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Psychosocial Factors in Musculoskeletal Disorders

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Work-related musculoskeletal disorders (MSDs) have a multifactorial etiology that includes not only physical stressors but also psychosocial risk factors, such as job strain, social support at work, and job dissatisfaction. Once an injury has occurred, psychosocial factors, such as depression and maladaptive pain responses, are pivotal in the transition from acute to chronic pain and the development of disability. Interventions to prevent MSD incidence and address psychosocial risk factors for delayed recovery are described. There is broad agreement that work-related MSDs have a multifactorial etiology, with workplace and nonwork risk factors playing a role in their cause [1–3]. In its preamble to its Ergonomics Standard, the Occupational Safety and Health Administration (OSHA) defined a risk factor (stressor) as

> a characteristic of the work environment that research has shown to be associated with an elevated occurrence or severity of MSDs. Risk factors can involve purely external exposures, such as shock or percussion, that act on the musculoskeletal system. They can also involve intrinsic response to a load or task, such as lifting or rapid and awkward movement. The effect of a risk factor may be modified by personal characteristics, such as anthropometry and physical conditioning, or by concurrent or previous non-work exposure. Risk factors can also involve work organizational or social factors [4].

OSHA [4] defines biomechanical stressors as "the physical aspects of workstation, work piece, tools, and work process that exert stress on the body." OSHA does not define "psychosocial risk factor." It justifies its exclusive focus in the standard on biomechanical risk factors by concluding that they "contribute independently from psychosocial factors, and exposure to biomechanical risk factors has been observed to be generally stronger than for psychosocial factors" [4].

Similar to the conclusions drawn by OSHA, there is widespread scientific agreement about the role of biomechanical risk factors in causing MSDs in nurses, with strong research studies and a comprehensive epidemiologic evidence review supporting this conclusion [2,5–7]. The evidence is not so clear, however, about psychosocial risk factors, such as stress, as causative factors. Although many studies find an association, the role these factors play in causation is unclear: Are they independent factors or do they act as effect modifiers, altering the association between physical stressors and MSDs? If they are independent factors, what is the mechanism by which they are believed to produce MSDs?

Psychosocial factor definitions

Psychosocial factors are defined in a variety of ways. The National Institute for Occupational Safety and Health [2] points out that it is a "catch-all term" for the following: "1) factors associated with the job and work environment, 2) factors associated with the extra-work environment, and 3) characteristics of the individual worker." It points out further that these factors are believed to interact with each other, affecting health and job performance. Some factors specific to nursing personnel that are identified in the literature fall into all three categories.

Work-related factors include job satisfaction [8], job strain (performing psychologically

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demanding tasks under time pressure while having low control over the job) [9–11], time pressure [12,13], high mental pressure [14,15], work relationships with coworkers [16], support at work [11,15,17], and stress [18,19]. An extra-work environment risk factor, amount of leisure time exercise, was correlated negatively with low back pain in Chinese nurses [18]. Individual (not work-related) characteristics include pain coping skills [20], premenstrual tension [14], having children [14], and affective states (depression and anxiety) [21,22].

Why the contribution of psychosocial risk factors remains unclear

The reasons that psychosocial factors lack a supporting body of research evidence are many. One is imprecision in psychosocial construct definition. For example, work-related stress in health care is defined and measured differently in many articles on this topic, which may use other terms, such as burnout or strain, instead of stress [23].

A second problem is measurement of psychosocial constructs. Whereas there are established definitions of physical force and shear and how to measure them, the opposite is true of constructs, such as job strain or stress coping ability. Unlike using objective computer programs with biomechanical models to calculate spinal compression from lifting or strain gauges to measure push-pull forces, to cite two ways to measure physical stressors, psychosocial stress in nursing (and other occupations) is measured using self-report (subjective) instruments. These include diaries of unknown reliability and validity [24], interviews that leave the definition of stress up to the interviewee [25], and instruments with acceptable psychometric values (reliability and validity), such as the Perceived Stress Scale [20]. Finally, many of the studies that have been done on psychosocial factor association with MSDs are cross sectional; cross-sectional designs preclude inferring cause and effect because it is not possible to determine temporal plausibility. For example, a direct patient care provider may report back pain and depression. Is the caregiver depressed because of the pain or did the depression cause the pain?

