to work or determination of permanency.

Rationale

There are no quality trials that assess the efficacy of typical NCM management, thus the evidence is insufficient. There is clinical experience that NCM is helpful show clear evidence of efficacy, and thus NCM is recommended.

Evidence

A comprehensive literature search was conducted using PubMed, Scopus, CINAHL, Cochrane Library, and Google Scholar without date limits using the following terms: nurse case management; disability prevention, work disability, occupational disability, disability management, return to work, RTW; controlled clinical trial, controlled trials, randomized controlled trial, randomized controlled trials, random allocation, random*, randomized, randomization, randomly; systematic, systematic review, retrospective, prospective studies. We found and reviewed 134 articles in PubMed, 537 in Scopus, 2 in CINAHL, 386 in Cochrane Library, 115900 in Google Scholar, and 0 from other sources†. We considered for inclusion 7 from PubMed, 7 from Scopus, 1 from CINAHL, 0 from Cochrane Library, 1 from Google Scholar, and 0 from other sources. Of the 21 articles considered for inclusion, 5 randomized trials and 3 systematic reviews met the inclusion criteria.

† The results for databases are sorted by relevancy based on customized search term algorithms. Algorithms for each database determine relevancy. The first 100 articles are reviewed in each search, and if relevant literature appears in the first 100 articles, we review an additional 100 articles. If relevant articles appear in these additional 100 articles, we then review another 100. We continue this pattern of review until we review a batch of 100 articles that contains no relevant literature. When this happens then the remaining articles are not reviewed due to a lack of relevancy.

3.11. Workplace Interventions

Workplace interventions have been used to attempt to facilitate better RTW and stay at work (139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164).

Workplace Interventions for Reducing Work Disability

Recommended

Workplace interventions are recommended to reduce lost work time, including participatory ergonomics programs.

Strength of evidence: Recommended, Insufficient Evidence (I)

Level of confidence: Moderate

Indications

Workers off work or at high risk of going off work. This may include measurements of job tasks, identification of potential job accommodations, identification of alternate jobs, and participatory ergonomics programs.

Benefits

Improved return to work/stay at work.

Harms

Further medicalization and/or excessive externalization and reliance on others instead of resiliency and CBT, which may be indicated in many circumstances as at least adjunctive.

Indications for discontinuation

Satisfactory resolution including stay at work/RTW, non-compliance.

Rationale

The literature regarding job modifications is highly heterogeneous. This limits the ability to develop a letter grade (A/B/C) recommendation. There are multiple moderate quality RCTs that include some element of job modification and are generally supportive. Job modifications generally have negligible adverse effects, their costs can be low to very high, and they are selectively recommended especially when there are cost-effective means to facilitate return to work/stay at work.

Evidence

A comprehensive literature search was conducted using PubMed, Scopus, CINAHL, Cochrane Library, and Google Scholar without date limits using the following terms: job modification, work accommodation, job accommodation, workplace accommodation; disability prevention, work disability, occupational disability, disability management; controlled clinical trial, controlled trials, randomized controlled trial, randomized controlled trials, random allocation, random*, randomized, randomization, randomly; systematic, systematic review, retrospective, prospective studies. We found and reviewed 87 articles in PubMed, 168 in Scopus, 10 in CINAHL, 168 in Cochrane Library, 18800 in Google Scholar, and 3 from other sources†. We considered for inclusion 4 from PubMed, 3 from Scopus, 3 from CINAHL, 2 from Cochrane Library, 1 from Google Scholar, and 3 from other sources. Of the 16 articles considered for inclusion, 2 randomized controlled trials and 9 epidemiological studies met the inclusion criteria.

† The results for databases are sorted by relevancy based on customized search term algorithms. Algorithms for each database determine relevancy. The first 100 articles are reviewed in each search, and if relevant literature appears in the first 100 articles, we review an additional 100 articles. If relevant articles appear in these additional 100 articles, we then review another 100. We continue this pattern of review until we review a batch of 100 articles that contains no relevant literature. When this happens then the remaining articles are not reviewed due to a lack of relevancy.

3.12. Vocational Rehabilitation

Vocational rehabilitation has been used for treating work disability prevention (165,166).

Vocational Rehabilitation for Work Disability Prevention

Recommended

Vocational rehabilitation is recommended for treatment of work disability.

Strength of evidence: Recommended, Insufficient Evidence (I)

Level of confidence: Moderate

Indications

Generally only chronic and stable conditions among workers. Highly selective use for those with subacute rehabilitation where recovery is unlikely to result in return to the prior job and there is no comparable job available that is able to be performed. Early return-to-work programs are reviewed in the Chronic Pain Guideline.

Benefits

Improved return-to-work and stay-at-work.

Harms

Negligible.

Frequency/Dose/Duration

One course.

Indications for discontinuation

Completion, non-compliance, non-participation

Rationale

There are no quality articles to address the efficacy of vocational rehabilitation services, as the available literature addresses work rehabilitation and/or interdisciplinary care. Vocational rehabilitation has been suggested to delay job loss among workers with rheumatic diseases (Allaire et al., 2003). Some evidence suggests function-based rehabilitation is superior to pain-centered rehabilitation over a 1-year period (Kool et al., 2007). A non-significant trend favored intensive case management over standard case management (Scholz et al., 2016). Vocational rehabilitation programs have some evidence suggesting efficacy, have minimal adverse effects, but are high cost and thus are selectively recommended.

Evidence

A comprehensive literature search was conducted using PubMed, Scopus, CINAHL, Cochrane Library, and Google Scholar without date limits using the following terms: vocational rehabilitation; disability prevention, work disability, occupational disability, disability management; controlled clinical trial, controlled trials, randomized controlled trial, randomized controlled trials, random allocation, random*, randomized, randomization, randomly; systematic, systematic review, retrospective, prospective studies. We found and reviewed 269 articles in PubMed, 398 in Scopus, 272 in CINAHL, 83 in Cochrane Library, 35,900 in Google Scholar, and 0 from other sources†. We considered for inclusion 14 from PubMed, 2 from Scopus, 8 from CINAHL, 2 from Cochrane Library, 1 from Google Scholar, and 0 from other sources. Of the 27 articles considered for inclusion, 5 randomized trials and 7 systematic reviews met the inclusion criteria.

† The results for databases are sorted by relevancy based on customized search term algorithms. Algorithms for each database determine relevancy. The first 100 articles are reviewed in each search, and if relevant literature appears in the first 100 articles, we review an additional 100 articles. If relevant articles appear in these additional 100 articles, we then review another 100. We continue this pattern of review until we review a batch of 100 articles that contains no relevant literature. When this happens then the remaining articles are not reviewed due to a lack of relevancy.

4. AUDITING/MONITORING CRITERIA

The provider is recommended to assure:

- Patients whose clinical course diverges from expectations undergo disability screening. Target 90%.
- Patients who screen positive for increased risk of disability receive education including the benefits of active rehabilitation and the adverse effects of disability. Target 90%.
- Patients at increased risk of disability are provided an active exercise program. Target 90%.
- Patients at increased risk of disability are provided work-focused cognitive behavioral therapy. Target 75%

There are currently relatively few facilitators to implementation of this guideline other than healthcare providers who already have either recognition of, or insight into disability. This prominently includes those seeking to do the greater good for patient care while simultaneously have a focus and interest in preventing needless disability.

The barriers to the application of this guidelines' recommendations importantly include the healthcare system's lack of training in, and focus on disability prevention. Providers are generally not given education in how to monitor for divergent clinical courses and screen for disability. There is little education provided to patients about disability prevention. There is a propensity for some healthcare providers and therapists to provide a treatment regimen that is concentrated on passive modalities and excessively limited activity limitations, thus those practice patterns would need to be adjusted to, at minimum include active exercise. The number of, and access to providers who can provide cognitive behavioral therapy is particularly limited.

The overall resource implications for the implementation of the Disability Prevention guideline involve relatively low cost of the screening and interventions. However, the pain, suffering and cost savings for the implementation of this guideline's recommendations and its auditing/monitoring criteria are potentially quite large.

5. CONTRIBUTORS AND DISCLOSURES

Editor-in-Chief:

Kurt T. Hegmann, MD, MPH, FACOEM, FACP

Evidence-based Practice Disability Prevention and Management Panel Co-Chairs:

Garson M. Caruso, MD, MPH, CLCP, FACOEM, FIAIME

Les Kertay, PhD

Evidence-based Practice Disability Prevention and Management Panel Members:

Nancy Baker, ScD, MPH, OTR/L

Robert J. Barth, PhD

Jennifer H. Christian, MD, MPH, FACOEM

Jerald L. Cook, MD, MS, FACOEM

Rajiv Das, MD, MPH, MS, MRO, FACOEM

Michael Goertz, MD, MPH, FACOEM

Judith Green McKenzie, MD, MPH, FACPM, FACP, FACOEM

Gideon A. Letz, MD, MPH

Douglas W. Martin, MD, FAADEP, FAAFP, FACOEM

J. Mark Melhorn, MD, FACOEM

Amir Mohammad, MD, MPH, FACOEM

Albert J. Osbahr III, MD, MSCM, FACOEM

Glenn Pransky, MD, MOccH, FACOEM

Pamela A. Warren, PhD

Panel Consultant:

Steven Mandel, MD, FACOEM

These panel members represent expertise in occupational medicine, emergency medicine, internal medicine, family medicine, public health/preventive medicine, physical medicine and rehabilitation, pain medicine, neurology, neuropsychology, clinical psychology, nursing, orthopedic surgery, occupational therapy, and toxicology. As required for quality guidelines (Institute of Medicine's (IOM) Standards for Developing Trustworthy Clinical Practice Guidelines and Appraisal of Guidelines for Research and Evaluation (AGREE)), a detailed application process captured conflicts of interest. The above panel has none to declare relevant to this guideline.

Methodology Committee Consultant:

Jeffrey S. Harris, MD, MPH, MBA, FACOEM

Research Conducted By:

Kurt T. Hegmann, MD, MPH, FACOEM, FACP

Matthew S. Thiese, PhD, MSPH

Kristine Hegmann, MSPH

Specialty Society and Society Representative Listing:

ACOEM acknowledges the following organizations and their representatives who served as reviewers of the Disability Prevention and Management Guideline. Their contributions are greatly appreciated. By listing the following individuals or organizations, it does not infer that these individuals or organizations support or endorse the Disability Prevention and Management Guideline developed by ACOEM.

American Academy of Physical Medicine and Rehabilitation

American Association of Occupational Health Nurses

American College of Physicians

American Occupational Therapy Association

Amanda Acord-Vira, EdD, OTR/L, CBIS

Steven Wheeler, PhD, OTR/L, FAOTA

American Physical Therapy Association

American Psychological Association

Daniel N. Jolivet, PhD

International Academy of Independent Medical Evaluators

Fabrice Czarnecki, MD, MA, MPH, FAAFP, FIAIME, FACOEM

Other Reviewers:

Manijeh Berenji, MD, MPH, FACOEM

Michael Erdil, MD, FACOEM

Yusef Sayeed, MD, MPH, MEng, CPH, FAIUM, FACOEM

Michael S. Weiss, MD, MPH, FACOEM, FAAPMR, FAANEM

REFERENCES

1. American Medical Association. AMA Guides. 2021.

2. Rondinelli, Robert D. Changes for the new AMA Guides to impairment ratings: implications and applications for physician disability evaluations. *PM&R*; 2009.