A third problem is the lack of knowledge about the biologic plausibility of psychosocial factors as etiologic agents. In epidemiologic studies, biologic plausibility occurs when the association between two factors is consistent with current medical knowledge. For example how a psychosocial factor, such as job dissatisfaction, is associated with the incidence of MSDs is unknown, based on the state of the science of the mind-body connection.

Four pathways for biologic plausibility are hypothesized. The first is that psychosocial factors result in muscle tension and increase spinal loading; there are laboratory studies demonstrating this link [26–28]. The second hypothesized pathway is that psychosocial factors may influence body awareness and result in reporting of musculoskeletal pain or attribution of work factors as the cause. Third, psychosocial factors may influence that transition from the original acute injury to chronic pain, even after the original muscle damage heals [29]. Finally, psychosocial demands may be associated with physical demands, making it seem that psychosocial factors are associated with MSDs when, in fact, they may be confounders (not part of the real association between exposure and disease) or effect modifiers [30].

A fourth difficulty is the variability in outcome definition and measurement, with some studies using MSD pain but most using reported injury incidence or lost days because of injury. Given that occupational injuries are shown to be underreported by orders of magnitude, the latter outcome is an unreliable and lagging indicator of musculoskeletal stress and pain [31].

Because of the lack of standardization of terms, tools, and outcomes, it is difficult to use meta-analyses (the highest level of evidence) to assemble a body of evidence using the same construct definitions and the same measurement instruments for psychosocial factors. One meta-analysis, however, does find an increased risk of prevalence of occupational back pain from job dissatisfaction in the general working population [8].

Conceptual models

The Institute of Medicine (IOM) [3] Panel on Musculoskeletal Disorders and the Workplace published a conceptual model for MSD etiology that emphasizes physical risk factors, sidelining individual risk factors outside the main causal pathway. Although several other conceptual models are proposed for the role of psychosocial factors in the development of work-related MSDs [32–34], there is none that has received

widespread acceptance, which hinders hypothesis generation and research.

What is the evidence for psychosocial factors as etiologic agents?

According to the Institute of Medicine [3], job strain is the most prominent among the psychosocial risk factors for upper-extremity disorders. Other studies similarly have identified job strain as a psychosocial risk factor for developing MSDs [10,11,35,36].

Job dissatisfaction is associated with MSDs in Norwegian nursing aides [37] and in Japanese, Canadian, and Icelandic nurses [14,38,39]. Similar findings are reported for other occupational groups [40–42]. Limited social support at work is another psychosocial factor that has emerged as a risk for MSDs among nurses [11,15,43].

Some individual factors are shown through longitudinal studies to be associated with the development of back pain: psychologic distress or stress [19,44–46] and negative coping styles [46]. No extra-work risk factors are identified consistently as etiologic risk factors.

What is the evidence for psychosocial factors in disability and return to work?

There is evidence that psychosocial factors are important in determining length of disability, transition from acute to chronic pain, and return to work, once a nurse or other worker reports an MSD [17,47–50]. In a longitudinal study of more than 1800 Canadian nurses, job strain and low social support at work were associated with sick leave incidence and length [51] (although the study does not identify the work-related injury that precipitated the absence). In another longitudinal study of more than 4000 Norwegian nursing aides, low support at work was associated with long-term low back pain–related sick leaves [17]. In a systematic review of six cohort studies of low back pain, distress, depressive mood, and somatization were associated with the transition from acute to chronic pain [48]. For low back pain, there is strong empiric evidence from prospective studies that psychosocial factors are the predominant risks for developing chronicity and disability, leading to calls for intervention early in the continuum of disease [49,50,52].

These empiric findings support the multidimensional view of pain adopted by the pain research community and reflected in the International Association for the Study of Pain [53] definition of pain, which states that pain is "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." Key to this definition is the recognition that pain is multidimensional and includes not only sensory input but also cognitive and emotional components. Pain is a psychologic construct, not a physical diagnosis of tissue damage or other physical pathology. When considered from this perspective, it is not surprising why psychosocial factors, such as emotion [54], work satisfaction [49], and psychopathology [50], are important determinants of pain chronicity and related disability. Furthermore, pain is a significant predictor of disability [49,50], offering a direct path for the emotional component of pain perception to influence disability.