3. World Health Organisation. International Classification of Functioning, Disability and Health (ICF). 2018.

4. World Health Organisation. Disability. 2021.

5. Schultz, Alyssa B, Edington, Dee W. Employee health and presenteeism: a systematic review. *Journal of occupational rehabilitation*; 2007.

6. Melhorn, JM, Talmage, JB, Ackerman III, W, Hyman, MH. AMA Guides® to the Evaluation of Disease and Injury Causation, second edition. 2014.

7. Center for the Evaluative Clinical Sciences. Spine surgery. A Report by the Dartmouth Atlas of Health Care. CMS-FDA Collaborative. 2006.

8. Centers for Disease Control and Prevention (CDC). Vital signs: risk of overdose from methadone used for pain relief-United States, 1999-2010. *MMWR*; 2012.

9. Centers for Disease Control and Prevention. Vital signs: overdoses of prescription opioid pain relievers---United States, 1999--2008. *MMWR*; Nov 4 2011.

10. Institute of Medicine. Standards for Developing Trustworthy Clinical Practice Guidelines. Available at: https://www.ncbi.nlm.nih.gov/books/NBK209539/. 2011.

11. The AGREE Research Trust. Appraisal of Guidelines for Research & Evaluation II (AGREE II) Instrument. 2009.

12. Harris, Jeffrey S, Weiss, Michael S, Haas, Nelson S, Hegmann, Kurt T, Holland, John P, Kistner, Frances, Ott, Ulrike, Hegmann, Kristine B, Thiese, Matthew S. Methodology for ACOEM's Occupational Medicine Practice Guidelines—2017 Revision. *Journal of occupational and environmental medicine*; 2017.

13. World Health Organisation. Disability and Health. 2018.

14. Theis, Kristina A, Steinweg, Amy, Helmick, Charles G, Courtney-Long, Elizabeth, Bolen, Julie A, Lee, Robin. Which one? What kind? How many? Types, causes, and prevalence of disability among US adults. *Disability and health journal*; 2019.

15. Kraus, L., Lauer, E., Coleman, R., and Houtenville, A. 2017 Disability Statistics Annual Report. 2018.

16. Worzer, Whitney E, Kishino, Nancy D, Gatchel, Robert J. Primary, secondary, and tertiary losses in chronic pain patients. *Psychological Injury and Law*; 2009.

17. Koopmanschap, Marc, Burdorf, Alex, Lötters, Freek. Work absenteeism and productivity loss at work. *Handbook of work disability*; 2013.

18. Tompa, Emile. Measuring the burden of work disability: a review of methods, measurement issues and evidence. *Handbook of Work Disability*; 2013.

19. Cammarota, A. The European commission initiative on WRMSDs: recent developments, presentation to EUROFOUND conference on 'musculoskeletal disorders'. 2007.

20. Roelfs, David J, Shor, Eran, Davidson, Karina W, Schwartz, Joseph E. Losing life and livelihood: a systematic review and meta-analysis of unemployment and all-cause mortality. *Social science & medicine*; 2011.

21. Laditka, James N, Laditka, Sarah B. Unemployment, disability and life expectancy in the United States: A life course study. *Disability and Health Journal*; 2016.

22. Singh, Gopal K, Siahpush, Mohammad. Inequalities in US life expectancy by area unemployment level, 1990–2010. *Scientifica*; 2016.

23. Forman-Hoffman, Valerie L, Ault, Kimberly L, Anderson, Wayne L, Weiner, Joshua M, Stevens, Alissa, Campbell, Vincent A, Armour, Brian S. Disability status, mortality, and leading causes of death in the United States community population. *Medical care*; 2015.

24. Majer, Istvan M, Nusselder, Wilma J, Mackenbach, Johan P, Klijs, Bart, van Baal, Pieter HM. Mortality risk associated with disability: a population-based record linkage study. *American Journal of Public Health*; 2011.

25. Yamaoka, Kazue, Suzuki, Masako, Inoue, Mariko, Ishikawa, Hirono, Tango, Toshiro. Spatial clustering of suicide mortality and associated community characteristics in Kanagawa prefecture, Japan, 2011–2017. *BMC psychiatry*; 2020.

26. Junna, Liina, Moustgaard, Heta, Huttunen, Kristiina, Martikainen, Pekka. The association between unemployment and mortality: a cohort study of workplace downsizing and closure. *American journal of epidemiology*; 2020.

27. Guo, Tao, Fan, Yongzhen, Chen, Ming, Wu, Xiaoyan, Zhang, Lin, He, Tao, Wang, Hairong, Wan, Jing, Wang, Xinghuan, Lu, Zhibing. Cardiovascular implications of fatal outcomes of patients with coronavirus disease 2019 (COVID-19). *JAMA cardiology*; 2020.

28. Lindner, Diana, Fitzek, Antonia, Bräuninger, Hanna, Aleshcheva, Ganna, Edler, Caroline, Meissner, Kira, Scherschel, Katharina, Kirchhof, Paulus, Escher, Felicitas, Schultheiss, Heinz-Peter. Association of Cardiac Infection With SARS-CoV-2 in Confirmed COVID-19 Autopsy Cases. *JAMA cardiology*; 2020.

29. Driggin, Elissa, Madhavan, Mahesh V., Bikdeli, Behnood, Chuich, Taylor, Laracy, Justin, Biondi-Zoccai, Giuseppe, Brown, Tyler S., Der Nigoghossian, Caroline, Zidar, David A., Haythe, Jennifer, Brodie, Daniel, Beckman, Joshua A., Kirtane, Ajay J., Stone, Gregg W., Krumholz, Harlan M., Parikh, Sahil A. Cardiovascular Considerations for Patients, Health Care Workers, and Health Systems During the COVID-19 Pandemic. *Journal of the American College of Cardiology*; 2020.

30. Dinglas, V. D., Chessare, C. M., Davis, W. E., Parker, A., Friedman, L. A., Colantuoni, E., Bingham, C. O., Turnbull, A. E., Needham, D. M. Perspectives of survivors, families and researchers on key outcomes for research in acute respiratory failure. *Thorax*; Jan 2018.

31. Chen, Jiajia, Wu, Jie, Hao, Shaorui, Yang, Meifang, Lu, Xiaoqing, Chen, Xiaoxiao, Li, Lanjuan. Long term outcomes in survivors of epidemic Influenza A (H7N9) virus infection. *Scientific reports*; 2017.

32. Chiumello, Davide, Coppola, Silvia, Froio, Sara, Gotti, Miriam. What's next after ARDS: long-term outcomes. *Respiratory care*; 2016.

33. Herridge, Margaret S, Moss, Marc, Hough, Catherine L, Hopkins, Ramona O, Rice, Todd W, Bienvenu, O Joseph, Azoulay, Elie. Recovery and outcomes after the acute respiratory distress syndrome (ARDS) in patients and their family caregivers. *Intensive care medicine*; 2016.

34. Mason, Christopher, Dooley, Nessa, Griffiths, Mark. Acute respiratory distress syndrome. *Clinical Medicine*; 2016.

35. Disser, Nathaniel P., De Micheli, Andrea J., Schonk, Martin M., Konnaris, Maxwell A., Piacentini, Alexander N., Edon, Daniel L., Toresdahl, Brett G., Rodeo, Scott A., Casey, Ellen K., Mendias, Christopher L. Musculoskeletal Consequences of COVID-19. *JBJS*; 2020.

36. Nehme, Mayssam, Braillard, Olivia, Chappuis, François, Courvoisier, Delphine S., Guessous, Idris. Prevalence of Symptoms More Than Seven Months After Diagnosis of Symptomatic COVID-19 in an Outpatient Setting. *Annals of Internal Medicine*; 2021/09/21.

37. Carfì, Angelo, Bernabei, Roberto, Landi, Francesco. Persistent symptoms in patients after acute covid-19. *JAMA*; 2020.

38. Mahase, E., Kmietowicz, Z. Covid-19: Doctors are told not to perform CPR on patients in cardiac arrest. *Bmj*; Mar 29 2020.

39. NICE. COVID-19 rapid guideline: managing the long-term effects of COVID-19. 2020.

40. DiSilvio, Briana, Young, Meilin, Gordon, Ayla, Malik, Khalid, Singh, Ashley, Cheema, Tariq. Complications and outcomes of acute respiratory distress syndrome. *Critical care nursing quarterly*; 2019.

41. Li, J., Li, X., Jiang, J., Xu, X., Wu, J., Xu, Y., Lin, X., Hall, J., Xu, H., Xu, J., Xu, X. The Effect of Cognitive Behavioral Therapy on Depression, Anxiety, and Stress in Patients With COVID-19: A Randomized Controlled Trial. *Front Psychiatry*; 2020.

42. Liu, Z., Qiao, D., Xu, Y., Zhao, W., Yang, Y., Wen, D., Li, X., Nie, X., Dong, Y., Tang, S., Jiang, Y., Wang, Y., Zhao, J., Xu, Y. The Efficacy of Computerized Cognitive Behavioral Therapy for Depressive and Anxiety Symptoms in Patients With COVID-19: Randomized Controlled Trial. *J Med Internet Res*; May 14 2021.

43. Aminoff, V., Sellén, M., Sörliden, E., Ludvigsson, M., Berg, M., Andersson, G. Internet-Based Cognitive Behavioral Therapy for Psychological Distress Associated With the COVID-19 Pandemic: A Pilot Randomized Controlled Trial. *Front Psychol*; 2021.

44. Bevan, Stephen. Back to work: exploring the benefits of early interventions which help people with chronic illness remain in work. *Fit for Work Europe. Brussels, Belgium: The Work Foundation*; 2015.

45. Linton, S. J., Boersma, K., Traczyk, M., Shaw, W., Nicholas, M. Early Workplace Communication and Problem Solving to Prevent Back Disability: Results of a Randomized Controlled Trial Among High-Risk Workers and Their Supervisors. *J Occup Rehabil*; Jun 2016.

46. Contreary, Kara, Ben-Shalom, Yonatan, Gifford, Brian. Using predictive analytics for early identification of short-term disability claimants who exhaust their benefits. *Journal of occupational rehabilitation*; 2018.

47. Stapleton, David, Anfield, Robert, Burns, Robert, Cashdollar, Winthrop, Doornink, Benjamin, Gifford, Brian, Harris, Mary, Ufier, Kevin. Targeting early intervention to workers who need help to stay in the labor force. *Washington, DC: Mathematica Policy Research*; 2015.

48. Rogerson, Mark D, Gatchel, Robert J, Bierner, Samuel M. A cost utility analysis of interdisciplinary early intervention versus treatment as usual for high-risk acute low back pain patients. *Pain Practice*; 2010.

49. Cochrane, Andy, Higgins, Niamh M, FitzGerald, Oliver, Gallagher, Pamela, Ashton, Jennifer, Corcoran, Oriel, Desmond, Deirdre. Early interventions to promote work participation in people with regional musculoskeletal pain: a systematic review and meta-analysis. *Clinical rehabilitation*; 2017.

50. DZ, Algire, M, Coupland. Early Intervention in chronic pain and delayed recovery. 2017.

51. Marco, José H, Alonso, Sandra, Andani, Joaquín. Early intervention with cognitive behavioral therapy reduces sick leave duration in people with adjustment, anxiety and depressive disorders. *Journal of Mental Health*; 2018.

52. Karran, Emma L, Traeger, Adrian C, McAuley, James H, Hillier, Susan L, Yau, Yun-Hom, Moseley, G Lorimer. The value of prognostic screening for patients with low back pain in secondary care. *The Journal of Pain*; 2017.

53. Sullivan, Michael JL. What is the clinical value of assessing pain-related psychosocial risk factors? *Pain management*; 2013.

54. Compensation, Colorado Division of Workers'. Rule 17, Exhibit 9: Chronic pain disorder medical treatment guidelines. Section F.2. 2012.

55. Bruns, Daniel, Warren, Pamela A. Assessment of psychosocial contributions to disability. *Handbook of Behavioral Health Disability Management*; 2018.

56. Loisel, Patrick, Anema, Johannes R. Handbook of work disability. *Prevention and management.: Springer*; 2013.

57. Linton, Steven J., Gross, Doug, Schultz, Izabela Z., Main, Chris, Côté, Pierre, Pransky, Glenn, Johnson, William. Prognosis and the Identification of Workers Risking Disability: Research Issues and Directions for Future Research. *Journal of Occupational Rehabilitation*; 2005/12/01.

58. Schultz, Izabela Z., Gatchel, Robert J. Research and Practice Directions in Risk for Disability Prediction and Early Intervention. *Handbook of Complex Occupational Disability Claims: Early Risk Identification, Intervention, and Prevention*; 2005.

59. Jon J. Ford, Andrew J. Hahne,Luke D. Surkitt,Alexander Y. P. Chan,Matthew C. Richards,Sarah L. Slater,Rana S. Hinman,Tania Pizzari,Megan Davidson,Nicholas F. Taylor. Individualised physiotherapy as an adjunct to guideline-based advice for low back disorders in primary care: a randomised controlled trial. *British Journal of Sports*; 2016.

60. Hahne, A. J., Ford, J. J., Richards, M. C., Surkitt, L. D., Chan, A. Y. P., Slater, S. L., Taylor, N. F. Who Benefits Most From Individualized Physiotherapy or Advice for Low Back Disorders? A Preplanned Effect Modifier Analysis of a Randomized Controlled Trial. *Spine (Phila Pa 1976)*; Nov 1 2017.

61. Schmidt, C. O., Kohlmann, T., Pfingsten, M., Lindena, G., Marnitz, U., Pfeifer, K., Chenot, J. F. Construct and predictive validity of the German Örebro questionnaire short form for psychosocial risk factor screening of patients with low back pain. *Eur Spine J*; Jan 2016.

62. Cherkin, D., Balderson, B., Wellman, R., Hsu, C., Sherman, K. J., Evers, S. C., Hawkes, R., Cook, A., Levine, M. D., Piekara, D., Rock, P., Estlin, K. T., Brewer, G., Jensen, M., LaPorte, A. M., Yeoman, J., Sowden, G., Hill, J. C., Foster, N. E. Effect of Low Back Pain Risk-Stratification Strategy on Patient Outcomes and Care Processes: the MATCH Randomized Trial in Primary Care. *J Gen Intern Med*; Aug 2018.

63. Delitto, A., Patterson, C. G., Stevans, J. M., Freburger, J. K., Khoja, S. S., Schneider, M. J., Greco, C. M., Freel, J. A., Sowa, G. A., Wasan, A. D., Brennan, G. P., Hunter, S. J., Minick, K. I., Wegener, S. T., Ephraim, P. L., Beneciuk, J. M., George, S. Z., Saper, R. B. Stratified care to prevent chronic low back pain in high-risk patients: The TARGET trial. A multi-site pragmatic cluster randomized trial. *EClinicalMedicine*; Apr 2021.

64. Katzan, I. L., Thompson, N. R., George, S. Z., Passek, S., Frost, F., Stilphen, M. The use of STarT back screening tool to predict functional disability outcomes in patients receiving physical therapy for low back pain. *Spine J*; Apr 2019.

65. Khan, Yasmeen, Lawrence, Dana, Vining, Robert, Derby, Dustin. Measuring biopsychosocial risk for back pain disability in chiropractic patients using the STarT back screening tool: a cross-sectional survey. *Chiropractic & Manual Therapies*; 2019/01/15.

66. Beneciuk, Jason M, Fritz, Julie M, George, Steven Z. The STarT Back Screening Tool for prediction of 6-month clinical outcomes: relevance of change patterns in outpatient physical therapy settings. *journal of orthopaedic & sports physical therapy*; 2014.

67. Lheureux, A., Berquin, A. Comparison between the STarT Back Screening Tool and the Örebro Musculoskeletal Pain Screening Questionnaire: Which tool for what purpose? A semi-systematic review. *Ann Phys Rehabil Med*; May 2019.

68. Hill, Jonathan C., Whitehurst, David G. T., Lewis, Martyn, Bryan, Stirling, Dunn, Kate M., Foster, Nadine E., Konstantinou, Kika, Main, Chris J., Mason, Elizabeth, Somerville, Simon, Sowden, Gail, Vohora, Kanchan, Hay, Elaine M. Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial. *Lancet (London, England)*; 2011.

69. Shaw, William S., Pransky, Glenn, Patterson, William, Winters, Thomas. Early Disability Risk Factors for Low Back Pain Assessed at Outpatient Occupational Health Clinics. *Spine*; 2005.

70. Herrell, R. K., Edens, E. N., Riviere, L. A., Thomas, J. L., Bliese, P. D., Hoge, C. W. Assessing functional impairment in a working military population: the Walter Reed functional impairment scale. *Psychol Serv*; Aug 2014.

71. Ahola, K, Gould, R, Virtanen, M, Honkonen, T, Aromaa, A, Lönnqvist, J. Occupational burnout as a predictor of disability pension: a population-based cohort study. *Occupational and Environmental Medicine*; 2009.

72. Garton, Pam, Murphy, Gregory, O'Halloran, Paul. A practical tool to improve outcomes in Work Injury Management. *Work*; 2016.

73. Steele, J., Bruce-Low, S., Smith, D. A reappraisal of the deconditioning hypothesis in low back pain: review of evidence from a triumvirate of research methods on specific lumbar extensor deconditioning. *Curr Med Res Opin*; May 2014.

74. Beinart, N. A., Goodchild, C. E., Weinman, J. A., Ayis, S., Godfrey, E. L. Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. *Spine J*; Dec 2013.

75. Bell, J. A., Burnett, A. Exercise for the primary, secondary and tertiary prevention of low back pain in the workplace: a systematic review. *J Occup Rehabil*; Mar 2009.

76. Brede, E., Mayer, T. G., Shea, M., Garcia, C., Gatchel, R. J. Facilitating unequivocal and durable decisions in workers' compensation patients eligible for elective orthopedic surgery. *J Pain*; Jan 2014.

77. Brennan, G. P., Fritz, J. M., Hunter, S. J., Thackeray, A., Delitto, A., Erhard, R. E. Identifying subgroups of patients with acute/subacute "nonspecific" low back pain: results of a randomized clinical trial. *Spine (Phila Pa 1976)*; Mar 15 2006.

78. Browder, D. A., Childs, J. D., Cleland, J. A., Fritz, J. M. Effectiveness of an extension-oriented treatment approach in a subgroup of subjects with low back pain: a randomized clinical trial. *Phys Ther*; Dec 2007.

79. Colle, F., Rannou, F., Revel, M., Fermanian, J., Poiraudeau, S. Impact of quality scales on levels of evidence inferred from a systematic review of exercise therapy and low back pain. *Arch Phys Med Rehabil*; Dec 2002.

80. Delitto, A., George, S. Z., Van Dillen, L. R., Whitman, J. M., Sowa, G., Shekelle, P., Denninger, T. R., Godges, J. J., Orthopaedic Section of the American Physical Therapy, Association. Low back pain. *J Orthop Sports Phys Ther*; Apr 2012.

81. Hauggaard, A, Persson, AL. Specific spinal stabilisation exercises in patients with low back pain: a systematic review. *Phys Ther Rev*; 2007.

82. Hayden, J. A., van Tulder, M. W., Malmivaara, A., Koes, B. W. Exercise therapy for treatment of non-specific low back pain. *Cochrane Database Syst Rev*; 2005.

83. Hendrick, P., Milosavljevic, S., Hale, L., Hurley, D. A., McDonough, S., Ryan, B., Baxter, G. D. The relationship between physical activity and low back pain outcomes: a systematic review of observational studies. *Eur Spine J*; Mar 2011.

84. Hendrick, P., Te Wake, A. M., Tikkisetty, A. S., Wulff, L., Yap, C., Milosavljevic, S. The effectiveness of walking as an intervention for low back pain: a systematic review. *Eur Spine J*; Oct 2010.

85. Mayer, J., Mooney, V., Dagenais, S. Evidence-informed management of chronic low back pain with lumbar extensor strengthening exercises. *Spine J*; Jan-Feb 2008.

86. Mayer, T. G., Gatchel, R. J., Brede, E., Theodore, B. R. Lumbar surgery in work-related chronic low back pain: can a continuum of care enhance outcomes? *Spine J*; Feb 1 2014.

87. Mayer, T. G., Gatchel, R. J., Keeley, J., McGeary, D., Dersh, J., Anagnostis, C. A randomized clinical trial of treatment for lumbar segmental rigidity. *Spine (Phila Pa 1976)*; Oct 15 2004.

88. Mayer, T. G., Neblett, R., Brede, E., Gatchel, R. J. The quantified lumbar flexion-relaxation phenomenon is a useful measurement of improvement in a functional restoration program. *Spine (Phila Pa 1976)*; Oct 15 2009.

89. Mayer, T. G., Robinson, R., Pegues, P., Kohles, S., Gatchel, R. J. Lumbar segmental rigidity: can its identification with facet injections and stretching exercises be useful? *Arch Phys Med Rehabil*; Sep 2000.

90. Escolar-Reina, P., Medina-Mirapeix, F., Gascon-Canovas, J. J., Montilla-Herrador, J., Jimeno-Serrano, F. J., de Oliveira Sousa, S. L., del Bano-Aledo, M. E., Lomas-Vega, R. How do care-provider and home exercise program characteristics affect patient adherence in chronic neck and back pain: a qualitative study. *BMC Health Serv Res*; 2010.