Because pain is a symptom that has sensory, affective, and cognitive dimensions, its clinical assessment depends on subjective reports. Because disability is defined as restricted function, it can be assessed reliably by self-report or work absence/modification [55]. In chronic pain, in particular low back pain, there may be no discernible structural impairment [55]. Tate and colleagues [56] found that disability in back-injured nurses predicted the incidence of lost time, whereas self-reported pain predicted how much time was lost.

A study by Waddell and coworkers [57] shows little association between pain and disability. Fear-avoidance beliefs about physical activity (kinesiophobia) and work, however, were associated strongly with work loss and disability in activities of daily living. These findings are replicated in other studies [47,58,59].

In addition, pain catastrophizing (an excessively negative orientation toward pain) is associated with chronic low back pain and disability [47]. According to a conceptual model developed by Vlaeyen and colleagues [58] and adapted by Pincus and coworkers [48], when pain from an original injury is interpreted as threatening (pain catastrophizing), it results in fear of re-injury, which leads to movement avoidance, hypervigilance, and muscle reactivity, which lead to disuse, depression, and disability, all of which maintain pain. Individuals who do not catastrophize their pain return to daily activities and recover quickly [48,58].

These studies highlight the relationship between physical disability and psychosocial

function. Much like pain, disability is not a physical diagnosis and has only a loose association with tissue damage and measurable physical pathology. This largely is because, from patients' perspective, disability results from an appraisal of their functional abilities, the associated risks and benefits of function, and the expectations of the consequences of function. Like pain, disability can be considered a psychologic construct influenced by psychosocial factors as demonstrated in the empiric literature.

Coping skills is a term found in the literature on MSD pain and disability. Coping is defined by Lazarus and Folkman [60] as "constantly changing cognitive and behavioral efforts to manage specific external or internal demands that are appraised as exceeding the resources of the person." When a stressful situation is viewed as unchangeable, emotion-focused coping is used to minimize emotional distress. Examples of emotion-focused coping are using alcohol or drugs, overeating, or participating in a distracting activity. If a stressful situation is viewed as changeable, then problem-focused coping is called up to assess the situation and choose among the best solutions. In meaning-focused coping, a third strategy, stressed individuals modify interpretation of a stressful situation by drawing on values, beliefs, and goals [61]. Although escapist strategies often result in poor mental health outcomes, other strategies, such as seeking social support or choosing to change a stressful situation, may have positive or negative outcomes depending on individual appraisal of the impact of the "important goals [that] have been harmed, lost or threatened. These appraisals are characterized by negative emotions that are often intense" [62]. Cognitive-behavioral therapy (CBT) is effective in teaching coping skills [62].

According to this brief overview (above), psychosocial factors, not tissue damage, are the most important factors in determining whether or not individuals develop disability and chronic pain after an MSD. In addition, they are paramount in determining whether or not injured individuals take time off from work and the length of that leave. Despite this evidence, the workers' compensation treatment paradigm does not include approaches to address these factors until individuals have progressed so far into disability and psychologic deterioration that the chance for recovery and return to work is remote [63]. Given the high cost of rehabilitation (tertiary prevention) compared with screening and early intervention (secondary prevention), this treatment approach is not evidence based.

Interventions to reduce psychosocial risk factors for the incidence of musculoskeletal disorders

In the psychosocial risk factor domain, only factors associated with the job and work environment are under the appropriate control of employers. Although it might be possible to screen for and refuse to hire nurses who have personal or extra-work risk factors, it is not legal, under federal equal employment opportunity laws, and impractical in light of the nursing shortage. Although evidence for the role of work-related psychosocial risk factors in the etiology of MSDs is not as strong as for physical risk factors, employers are well advised to address the factors that have emerged simply as good business practices that may reduce turnover and increase productivity, no matter what their musculoskeletal health benefits.