91. Fersum, K. V., Dankaerts, W., O'Sullivan, P. B., Maes, J., Skouen, J. S., Bjordal, J. M., Kvale, A. Integration of subclassification strategies in randomised controlled clinical trials evaluating manual therapy treatment and exercise therapy for non-specific chronic low back pain: a systematic review. *Br J Sports Med*; Nov 2010.

92. Hayden, J. A., Cartwright, J. L., Riley, R. D., Vantulder, M. W., Chronic Low Back Pain, I. P. D. Meta-Analysis Group. Exercise therapy for chronic low back pain: protocol for an individual participant data meta-analysis. *Syst Rev*; 2012.

93. Jenkins, E. M., Borenstein, D. G. Exercise for the low back pain patient. *Baillieres Clin Rheumatol*; Feb 1994.

94. Kent, P., Mjosund, H. L., Petersen, D. H. Does targeting manual therapy and/or exercise improve patient outcomes in nonspecific low back pain? A systematic review. *BMC Med*; 2010.

95. Kilpikoski, S, Alen, M, Paatelma, M, Simonen, R, Heinonen, A, Videman, T. Outcome comparison among working adults with centralizing low back pain: secondary analysis of a randomized controlled trial with 1-year follow-up. *Adv Physiother*; 2009.

96. Krein, S. L., Metreger, T., Kadri, R., Hughes, M., Kerr, E. A., Piette, J. D., Kim, H. M., Richardson, C. R. Veterans walk to beat back pain: study rationale, design and protocol of a randomized trial of a pedometer-based internet mediated intervention for patients with chronic low back pain. *BMC Musculoskelet Disord*; 2010.

97. Laird, R. A., Kent, P., Keating, J. L. Modifying patterns of movement in people with low back pain -does it help? A systematic review. *BMC Musculoskelet Disord*; 2012.

98. Liddle, S. D., Gracey, J. H., Baxter, G. D. Advice for the management of low back pain: a systematic review of randomised controlled trials. *Man Ther*; Nov 2007.

99. Lim, E. C., Poh, R. L., Low, A. Y., Wong, W. P. Effects of Pilates-based exercises on pain and disability in individuals with persistent nonspecific low back pain: a systematic review with meta-analysis. *J Orthop Sports Phys Ther*; Feb 2011.

100. Long, A., Donelson, R., Fung, T. Does it matter which exercise? A randomized control trial of exercise for low back pain. *Spine*; 2004.

101. Fritz, J. M., Cleland, J. A., Brennan, G. P. Does adherence to the guideline recommendation for active treatments improve the quality of care for patients with acute low back pain delivered by physical therapists? *Med Care*; Oct 2007.

102. Hettinga, DM, Jackson, A, Moffett, JK, May, S, Mercer, C, Woby, SR. A systematic review and synthesis of higher quality evidence of the effectiveness of exercise interventions for non-specific low back pain of at least 6 weeks' duration. *Phys Ther Rev*; 2007.

103. Hilde, G., Hagen, K. B., Jamtvedt, G., Winnem, M. Advice to stay active as a single treatment for low back pain and sciatica. *Cochrane Database Syst Rev*; 2002.

104. Macedo, L. G., Smeets, R. J., Maher, C. G., Latimer, J., McAuley, J. H. Graded activity and graded exposure for persistent nonspecific low back pain: a systematic review. *Phys Ther*; Jun 2010.

105. McDonough, S. M., Tully, M. A., O'Connor, S. R., Boyd, A., Kerr, D. P., O'Neill, S. M., Delitto, A., Bradbury, I., Tudor-Locke, C., Baxter, D. G., Hurley, D. A. The back 2 activity trial: education and advice versus education and advice plus a structured walking programme for chronic low back pain. *BMC Musculoskelet Disord*; 2010.

106. Medina-Mirapeix, F., Escolar-Reina, P., Gascon-Canovas, J. J., Montilla-Herrador, J., Collins, S. M. Personal characteristics influencing patients' adherence to home exercise during chronic pain: a qualitative study. *J Rehabil Med*; Apr 2009.

107. Medina-Mirapeix, F., Escolar-Reina, P., Gascon-Canovas, J. J., Montilla-Herrador, J., Jimeno-Serrano, F. J., Collins, S. M. Predictive factors of adherence to frequency and duration components in home exercise programs for neck and low back pain: an observational study. *BMC Musculoskelet Disord*; 2009.

108. McFeely, JA, Gracey, J. Postoperative exercise programmes for lumbar spine decompression surgery: a systematic review of the evidence. *Phys Ther Rev*; 2006.

109. Oesch, P., Kool, J., Hagen, K. B., Bachmann, S. Effectiveness of exercise on work disability in patients with non-acute non-specific low back pain: Systematic review and meta-analysis of randomised controlled trials. *J Rehabil Med*; Mar 2010.

110. Posadzki, P., Ernst, E. Yoga for low back pain: a systematic review of randomized clinical trials. *Clin Rheumatol*; Sep 2011.

111. Schaafsma, F., Schonstein, E., Ojajarvi, A., Verbeek, J. Physical conditioning programs for improving work outcomes among workers with back pain. *Scand J Work Environ Health*; Jan 2011.

112. Slade, S. C., Keating, J. L. Trunk-strengthening exercises for chronic low back pain: a systematic review. *J Manipulative Physiol Ther*; Feb 2006.

113. Smeets, R. J., Vlaeyen, J. W., Hidding, A., Kester, A. D., van der Heijden, G. J., van Geel, A. C., Knottnerus, J. A. Active rehabilitation for chronic low back pain: cognitive-behavioral, physical, or both? First direct post-treatment results from a randomized controlled trial [ISRCTN22714229]. *BMC Musculoskelet Disord*; 2006.

114. Swinkels, A, Cochrane, K, Burt, A, Johnson, L, Lunn, T, Sian Rees, A. Exercise interventions for non-specific low back pain: an overview of systematic reviews. *Phys Ther Rev*; 2009.

115. Teasell, R. W., Harth, M. Functional restoration. Returning patients with chronic low back pain to work--revolution or fad? *Spine (Phila Pa 1976)*; Apr 1 1996.

116. Theodore, B. R., Mayer, T. G., Gatchel, R. J. Cost-Effectiveness of Early Versus Delayed Functional Restoration for Chronic Disabling Occupational Musculoskeletal Disorders. *J Occup Rehabil*; Sep 7 2014.

117. Torstensen, T. A., Ljunggren, A. E., Meen, H. D., Odland, E., Mowinckel, P., af Geijerstam, S. Efficiency and costs of medical exercise therapy, conventional physiotherapy, and self-exercise in patients with chronic low back pain - A pragmatic, randomized, single-blinded, controlled trial with 1-year follow-up. *Spine*; Dec 1 1998.

118. Stanton, T. R., Fritz, J. M., Hancock, M. J., Latimer, J., Maher, C. G., Wand, B. M., Parent, E. C. Evaluation of a treatment-based classification algorithm for low back pain: a cross-sectional study. *Phys Ther*; Apr 2011.

119. van Middelkoop, M., Rubinstein, S. M., Kuijpers, T., Verhagen, A. P., Ostelo, R., Koes, B. W., van Tulder, M. W. A systematic review on the effectiveness of physical and rehabilitation interventions for chronic non-specific low back pain. *Eur Spine J*; Jan 2011.

120. van Tulder, M., Malmivaara, A., Esmail, R., Koes, B. Exercise therapy for low back pain: a systematic review within the framework of the cochrane collaboration back review group. *Spine (Phila Pa 1976)*; Nov 1 2000.

121. Varatharajan, Sharanya, Côté, Pierre, Shearer, Heather M, Loisel, Patrick, Wong, Jessica J, Southerst, Danielle, Yu, Hainan, Randhawa, Kristi, Sutton, Deborah, van der Velde, Gabrielle. Are work disability prevention interventions effective for the management of neck pain or upper extremity disorders? A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration. *Journal of occupational rehabilitation*; 2014.

122. Martin, B. In-Depth: Cognitive Behavorial Therapy. *Psych Central*; 2016.

123. Wood, T. J., Thornley, P., Petruccelli, D., Kabali, C., Winemaker, M., de Beer, J. Preoperative Predictors of Pain Catastrophizing, Anxiety, and Depression in Patients Undergoing Total Joint Arthroplasty. *J Arthroplasty*; Jun 3 2016.

124. Weiss, K. E., Hahn, A., Wallace, D. P., Biggs, B., Bruce, B. K., Harrison, T. E. Acceptance of pain: associations with depression, catastrophizing, and functional disability among children and adolescents in an interdisciplinary chronic pain rehabilitation program. *J Pediatr Psychol*; Aug 2013.

125. Velly, A. M., Look, J. O., Carlson, C., Lenton, P. A., Kang, W., Holcroft, C. A., Fricton, J. R. The effect of catastrophizing and depression on chronic pain--a prospective cohort study of temporomandibular muscle and joint pain disorders. *Pain*; Oct 2011.

126. Linton, S. J., Nicholas, M. K., MacDonald, S., Boersma, K., Bergbom, S., Maher, C., Refshauge, K. The role of depression and catastrophizing in musculoskeletal pain. *Eur J Pain*; Apr 2011.

127. Edwards, R. R., Cahalan, C., Mensing, G., Smith, M., Haythornthwaite, J. A. Pain, catastrophizing, and depression in the rheumatic diseases. *Nat Rev Rheumatol*; Apr 2011.

128. Trocoli, T. O., Botelho, R. V. Prevalence of anxiety, depression and kinesiophobia in patients with low back pain and their association with the symptoms of low back spinal pain. *Rev Bras Reumatol Engl Ed*; Jul-Aug 2016.

129. Oskay, D., Tuna, Z., Duzgun, I., Elbasan, B., Yakut, Y., Tufan, A. Relationship between kinesiophobia and pain, quality of life, functional status, disease activity, mobility, and depression in patients with ankylosing spondylitis. *Turk J Med Sci*; Nov 13 2017.

130. Filardo, G., Merli, G., Roffi, A., Marcacci, T., Berti Ceroni, F., Raboni, D., Bortolotti, B., Kon, E., Marcacci, M. Kinesiophobia and depression affect total knee arthroplasty outcome in a multivariate analysis of psychological and physical factors on 200 patients. *Knee Surg Sports Traumatol Arthrosc*; Nov 2017.

131. Beck, A. T. Thinking and Depression. II. Theory and Therapy. *Arch Gen Psychiatry*; Jun 1964.

132. Seligman, M. E. Learned optimism. 1991.

133. Overmeer, T., Boersma, K. What Messages Do Patients Remember? Relationships Among Patients' Perceptions of Physical Therapists' Messages, Patient Characteristics, Satisfaction, and Outcome. *Phys Ther*; Mar 2016.

134. Lagerveld, Suzanne E, Blonk, Roland WB, Brenninkmeijer, Veerle, Wijngaards-de Meij, Leoniek, Schaufeli, Wilmar B. Work-focused treatment of common mental disorders and return to work: a comparative outcome study. *Journal of occupational health psychology*; 2012.

135. van der Feltz-Cornelis, Christina M, Hoedeman, Rob, de Jong, Fransina J, Meeuwissen, Jolanda AC, Drewes, Hanneke W, van der Laan, Niels C, Adèr, Herman J. Faster return to work after psychiatric consultation for sicklisted employees with common mental disorders compared to care as usual. A randomized clinical trial. *Neuropsychiatric disease and treatment*; 2010.

136. Kuehnl, Andreas, Seubert, Christian, Rehfuess, Eva, von Elm, Erik, Nowak, Dennis, Glaser, Jürgen. Human resource management training of supervisors for improving health and well-being of employees. *Cochrane Database of Systematic Reviews*; 2019.

137. Kori, SH. Kinisophobia: a new view of chronic pain behavior. *Pain Manage*; 1990.

138. Streibelt, Marco, Bürger, Wolfgang, Nieuwenhuijsen, Karen, Bethge, Matthias. Effectiveness of graded return to work after multimodal rehabilitation in patients with mental disorders: a propensity score analysis. *Journal of occupational rehabilitation*; 2018.

139. Cullen, K. L., Irvin, E., Collie, A., Clay, F., Gensby, U., Jennings, P. A., Hogg-Johnson, S., Kristman, V., Laberge, M., McKenzie, D., Newnam, S., Palagyi, A., Ruseckaite, R., Sheppard, D. M., Shourie, S., Steenstra, I., Van Eerd, D., Amick, B. C.,3rd. Effectiveness of Workplace Interventions in Return-to-Work for Musculoskeletal, Pain-Related and Mental Health Conditions: An Update of the Evidence and Messages for Practitioners. *J Occup Rehabil*; Mar 2018.

140. Noordik, Erik, van der Klink, Jac J, Geskus, Ronald B, de Boer, Michiel R, van Dijk, Frank JH, Nieuwenhuijsen, Karen. Effectiveness of an exposure-based return-to-work program for workers on sick leave due to common mental disorders: a cluster-randomized controlled trial. *Scandinavian journal of work, environment & health*; 2013.

141. Bendix, AF, Bendix, T, Ostenfeld, S, Bush, E, Andersen, A. Active treatment programs for patients with chronic low back pain: a prospective, randomized, observer-blinded study. *European Spine Journal*; 1995.

142. Bültmann, Ute, Sherson, David, Olsen, Jens, Hansen, Carl Lysbeck, Lund, Thomas, Kilsgaard, Jørgen. Coordinated and tailored work rehabilitation: a randomized controlled trial with economic evaluation undertaken with workers on sick leave due to musculoskeletal disorders. *Journal of occupational rehabilitation*; 2009.

143. Hees, Hiske L, de Vries, Gabe, Koeter, Maarten WJ, Schene, Aart H. Adjuvant occupational therapy improves long-term depression recovery and return-to-work in good health in sick-listed employees with major depression: results of a randomised controlled trial. *Occupational and Environmental Medicine*; 2013.

144. Arnetz, Bengt B, Sjögren, Berit, Rydéhn, Berit, Meisel, Roland. Early workplace intervention for employees with musculoskeletal-related absenteeism: a prospective controlled intervention study. *Journal of occupational and environmental medicine*; 2003.

145. Anema, Johannes R, Steenstra, Ivan A, Bongers, Paulien M, de Vet, Henrica CW, Knol, Dirk L, Loisel, Patrick, van Mechelen, Willem. Multidisciplinary rehabilitation for subacute low back pain: graded activity or workplace intervention or both?: a randomized controlled trial. *Spine*; 2007.

146. Jousset, Nathalie, Fanello, Serge, Bontoux, Luc, Dubus, Valérie, Billabert, Colette, Vielle, Bruno, Roquelaure, Yves, Penneau-Fontbonne, Dominique, Richard, Isabelle. Effects of functional restoration versus 3 hours per week physical therapy: a randomized controlled study. *Spine*; 2004.

147. Lambeek, Ludeke C, Bosmans, Judith E, Van Royen, Barend J, Van Tulder, Maurits W, Van Mechelen, Willem, Anema, Johannes R. Effect of integrated care for sick listed patients with chronic low back pain: economic evaluation alongside a randomised controlled trial. *Bmj*; 2010.

148. Lambeek, Ludeke C, van Mechelen, Willem, Knol, Dirk L, Loisel, Patrick, Anema, Johannes R. Randomised controlled trial of integrated care to reduce disability from chronic low back pain in working and private life. *Bmj*; 2010.

149. Loisel, Patrick, Abenhaim, Lucien, Durand, Pierre, Esdaile, John M, Suissa, Samy, Gosselin, Lise, Simard, Robert, Turcotte, Jean, Lemaire, Jacques. A population-based, randomized clinical trial on back pain management. *Spine*; 1997.

150. Magnussen, Liv, Strand, Liv I, Skouen, Jan S, Eriksen, Hege R. Motivating disability pensioners with back pain to return to work–a randomized controlled trial. *Journal of Rehabilitation Medicine*; 2007.

151. Netterstrøm, Bo, Friebel, Lene, Ladegaard, Yun. Effects of a multidisciplinary stress treatment programme on patient return to work rate and symptom reduction: results from a randomised, wait-list controlled trial. *Psychotherapy and psychosomatics*; 2013.

152. Nystuen, Pal, Hagen, Kare B. Solution-focused intervention for sick listed employees with psychological problems or muscle skeletal pain: a randomised controlled trial [ISRCTN39140363]. *BMC Public Health*; 2006.

153. Poulsen, Otto M, Aust, Birgit, Bjorner, Jakob Bue, Rugulies, Reiner, Hansen, Jørgen V, Tverborgvik, Torill, Winzor, Glen, Mortensen, Ole S, Helverskov, Trine, Ørbæk, Palle. Effect of the Danish return-to-work program on long-term sickness absence: results from a randomized controlled trial in three municipalities. *Scandinavian journal of work, environment & health*; 2014.

154. Scheel, Inger B, Hagen, Kåre Birger, Herrin, Jeph, Carling, Cheryl, Oxman, Andrew D. Blind faith? The effects of promoting active sick leave for back pain patients: a cluster-randomized controlled trial. *Spine*; 2002.

155. Schene, Aart H, Koeter, Maarten WJ, Kikkert, Martijn J, Swinkels, Jan A, McCrone, Paul. Adjuvant occupational therapy for work-related major depression works: randomized trial including economic evaluation. *Psychological medicine*; 2007.

156. Stapelfeldt, Christina M, Christiansen, David H, Jensen, Ole K, Nielsen, Claus V, Petersen, Karin D, Jensen, Chris. Subgroup analyses on return to work in sick-listed employees with low back pain in a randomised trial comparing brief and multidisciplinary intervention. *BMC musculoskeletal disorders*; 2011.

157. Streibelt, Marco, Bethge, Matthias. Effects of intensified work-related multidisciplinary rehabilitation on occupational participation: a randomized-controlled trial in patients with chronic musculoskeletal disorders. *International journal of rehabilitation research*; 2014.

158. van den Hout, Johanna HC, Vlaeyen, Johan WS, Heuts, Peter HTG, Zijlema, Johan HL, Wijnen, Joseph AG. Secondary prevention of work-related disability in nonspecific low back pain: does problem-solving therapy help? A randomized clinical trial. *The Clinical journal of pain*; 2003.

159. Verbeek, Jos H, van der Weide, Willeke E, van Dijk, Frank J. Early occupational health management of patients with back pain: a randomized controlled trial. *Spine*; 2002.

160. Vermeulen, Sylvia J, Anema, Johannes R, Schellart, Antonius JM, Knol, Dirk L, van Mechelen, Willem, van der Beek, Allard J. A participatory return-to-work intervention for temporary agency workers and unemployed workers sick-listed due to musculoskeletal disorders: results of a randomized controlled trial. *Journal of occupational rehabilitation*; 2011.

161. Viikari-Juntura, Eira, Kausto, Johanna, Shiri, Rahman, Kaila-Kangas, Leena, Takala, Esa-Pekka, Karppinen, Jaro, Miranda, Helena, Luukkonen, Ritva, Martimo, Kari-Pekka. Return to work after early part-time sick leave due to musculoskeletal disorders: a randomized controlled trial. *Scandinavian journal of work, environment & health*; 2012.

162. Vlasveld, MC, Van der Feltz-Cornelis, CM, Bültmann, U, Beekman, ATF, Van Mechelen, W, Hoedeman, R, Anema, JR. Predicting return to work in workers with all-cause sickness absence greater than 4 weeks: a prospective cohort study. *Journal of Occupational Rehabilitation*; 2012.

163. Volker, Daniëlle, Vlasveld, Moniek C, Anema, Johannes R, Beekman, Aartjan TF, Hakkaart-van Roijen, Leona, Brouwers, Evelien PM, Van Lomwel, A Gijsbert C, van der Feltz-Cornelis, Christina M. Blended E-health module on return to work embedded in collaborative occupational health care for common mental disorders: design of a cluster randomized controlled trial. *Neuropsychiatric disease and treatment*; 2013.

164. van Oostrom, Sandra H, van Mechelen, Willem, Terluin, Berend, de Vet, Henrica CW, Knol, Dirk L, Anema, Johannes R. A workplace intervention for sick-listed employees with distress: results of a randomised controlled trial. *Occupational and environmental medicine*; 2010.

165. Hou, Wen-Hsuan, Chi, Ching-Chi, Lo, Heng-Lien, Chou, Yun-Yun, Kuo, Ken N, Chuang, Hung-Yi. Vocational rehabilitation for enhancing return-to-work in workers with traumatic upper limb injuries. *Cochrane Database of Systematic Reviews*; 2017.

166. de Boer, Angela GEM, Taskila, Tyna K, Tamminga, Sietske J, Feuerstein, Michael, Frings-Dresen, Monique HW, Verbeek, Jos H. Interventions to enhance return-to-work for cancer patients. *Cochrane database of systematic reviews*; 2015.

167. Loisel, P., Buchbinder, R., Hazard, R., Keller, R., Scheel, I., van Tulder, M., Webster, B. Prevention of work disability due to musculoskeletal disorders: the challenge of implementing evidence. *J Occup Rehabil*; Dec 2005.

168. Caruso, Garson, Kertay, Les. Part I: Psychological Factors in Delayed and Failed Recovery and Unnecessary Disability. *Guides Newsletter*; 2019.

169. Steiner, Timothy J, Stovner, Lars J, Vos, Theo, Jensen, R, Katsarava, Z. Migraine is first cause of disability in under 50s: will health politicians now take notice? 2018.

170. Cheadle, Allen, Franklin, Gary, Wolfhagen, Carl, Savarino, James, Liu, PY, Salley, Charles, Weaver, Marcia. Factors influencing the duration of work-related disability: a population-based study of Washington State workers' compensation. *American journal of public health*; 1994.