Job strain is a conceptual model developed by Karasek and colleagues [64–68] that states that work conditions involving the greatest mental demand and lowest control over those conditions produce the largest physical responses. They developed the Job Content Questionnaire to measure job strain and other concepts [69] and found that job strain is most severe among nursing aides, who are at the lowest level of the health care hierarchy. Registered nurses (RNs), however, also feel little control over their work environment. Employers can address job strain through increased participation, by letting nurses have a role in making assignments and agreeing on staffing ratios and by allowing nurse representation when important management decisions are made.

Job satisfaction for nurses involves several variables, including pay [70,71], work organization and workload [70,71], autonomy [72], stress, and leadership issues [73]. Remedies for all these issues are under employers' immediate control, based on an assessment of which ones are the most vexing to nurses in their institutions. Exit surveys, conducted whe nurses leave employment, are one way to gather this information.

Low social support at work (from supervisors and peers) is identified as an MSD risk factor in many studies. Such support is vital to retain new graduates [74]. Social support equally is important, however, for all nurses because it serves as a coping mechanism, reducing stress from the demanding job of nursing [75]. Employers should promote social support by encouraging collegial networks and offering management training that emphasizes nonpunitive approaches to leadership.

Interventions to reduce psychosocial risk factors for musculoskeletal disorders and disability

Once an MSD is reported, the no-fault workers' compensation system is activated. Nurses receive immediate medical care at no cost. Treating health care providers determine whether or not nurses can return to full or modified duty or should remain away from work for a specified number of days until a follow-up visit. Whether or not nurses are paid for the days away from work depends on whether or not they have any paid sick leave and jurisdictions' waiting or elimination period for indemnity (wage replacement) benefits. The treatment provided follows the jurisdiction protocol and other occupational health guidelines, depending on the injury. These protocols and guidelines focus on rapid return to work. In the acute stage of injury, the guidelines do not recommend any screening for psychosocial risk factors, despite evidence that these determine whether or not the pain transitions to a chronic state, whether or not disability develops, and the length of time workers stay out of work. One reason for this avoidance is the fear of employers and insurers that any referral for psychologic assessment will result in a costly workers' compensation claim for stress or mental health issues, such as depression. No studies have been conducted, however, to validate or disprove this concern.

Cognitive-behavioral therapy

CBT is shown effective as treatment for chronic pain and depression [76–79]. CBT is based on the premise that thought influences emotion and behavior. Several cognitive styles, such as pain catastrophizing, are related to poor outcome [80]. CBT is a psychologic treatment approach aimed at reducing distorted thinking patterns and behaviors by replacing them with more realistic substitute patterns that are critical to adjusting to pain and injury (eg, exercise, relaxation, or avoidance). Linton and Ryberg [81] found that CBT prevented low back pain disability [82]. Hasenbring and associates [82] replicated this finding.

Psychosocial stress and affective responses to pain cause or worsen MSDs and associated disability in direct patient care providers. CBT is shown effective in helping individuals cope with stress and pain and preventing or reducing MSDs and disability [20]. Fig. 1 is a conceptual model of how CBT is believed to work. Accordingly, employer and workers' compensation insurers should consider asking occupational health care providers to screen those who have new MSDs for psychosocial risk factors and refer them to a pain center for CBT. Screening tools include the Beck Depression Inventory [83], Fear-Avoidance Beliefs Questionnaire [57], Tampa Scale for Kinesiophobia [58,84], Pain Catastrophizing Scale [85], and the Pain Disability Index [86].

Case study

Kathy is a 58-year-old RN who has worked in a medical ICU at a large, tertiary-care medical center for 15 years. Although she has had work-related back pain intermittently for the past 5 years, she has not reported it because of fears of reprisal or job loss. Staff members who report workers' compensation injuries are shunned by other staff members, who feel they have to assume additional work for the person who is on modified duty or absent. Her goal is to complete 4 more years of work until she turns 62, then apply for social security retirement. She does not like her nurse manager and her authoritarian style. Kathy is older than all the other RNs on her unit and finds little in common with them. She lives alone, after a divorce 10 years ago. She has no outside activities and spends her days off watching television and eating to excess.