171. Waddell, Gordon, Burton, A Kim. Is work good for your health and well-being? 2006.

172. Mehta, Neil K, Patel, Shivani A, Ali, Mohammed K, Venkat Narayan, KM. Preventing disability: the influence of modifiable risk factors on state and national disability prevalence. *Health Affairs*; 2017.

173. Theis, Kristina A, Roblin, Douglas W, Helmick, Charles G, Luo, Ruiyan. Prevalence and causes of work disability among working-age US adults, 2011–2013, NHIS. *Disability and health journal*; 2018.

174. Prasarn, Mark L, Horodyski, Mary B, Behrend, Caleb, Wright, John, Rechtine, Glenn R. Negative effects of smoking, workers' compensation, and litigation on pain/disability scores for spine patients. *Surgical neurology international*; 2012.

175. Dellve, L., Lagerström, M., Hagberg, M. Work-system risk factors for permanent work disability among home-care workers: a case-control study. *Int Arch Occup Environ Health*; Apr 2003.

176. Karpansalo, M., Manninen, P., Lakka, T. A., Kauhanen, J., Rauramaa, R., Salonen, J. T. Physical workload and risk of early retirement: prospective population-based study among middle-aged men. *J Occup Environ Med*; Oct 2002.

177. Skarpsno, E. S., Mork, P. J., Nilsen, T. I. L., Nordstoga, A. L. Influence of sleep problems and co-occurring musculoskeletal pain on long-term prognosis of chronic low back pain: the HUNT Study. *J Epidemiol Community Health*; Mar 2020.

178. Nielsen, M. B., Emberland, J. S., Knardahl, S. Workplace Bullying as a Predictor of Disability Retirement: A Prospective Registry Study of Norwegian Employees. *J Occup Environ Med*; Jul 2017.

179. Clausen, T., Conway, P. M., Burr, H., Kristensen, T. S., Hansen Å, M., Garde, A. H., Hogh, A. Does leadership support buffer the effect of workplace bullying on the risk of disability pensioning? An analysis of register-based outcomes using pooled survey data from 24,538 employees. *Int Arch Occup Environ Health*; Oct 2019.

180. Ward, M. M., Kuzis, S. Risk factors for work disability in patients with ankylosing spondylitis. *J Rheumatol*; Feb 2001.

181. Eisner, Mark D., Yelin, Edward H., Katz, Patricia P., Lactao, Gretchen, Iribarren, Carlos, Blanc, Paul D. Risk Factors for Work Disability in Severe Adult Asthma. *The American Journal of Medicine*; 2006.

182. Lahelma, Eero, Laaksonen, Mikko, Lallukka, Tea, Martikainen, Pekka, Pietiläinen, Olli, Saastamoinen, Peppiina, Gould, Raija, Rahkonen, Ossi. Working conditions as risk factors for disability retirement: a longitudinal register linkage study. *BMC Public Health*; 2012/04/26.

183. Airaksinen, Jaakko, Jokela, Markus, Virtanen, Marianna, Oksanen, Tuula, Pentti, Jaana, Vahtera, Jussi, Koskenvuo, Markku, Kawachi, Ichiro, Batty, G. David, Kivimäki, Mika. Development and validation of a risk prediction model for work disability: multicohort study. *Scientific Reports*; 2017/10/19.

184. Bjørn, Tore Langeland. Risk factors for work disability. 2013.

185. Wang, Mo, Vaez, Marjan, Dorner, Thomas Ernst, Rahman, Syed, Helgesson, Magnus, Ivert, Torbjörn, Mittendorfer-Rutz, Ellenor. Risk factors for subsequent work disability in patients with acute myocardial infarction. *European Journal of Public Health*; 2019.

186. Virtanen, Marianna, Vahtera, Jussi, Head, Jenny, Dray-Spira, Rosemary, Okuloff, Annaleena, Tabak, Adam G., Goldberg, Marcel, Ervasti, Jenni, Jokela, Markus, Singh-Manoux, Archana, Pentti, Jaana, Zins, Marie, Kivimäki, Mika. Work Disability among Employees with Diabetes: Latent Class Analysis of Risk Factors in Three Prospective Cohort Studies. *PLOS ONE*; 2015.

187. Hubert, H. B., Fries, J. F. Predictors of physical disability after age 50. Six-year longitudinal study in a runners club and a university population. *Ann Epidemiol*; Jul 1994.

188. Centers for Disease Control and Prevention. Disability and Health Related Conditions. 2020.

189. Dembe, Allard E, Erickson, J Bianca, Delbos, Rachel G, Banks, Steven M. The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States. *Occupational and environmental medicine*; 2005.

190. Franklin, Gary M., Turner, Judith A., Wickizer, Thomas M., Fulton-Kehoe, Deborah, Mootz, Robert D. Disability Prevention. *Encyclopedia of Pain*; 2013.

191. Martins, C., Godycki-Cwirko, M., Heleno, B., Brodersen, J. Quaternary prevention: reviewing the concept. *Eur J Gen Pract*; Dec 2018.

192. Della-Posta, C., Drummond, P. D. Cognitive behavioural therapy increases re-employment of job seeking worker's compensation clients. *J Occup Rehabil*; Jun 2006.

193. Reme, Silje Endresen, Grasdal, Astrid Louise, Løvvik, Camilla, Lie, Stein Atle, Øverland, Simon. Work-focused cognitive–behavioural therapy and individual job support to increase work participation in common mental disorders: a randomised controlled multicentre trial. *Occup Environ Med*; 2015.

194. Hegmann, KT, et al. ACOEM Workplace Mental Health Guideline: Anxiety Disorders. 2021.

195. Hegmann, KT, et al. ACOEM Workplace Mental Health Guideline: Depressive Disorders. 2020.

196. Hegmann, KT, et al. Posttraumatic Stress Disorder and Acute Stress Disorder. 2018.

197. Hegmann, KT, et al. Chronic pain guidelines. *MDGuidelines®. Occupational medicine practice guidelines: Evaluation and Management of Common Health Problems and Functional Recovery in Workers*; 2017.

198. Hegmann, KT, et al. Non-invasive and minimally invasive management of low back disorders. *Journal of occupational and environmental medicine*; 2020.

199. Hegmann, KT, et al. ACOEM Practice Guidelines: Low Back Disorders. 2020.

200. Franche, R. L., Cullen, K., Clarke, J., Irvin, E., Sinclair, S., Frank, J. Workplace-based return-to-work interventions: a systematic review of the quantitative literature. *J Occup Rehabil*; Dec 2005.

201. E, MacEachen, L, Chambers, A, Kosny, K, Keown. Red flags green lights: a guide to identifying and solving return-to-work problems. 2009.

202. Washington State Department of Labor and Industries. Attending Provider's Return to Work Desk Reference. 2012.

203. Colledge, A. A model for the prevention of iatrogenic disease associated with work-related low back pain. *J Occup Rehabil*; Dec 1993.

204. U.S. Department of the Army. A leader's guide to soldier health and fitness. Field Manual ATP 6-22.5. 2016.

205. Lowe, A., Neligan, A., Greenwood, R. Sleep disturbance and recovery during rehabilitation after traumatic brain injury: a systematic review. *Disabil Rehabil*; Apr 2020.

206. Gilbert, K. S., Kark, S. M., Gehrman, P., Bogdanova, Y. Sleep disturbances, TBI and PTSD: Implications for treatment and recovery. *Clin Psychol Rev*; Aug 2015.

207. Pakpour, A. H., Yaghoubidoust, M., Campbell, P. Persistent and Developing Sleep Problems: A Prospective Cohort Study on the Relationship to Poor Outcome in Patients Attending a Pain Clinic with Chronic Low Back Pain. *Pain Pract*; Jan 2018.

208. Faraut, B., Léger, D., Medkour, T., Dubois, A., Bayon, V., Chennaoui, M., Perrot, S. Napping reverses increased pain sensitivity due to sleep restriction. *PLoS One*; 2015.

209. Purvis, T. E., Neuman, B. J., Riley, L. H.,3rd, Skolasky, R. L. Discriminant Ability, Concurrent Validity, and Responsiveness of PROMIS Health Domains Among Patients with Lumbar Degenerative Disease Undergoing Decompression With or Without Arthrodesis. *Spine (Phila Pa 1976)*; Nov 1 2018.

210. Edéll-Gustafsson, U. M., Kritz, E. I., Bogren, I. K. Self-reported sleep quality, strain and health in relation to perceived working conditions in females. *Scand J Caring Sci*; Jun 2002.

211. Ho, Fiona Yan-Yee, Yeung, Wing-Fai, Ng, Tommy Ho-Yee, Chan, Christian S. The efficacy and cost-effectiveness of stepped care prevention and treatment for depressive and/or anxiety disorders: a systematic review and meta-analysis. *Scientific reports*; 2016.

212. Bair, Matthew J, Ang, Dennis, Wu, Jingwei, Outcalt, Samantha D, Sargent, Christy, Kempf, Carol, Froman, Amanda, Schmid, Arlene A, Damush, Teresa M, Yu, Zhangsheng. Evaluation of stepped care for chronic pain (ESCAPE) in veterans of the Iraq and Afghanistan conflicts: a randomized clinical trial. *JAMA internal medicine*; 2015.

213. Waddell, Gordon, Burton, A Kim, Aylward, Mansel. A biopsychosocial model of sickness and disability. *The Guides Newsletter*; 2008.

214. Wade, Derick. Why physical medicine, physical disability and physical rehabilitation? We should abandon Cartesian dualism. 2006.

215. Nicholas, M. K., Costa, D. S. J., Linton, S. J., Main, C. J., Shaw, W. S., Pearce, R., Gleeson, M., Pinto, R. Z., Blyth, F. M., McCauley, J. H., Maher, C. G., Smeets, Rjem, McGarity, A. Predicting Return to Work in a Heterogeneous Sample of Recently Injured Workers Using the Brief ÖMPSQ-SF. *J Occup Rehabil*; Jun 2019.

216. Jurisic, Maja, Bean, Melissa, Harbaugh, John, Cloeren, Marianne, Hardy, Scott, Liu, Hanlin, Nelson, Cameron, Christian, Jennifer. The Personal Physician's Role in Helping Patients With Medical Conditions Stay at Work or Return to Work. *Journal of Occupational and Environmental Medicine*; 2017.

217. Mueller, Kathryn L., Hudson, Thomas Warner,III, Bruns, Daniel, Algire, Denise Zoe, Buchta, William G., Christian, Jennifer H., Cloeren, Marianne, Das, Rupali, Eisenhart, Michael, Frangos, Stephen A., Gillaspy, Stephen, Hammel, Richard, Havens, Carol, Marks, Steven, Melvin, John, Moses, X. J. Ethan, Persell, Stephen, Pushkin, Gary, Rodrigues, Shelly, Rogers, Bonnie, Rosenthal, Jill A., Saito, Kenji, Schwartz, Lori A., Snodgrass, Jeff, Wright, C. Vaile. Recommendations From the 2019 Symposium on Including Functional Status Measurement in Standard Patient Care. *Journal of Occupational and Environmental Medicine*; 2020.

218. Mueller, Kathryn, Konicki, Doris, Larson, Paul, Hudson, T. Warner, Yarborough, Charles, and the, Acoem Expert Panel on Functional Outcomes. Advancing Value-Based Medicine: Why Integrating Functional Outcomes With Clinical Measures Is Critical to Our Health Care Future. *Journal of Occupational and Environmental Medicine*; 2017.

219. Talmage, James B, Melhorn, J Mark, Hyman, MH. How to think about work ability and work restrictions: risk, capacity, and tolerance. *A physician's guide to return to work*; 2005.

220. Gaspar, Fraser W., Jolivet, Daniel N., Wizner, Kerri, Schott, Fred, Dewa, Carolyn S. Pre-Existing and New-Onset Depression and Anxiety Among Workers With Injury or Illness Work Leaves. *Journal of Occupational and Environmental Medicine*; 2020.

221. Lynch, NT, Clay, RL, Hegmann, KT, Greaves, WW, Gold, JA. Advocagenic illness: proposed term, case reports, and estimates of prevalence. *Journal of Occupational and Environmental Medicine*; 1998.

222. Loeser, John D, Sullivan, Mark. Doctors, diagnosis, and disability: a disastrous diversion. *Clinical Orthopaedics and Related Research (1976-2007)*; 1997.

223. Conrad, Peter. The medicalization of society: on the transformation of human conditions into treatable disorders. 2007.

224. Van Dijk, Wieteke, Faber, Marjan J, Tanke, Marit AC, Jeurissen, Patrick PT, Westert, Gert P. Medicalisation and overdiagnosis: what society does to medicine. *International journal of health policy and management*; 2016.

225. Stone, Jon, Carson, A, Duncan, R, Coleman, R, Roberts, R, Warlow, C, Hibberd, C, Murray, G, Cull, R, Pelosi, A. Symptoms 'unexplained by organic disease' in 1144 new neurology out-patients: how often does the diagnosis change at follow-up? *Brain*; 2009.

226. Colledge, Alan L, Johnson, Hugh I. The SPICE model for return to work. *Occupational Health & Safety*; 2000.

CONFLICT OF INTEREST DISCLOSURES

Kurt T. Hegmann, MD, MPH, FACOEM, FACP (Editor-in-Chief)
Professor and Center Director, Rocky Mountain Center for Occupational and Environmental Health, University of Utah
National, Regional, Local Committee Affiliations—Board of Trustees (2003-12) and Chair (2010-12), American Board of Preventive Medicine; Chair, Federal Motor Carrier Safety Administration's Medical Review Board (2006-2010); Member, *Journal of Occupational and Environmental Medicine* Editorial Board
Other Guidelines Related Professional Activities—Chair, Evidence-based Practice Committee, ACOEM (2006-present)
Research Grants/Other Support—NIOSH (CDC) Training grants and research grants primarily on the epidemiology of musculoskeletal disorders (e.g., CTS, shoulder tendinosis, LBP) and truck driver safety.
Financial/Non-Financial Conflict of Interest—Consultant, Reed Group (ACOEM Guidelines Editor-in-Chief); Consulting with companies, unions and insurers

Les Kertay, PhD, ABPP, FIAIME (Panel Co-Chair)
Senior Vice President of Behavioral Health, Axiom Medical; Adjunct Professor, Psychology Department, University of Tennessee at Chattanooga
National, Regional, Local Committee Affiliations—Immediate Past President, International Academy of Independent Medical Evaluators; Member, Ethics Committee, Dr Ida Rolf Institute; Member, Ethics Committee, Tennessee Psychological Association; Editorial Board, AMA Guides Newsletter; Advisory Board, Work Comp Laude Gala and Awards
Other Guidelines Related Professional Activities—Member, ACOEM Evidence-based Practice Workplace Mental Health Panel; Member, Official Disability Guidelines Editorial Advisory Panel
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Garson M. Caruso, MD, MPH, CLCP, CMLE, FACOEM, FIAIME (Panel Co-Chair)
Independent Physician Consultant; Medical Consultant, PSA Airlines and Service Employees International Union; Clinical Associate, Johns Hopkins Medical Institutions; Medicolegal Expert Witness and Litigation Support; Disability and Workers' Compensation File Reviewer
National, Regional, Local Committee Affiliations – *Member, Board of Directors,* International Academy of Independent Medical Evaluators; Book and Peer Reviewer: *Journal of Occupational and Environmental Medicine, International Archives of Occupational and Environmental Health,* and *Occupational Medicine*; Member and Prior Vice Chair, Work Fitness and Disability Section
Guidelines Related Professional Activities – Member, ACOEM Evidence-based Practice Workplace Mental Health Panel; Member, ACOEM Evidence-based Practice Hip and Groin Panel
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—Perform disability case reviews for national and international insurers

Nancy Baker, ScD, MPH, OTR/L, FAOTA (Panel Member)
Associate Professor, Department of Occupational Therapy, Tufts University; Adjunct Appointment, Department of Occupational Therapy, University of Pittsburgh, School of Health and Rehabilitation Sciences
National, Regional, Local Committee Affiliations—Associate Editor, *Occupational Therapy Journal of Research*; Editorial Board, *The American Journal of Occupational Therapy*; Ad hoc Reviewer for *Archives of Physical Medicine and Rehabilitation*, *Arthritis Care & Research*, *BMC Musculoskeletal Disorders*, *BMJ Open, Clinical Orthopaedics and Related Research*, *Ergonomics*, *Human Factors, Journal of Hand Therapy, Journal of Occupational and Environmental Medicine, Occupational Therapy Journal of Research*; Faculty Mentor for Young Investigators Initiative (US Bone and Joint Initiative and Bone and Joint Decade Canada)
Guidelines Related Professional Activities—American College of Rheumatology Guideline for the Treatment of Rheumatoid Arthritis
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Robert J. Barth, PhD (Panel Member)
Owner, Barth NeuroScience
National, Regional, Local Committee Affiliations—None
Guidelines Related Professional Activities—Contributor, *Guides to the Evaluation of Disease and Injury Causation*, Contributor and Reviewer, *AMA Guides to the Evaluation of Permanent Impairment, 6th Edition*, Editorial Board, *AMA Guides* Newsletter; Clinical Guideline Reviewer, American Academy of Neurology
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Jennifer H. Christian, MD, MPH, FACOEM (Panel Member)
Founder/President/Chief Medical Officer, Webility Corporation; Owner/Clinician, Multi-Dimensional Medical Care LLC; Chair, Alliance for Bridging Health and Work (multi-stakeholder); previously Senior Advisor for RETAIN Demonstration Project, Office of Disability Employment Policy, US Department of Labor
National, Regional, Local Committee Affiliations— Chair, ACOEM Work Fitness & Disability Section; Member/List-serv Moderator, ACOEM Behavioral Health Section; Founder/List-serv Moderator, Work Fitness & Disability Roundtable (multi-stakeholder); Reviewer, *American Journal of Family Practice*
Guidelines Related Professional Activities—Lead author of ACOEM guidance statements: "The Personal Physician's Role in Helping Patients with Medical Conditions Stay at Work or Return to Work," "Preventing Needless Work Disability by Helping People Stay Employed," "Attending Physician's Role in Helping Patients Return to Work Following Illness or Injury"
Research Grants/Other Support— None
Financial/Non-Financial Conflict of Interest—*Member, Advisory Board for Figur8.com and Tiatros.com;* Consulting clients may include employers, insurers, healthcare delivery organizations, managed care companies, non-profit organizations, government agencies.

Jerald L. Cook, MD, MS, FACOEM (Panel Member)
President, Med Fit Consulting, Inc; Employee Care Center, Scripps Healthcare Inpatient, Medical Group; Vice President/Chief Medical Officer, American Analytical Medical Services, Inc; Medical Director, Lowe's Health Center, Premise Health
National, Regional, Local Committee Affiliations—None
Guidelines Related Professional Activities—MDGuidelines Duration Review project
Research Grants/Other Support—None

Rajiv Das, MD, MPH, MS, MRO, FACOEM (Panel Member)
Medical Director, Safeway/Albertsons Companies; Medical Director, UCSF Benioff Children's Hospital Oakland
National, Regional, Local Committee Affiliations—Member, Pharmacy and Therapeutic Committee, Department of Industrial Relations, State of California
Guidelines Related Professional Activities—Member, ACOEM Evidence-based Practice Work-relatedness Panel; Member, Medical Evidence Evaluation Advisory Council for State of California
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Michael Goertz, MD, MP, FACOEM (Panel Member)
Employer Health Services, LLC; Tang Health Center – UC Berkeley
National, Regional, Local Committee Affiliations—*None*
Guidelines Related Professional Activities—ICSI Acute and Subacute Low Back Pain Guideline; ICSI Pain Guidelines; Member, ACOEM Evidence-based Practice Spine Panel; ARAZ Corporation; Health Risk Management; Institute for Health and Productivity Management; State of Minnesota Medical Services Review Board
Research Grants/Other Support—Health Partners Foundation Grant: primary care approach to acute low back pain
Financial/Non-Financial Conflict of Interest—None

Judith Green McKenzie, MD, MPH, FACOEM (Panel Member)
Executive Director for Health, Safety and Environment, Johns Hopkins University and Johns Hopkins Health System; Division Director for Occupational and Environmental Medicine and Professor (PAR) of Medicine, Johns Hopkins Medicine; Owner, JudithGreenMcKenzie LLP

National, Regional, Local Committee Affiliations—Standing Committee Member, Committee of Medical Experts to Assist Social Security on Disability Issues, National Academy of the Sciences, Engineering and Medicine; ACOEM OEM Competencies Task Force; Chair, ACOEM History and Archives Section; Member, Executive Committee of the T32 Translational Research Training Program in Environmental Health Sciences; Lifestyle Coach for National CDC Diabetes Prevention Program; Peer Review Panel for Occupational Safety and Health Education & Research Centers; Member of American Board of Preventive Medicine Examination Committee; Peer Reviewer, *Annals of Internal Medicine*; Peer Reviewer, *Journal of National Medical Association*; Peer Reviewer, *Infection Control and Hospital Epidemiology*; Peer Reviewer, *American Journal of Infection Control*; Peer Reviewer, *International Journal of Occupational Health*; Editorial Board, *Journal of Occupational and Environmental Medicine*;
Guidelines Related Professional Activities—Member, ACOEM Evidence-based Practice Work-relatedness Panel; Co-Chair, ACOEM Evidence-based Practice Hip and Groin Panel
Research Grants/Other Support—NIOSH Training Grant; HRSA Training Grant
Financial/Non-Financial Conflict of Interest—None