Because she works in a unit with mandatory overtime, the nurse manager tells her she must work 16 hours on a day that later requires her to push an occupied stretcher. As she maneuvers the stretcher around a corner, she assumes an awkward posture and feels intense pain in her lower back. Pain radiates down her right leg; she is unable to complete the patient transport and calls for assistance. Too much in pain to complete her work assignment, she goes to the employee health department for evaluation and treatment. Because of her incapacity, she is sent home from work with a prescription for pain and muscle relaxants.

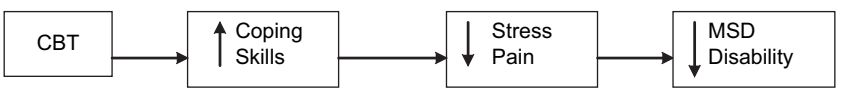

Fig. 1. CBT to reduce MSDs.

The next day, she has difficulty arising from bed without incurring severe pain and decides to stay in bed all day not only that day but also the next 2 before her follow-up appointment. She barely is able to show up for her appointment, so afraid is she of pain from moving. At the same time, she has thought with dread about the effect this injury will have on her plans for working 4 more years until retirement. She is certain that she has suffered a career-ending injury, which will have profound economic consequences.

The treatment provider refers her to physical therapy to assist her in movement, but she misses most of the appointments because of fear of pain from travel and therapy. A radiograph of the back reveals no damage other than age-related degenerative changes in the spine. The workers' compensation adjuster calls her to threaten claim denial if she misses any more appointments. Kathy calls an 800 number flashed on a television advertisement for a workers' compensation attorney and retains counsel. Her nurse manager calls to ask when she will be coming back to work because they are short staffed. Kathy is unable to cope with the stress and spends her days in bed crying and overeating. After Kathy has missed 3 months of work and received extensive medical testing and treatment, she is referred to a neurosurgeon for back surgery evaluation. The neurosurgeon treats her chronic pain by operating on her spine. The result is no improvement. At 6 months, the adjuster sends Kathy to a functional rehabilitation program, but she fails the preprogram psychologic screening tests for likelihood to benefit from the program. Kathy never returns to work.

Analysis: The work-related psychosocial risk factors for back injury incidence were obvious and unaddressed, making an MSD inevitable, given the interaction of those factors with a physical stressor and the nature of cumulative trauma. The employer could have improved social support for Kathy and similar experienced nurses by forming a "brain trust" that meets periodically to network and plan mentoring programs for new graduates. The employer could have eliminated its mandatory overtime policy, which creates job dissatisfaction and stress.

Once Kathy experienced pain severe enough to report an injury, the health care provider failed to assess or intervene in any domain but the physical. Kathy was exhibiting signs of depression even before the injury; once the acute injury occurred, the depression worsened and resulted in disability. She developed pain-related fear of movement and pain catastrophizing, which served to maintain the pain state. Her coping skills consisted of distracting behaviors and were no match for the perceived threat of the injury. No amount of neurosurgery could cure her depression and maladaptive pain-related behaviors, but when all you have is a hammer, everything looks like a nail. Had the health care provider done some simple screening tests at the first follow-up visit, when it was obvious that Kathy was not making progress, the outcome would have been much different had she been referred to appropriate resources with the cost covered by workers' compensation.

Summary

Epidemiologic studies provide only supporting evidence of the causes of a disease, not direct proof [87], a fact that tobacco companies were able to exploit for many years in getting the public to believe there was scientific uncertainty that cigarettes cause lung cancer. For diseases, such as MSDs, that have multifactorial origins, a single smoking gun never will be discovered. What is needed is a conceptual model that acknowledges the contributions of each factor and allows hypothesis generation and empiric testing. Control of psychosocial risk factors by federal regulators is not on OSHA's agenda, after its Ergonomic Standard to control physical risk factors was rescinded by Congress and the White House in 2001. With no mandatory control imminent, health care employers, treatment providers, and risk managers should use the precautionary principle (taking protective action in the face of lack of scientific proof of a threat) to act as if psychosocial factors were important contributors to the incidence and severity of MSDs and provide appropriate interventions for job strain, job dissatisfaction, and inadequate social support at work. Once injury occurs, workers' compensation insurers should support holistic treatment and not focus exclusively on physical risk factors. Mood state and abnormal reactions to pain complicate or prevent recovery if they are not addressed along with measures that promote physical healing.

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