Gideon A. Letz, MD, MPH (Panel Member)
Medical Director, State Compensation Insurance Fund; Staff Physician, Occupational Medicine Clinic, Kaiser Permanente Medical Group
National, Regional, Local Committee Affiliations—Member, Occupational Health, Workers' Compensation Committee, California Medical Association; Member, Occupational Health Committee, Alameda Contra Costa Medical Association; Member, Statewide Advisory Committee to University of California Occupational Health Program; Chair, Occupational Health Committee, International Association of Accident Boards and Commissions; Member, Medical Appeals Panel, State of California Personnel Board
Guidelines Related Professional Activities—None
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Douglas W. Martin, MD, FACOEM, FAAFP, FIAIME (Panel Member)
Medical Director, UnityPoint Health, St. Luke's Occupational Medicine; Medical Director, Octapharma Plasma Incorporated; Medical Director, O'Hara LLC Nebraska Workers' Compensation Managed Care Medical Plan; President, Martin Occupational Medicine PC; Medical Director, Dakota Valley Emergency Services Area; Superintendent, Union County SD Board of Public Health
National, Regional, Local Committee Affiliations—President, ACOEM (2022-2023); Member, ACOEM Coding Workgroup; ACOEM Bylaws Committee; AMA CPT Advisory Panel (IAIME Appointee); Member, AMA RUC Advisory Panel (IAIME Appointee); Board Member and Vice Chair for Interstate Postgraduate Medical Association; Member, AAFP Commission on Education; Member, AAFP Subcommittee on Graduate Curriculum Past Chair; Past President and Board Member for International Academy of Independent Medical Evaluators; Past President and Board Member for Iowa Academy of Family Physicians; Member of AAFP Opioid Advisory Group; Member, Technical Working Group, Social Security Administration RETAIN Demonstration Project;
Guidelines Related Professional Activities— AMA Guides to the Evaluation of Permanent Impairment Editorial Panel Co-Chair; ACOEM Private Practice Section OH Guide Project Lead; AMA Guides 6th Edition Advisory Panel (IAIME Representative); Opioid Member Advisory Group, AAFP; Editorial Advisory Board, Official Disability Guidelines; AAOS Carpal Tunnel Syndrome Guidelines Committee Member
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

J. Mark Melhorn, MD, FAAOS, FACOEM, FAADEP, FACS, FASSH, FAAHS, FIAIME (Panel Member)
The Hand Center, P.A.; Clinical Associate Professor, Section of Orthopaedics, Department of Surgery, University of Kansas School of Medicine - Wichita
National, Regional, Local Committee Affiliations – Past Board Chair, Current Past President and Current Chairman of Nomination Committee, and Member of Ethics & Discipline Committee, American Academy of Disability Evaluating Physicians; Member of Occupational Health Committee, Program Director for Expert Witness Program, and Program Director for Occupational Orthopaedics and Workers' Compensation: A Multidisciplinary Perspective, American Academy of Orthopaedic Surgeons;
Other Guidelines Related Professional Activities – Chair, ACOEM Evidence-based Practice Hand, Wrist and Forearm Panel; Member, ACOEM Evidence-based Practice Shoulder Panel; Lead Author, Section of Musculoskeletal Upper Extremity, AMA's *Guides to the Evaluation of Permanent Impairment, 6th Edition*;

Member, Advisory Board, The Medical Disability Advisor; Developer and Medical Consultant, CtdMAP (MAP Managers and PHI (Physical Health Index), co-editor of the text "AMA Guides™ to the Evaluation of Work Ability and Return to Work" 2nd edition AMA Press (2011) and the "AMA Guides™ to the Evaluation of Disease and Injury Causation" 2nd edition AMA Press (2014)
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Amir Mohammad, MD, MPH, MRO, FACPM, FACOEM (Panel Member)
Staff Physician, VA Connecticut Healthcare System; Assistant Professor, Department of Medicine, Division of Occupational and Environmental Medicine, University of Connecticut School of Medicine; Attending Physician, Yale-New Haven Hospital; Assistant Clinical Professor, Department of General Internal Medicine for Yale University School of Medicine; Attending Physician, Haven Free Clinic, Yale School of Medicine; Staff Physician, VA New Jersey Healthcare System; Director, VHA National Tele Occupational Medicine Consult (10NA); Consultant for war-related illness and injury study at VA New Jersey Healthcare System; Director of Health, Town of Orange; Co-Director, VHA National Occupational Medicine Tele-Consult Service (10P4Z); Consultant, Office of Disability and Medical Assessment, VA Central Office (10NC8); VISN-1 Lead Environmental Health Physician
National, Regional, Local Committee Affiliations— Co-Chair, Diversity Committee, American College of Physicians (ACP); Member, Annual Chapter Meeting Planning Committee, ACP; Co-Chair, VA/DoD Health Data Sharing Subgroup, Health Executive Committee, VHA; Member, Scientific Advisory Committee, ACPM; Member, CME/MOC Committee, ACPM; Member, Prevention Practice Committee, ACPM; Member, Graduate Medical Education Committee, ACPM; Co-Chair, Public Health Committee, Connecticut State Medical Society; Member, Occupational Health Advisory Board, VA Central Office; Reviewer for *American Journal of Preventive Medicine*, *Journal of General Internal Medicine*, *Journal of Occupational and Environmental Medicine*, *Federal Practitioner Journal*, *BioMedCentral Public Health*
Guidelines Related Professional Activities— Member, Task Force for ABIM Foundation, Choosing Wisely, American College of Preventive Medicine (ACPM)
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Albert J. Osbahr III, MD, MSCM, FACOEM (Panel Member)
Medical Director, Occupational Health Services, Catawba Valley Medical Center; Medical Consultant, Evergreen Packaging; Lab Director/Medical Consultant, Haywood County Health Department
National, Regional, Local Committee Affiliations—Board Member, Joint Commission; Member, Accreditation and Performance Measurement Committees, Joint Commission; Member, AMA Board of Trustees; ACOEM Delegate to AMA House of Delegates; Member, North Carolina Governor's Task Force on Public Health; Review Panel, North Carolina Medical Board; Chairman, Board of Directors, One Health Commission; Member, U.S. Department of Transportation, Federal Motor Carriers Safety Administration's Medical Review Board
Guidelines Related Professional Activities—Member, ACOEM Evidence-based Practice Chronic Pain Panel
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Glenn Pransky, MD, MOccH, FACOEM (Panel Member)
Associate Professor, Departments of Medicine and Family Medicine, UMass Medical School and UMass Lowell; Visiting Scientist, Harvard School of Public Health; Adjunct Professor, Institute of Health Professions-Harvard Medical School-Massachusetts General Hospital
National, Regional, Local Committee Affiliations—Senior Editor, *Journal of Occupational Rehabilitation*; Member, ACOEM COVID-19 Task Force
Guidelines Related Professional Activities—None
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None

Pamela A. Warren, PhD (Panel Member)
Clinical Psychologist, Carle Physician Group; Faculty, College of Education, Department of Counseling Psychology, University of Illinois; Faculty, College of Medicine, Department of Psychiatry, University of Illinois-Urbana, Champaign

National, Regional, Local Committee Affiliations—Member, Reed Group Medical Disability Advisory Board; Member, Disability Research Institute Advisory Board; Past member of the Social Security Administration's Functional and Vocational Expertise Panel; National Expert Panel for Social Security Administration Occupational Information Development Advisory Panel (OIDAP) Mental and Cognitive Subcommittee; Reviewer, Mental Health and Behavioral Disorders Chapter, *AMA Guides to the Evaluation of Permanent Impairment, 6th Edition*; Reviewer, Mental Illness Chapter, AMA *Guides to the Evaluation of Disease and Injury Causation, 2nd Edition*; Member, International Association of Rehabilitation Professionals (IARP) Case Management Division; Member of Health Services Council, American Psychological Association, Division 38 (Health Psychology); Member, WorkRx Group's Research Consortium; Member, Carle Physician Group Work Injury Network Advisory Board; Member, Carle Physician Group Employee Wellness Committee; Co-Head on *Psychological Injury and Law* Journal Editorial Board for Disability and Return to Work Sections; Psychological Disability Evaluator for Illinois State Universities Retirement System
Guidelines Related Professional Activities—Member, ACOEM Evidence-based Practice Chronic Pain Panel; Sole author of Work Loss Data Institute's Mental Health Guidelines
Research Grants/Other Support—Co-investigator for study on evaluation of psychological concerns in women with breast cancer; Co-investigator for EUMASS (European Union of Medicine in Assurance and Social Security) study on psychological aspects of disability and healthcare; World Health Organization's Field Study for ICD-11 Mental and Behavioral Disorders (Disorders Related to Stress)
Financial/Non-Financial Conflict of Interest—Consultations: health plans and insurers, state and federal governmental agencies, corporations, and legal firms; Royalties: *Handbook of Behavioral Health Disability Management* (2018)

Steven Mandel, MD, FACOEM, FAAN, FABQAURP, FIAIME
Clinical Professor of Neurology, Zucker School of Medicine; Adjunct Professor of Medicine, New York Medical College
National, Regional, Local Committee Affiliations—Past President, NY Occupational and Environmental Medical Association; Reviewer, *Journal of Voice*; Editorial Advisory Board, *Practical Neurology*
Other Guidelines Related Professional Activities—ACOEM Guidelines Panel Member and Reviewer: Member, ACOEM Evidence-based Practice Traumatic Brain Injury Panel; Member, ACOEM Evidence-based Practice Ankle/Foot Panel; Member, ACOEM Evidence-based Practice Opioids Panel; Guidelines Committee, Sjogren's Foundation; Alumni Board, Albert Einstein College of Medicine
Research Grants/Other Support—Sport Concussion/Laryngeal EMG/ Sjögren's Syndrome
Financial/Non-Financial Conflict of Interest—None

Jeffrey S. Harris, MD, MPH, MBA, FACOEM (Methodology Committee Consultant)
President, J. Harris Associates Inc; Associate Clinical Professor, Family and Preventive Medicine/Occupational Medicine, University of Utah
National, Regional, Local Committee Affiliations—President and Member, Board of Directors for the Collaborative for Excellence in Occupational Medicine; Editorial Board: *American Journal of Health Promotion, Occupational and Environmental Medicine Report*; Editorial Reviewer: Workers' Compensation Research Institute, California Workers' Compensation Institute, *American Journal of Health Promotion*, *JAMA*, *American Journal of Public Health*, *Journal of Occupational and Environmental Medicine*
Guidelines Related Professional Activities—Member, Guidelines Methodology Committee; Editor, *ACOEM Occupational Medicine Practice Guidelines, 1st Edition* and Associate Editor, *2nd Edition*; Cochrane Collaboration: Occupational Safety and Health Review Group, Back Review Group, Injuries Group, Musculoskeletal Review Group, Adverse Effects Methods Group, Primary Care Group, Pain, Palliative and Supportive Care Review Group, Effective Practice and Organization of Care Group, US Contributors Group; GRADE Working Group: Diagnostic Testing subgroup, Accreditation subgroup; Guidelines International Network: Performance Metrics working group
Research Grants/Other Support—None
Financial/Non-Financial Conflict of Interest—None