

Understanding risk factors in low back pain to improve self-management

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# Understanding risk factors in low back pain to improve self-management

## Abstract

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Low back pain is primarily a self-managed condition, which demands that an individual draws upon personal resources, skills, and knowledge to reduce the sensation of pain, and to compensate for reduced mobility and difficulty completing activities-of-daily living. Low back pain may disrupt sleep and cause fatigue. Fatigue may exacerbate low back pain. Self-management of low back pain is unavoidable; most episodes of back pain resolve without visits to healthcare providers. Understanding the psychosocial issues that complicate the lives of patients with low back pain is the first step to developing useful assessment tools, treatment protocols, and patient education for that population. The purpose of this paper is to use a literature review to develop an understanding of factors that inhibit the resolution of low back pain, and review current research related to interventions to reduce symptoms and life disruption by improving patient self-management techniques.

*Key words: low back pain, psychological risk for pain, fear avoidance, transition from acute to chronic pain, high risk for chronic low back pain, catastrophic thinking, self-management of low back pain, avoidance endurance model*

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## Understanding risk factors in low back pain to improve self-management

### Introduction

Statistics from the 2009, U.S. National Health Survey, conducted every decade by the Department of Health and Human Services, showed low back pain (LBP) affected 28.5% of all respondents. To qualify for inclusion in the count as LBP, episodes were to have occurred within the three months prior to data collection, lasted at least one day, and excluded minor pain incidents. Older age, female, lack of high school diploma, poverty status of poor or near poor, and Medicaid/Medicare combined insurance, Medicaid alone, or age older than 65 years, but without Medicare, were related to the highest incidences of LBP (Pleis, Ward, & Lucas, 2010). Low back pain is primarily a self-managed condition, which demands that an individual draw upon personal resources, skills, and knowledge to reduce the sensation of pain, and to compensate for reduced mobility and difficulty completing activities-of-daily living. Low back pain frequently disrupts sleep, and produces fatigue through insomnia, which further exacerbates the low back pain. Self-management of LBP is necessary and unavoidable, and most episodes of back pain resolve without visits to healthcare providers (Chou et al., 2007).

Low back pain is classified by its duration. Acute LBP episodes are those that resolve within four weeks; subacute LBP is unresolved after four weeks, and any LBP lasting longer than three months is treated as chronic (chronic LBP). Pain researchers and medical providers consistently use this acute and chronic LBP differentiation, but use of the subacute category is not always separated in the literature.

According to Chou et al., (2007), 30% of low back pain patients continue to have unresolved pain at one year, incur greater healthcare expenses, and lose work days due to pain as well. Direct healthcare utilization costs associated with chronic low back pain, measured from

12 months of data from a U.S. claims database (PharMetrics IMS Lifelink™), totaled \$96 million in 2008, and included healthcare visits, prescribed pharmaceuticals, and physical therapy (Mehra, Hill, Nicholl, and Schadrack, 2011). Among chronic LBP patients, those with neuropathic symptoms (e.g., radiculopathy) accounted for 90.4% of chronic LBP cases, and were responsible for 96% of the chronic LBP healthcare expenditures. These patients were more often older, female, had co-occurring depression, and used more prescribed medications, especially Schedule II opiates (Mehra, Hill, Nicholl, & Schadrack, 2011).

### **Back Pain Pathophysiology**

Physical pain after an acute back injury will often have a discernable physiologic cause, but frequently the pain cannot be linked to an acute injury, or pain continues or exists when all physiologic evidence is missing. Joint Clinical Practice Guidelines of the American College of Physicians and the American Pain Society (2007) call for thorough physical exam and psychosocial screening to enable the medical provider to target treatment and patient education, when history and exam findings point to cause (Chou et al., 2007), either organic or non-organic (Rives and Douglass, 2004). Organic causes require thorough initial investigation looking for the “red flag” signs and symptoms associated with emergent conditions that need immediate referral. Spine-associated red flag signs and symptoms include saddle anesthesia, bowel and bladder dysfunction, foot drop, balance difficulty, and lower extremity motor function change, and require urgent referral for possible surgical repair (Chou et al., 2007). Other LBP organic red flag examples include, but are not limited to abdominal bruits, and costovertebral angle tenderness, which require urgent referral or appropriate condition-specific treatment (Rives and Douglass, 2004). The differential diagnosis of physiologic causes of LBP is extensive (see Table 1).

Patients with first-time LBP may benefit from brief findings-tailored education regarding the anatomy of the spine, vertebrae and intervertebral disks, spinal cord, spinal nerve roots or the cauda equina, in order to place their individual conditions in perspective. If the patient understands that acute LBP pain is related to benign cause, self-management techniques may be more likely to be sufficient to endure pain and allow healing and resolution. When LBP is very intense or has not resolved within four weeks, it is possible that intellectual knowledge of spinal anatomy will not alleviate fear of harm and patient functioning can grow more impaired (Chou et al., 2007).

“Yellow flags” are symptoms and situational aspects of LBP that are known to inhibit LBP resolution or may be entirely responsible for pain. Yellow flags can include signs and symptoms of anxiety and depression, which may be exhibited in the forms of “behaviors incongruent with underlying anatomic and physiologic principles,” (Rives & Douglass, 2004, p. S26). Situational aspects may include emotional stress, meanings assigned to pain based on patient’s culture, litigation regarding the initial injury, history of substance abuse, or requests for disability designation. Yellow flag aspects of LBP have to be recognized and addressed during treatment, and if well hidden or ignored can prevent LBP resolution (Rives & Douglass, 2004).

### **Psychosocial Assessment**

A broad scope of psychosocial factors to include in assessment is necessary, and should include all behaviors and cognitions, influenced by all sources, that make it possible for an individual to participate in life. Research findings do not yet agree on which factors, combination of factors, or the degree to which the factors can influence LBP and its transition to chronic pain (Ramond et al., 2011). Depression and passive coping strategies, common in chronic LBP, must be assessed.

A randomized controlled trial (RCT) study by Kroenke et al. (2009) provides evidence of a strong link between depression and passive coping. This study is discussed in more detail in the literature review under Targeted Interventions. Fear avoidance behavior (FAB) and catastrophizing, both common findings in chronic LBP, are related to anxiety, and are important findings on assessment. The term “fear avoidance” is movement avoidance due to the expectation that pain means that harm is occurring, but other anxiety-related behaviors have been commonly (and perhaps inappropriately) categorized as FAB according to Pincus, Smeets, Simonds, & Sullivan, (2010), in an article discussed in the literature review under Fear Avoidance Behavior Model. Understanding and acceptance by the patient of the necessity of appropriate physical movement can be blocked by anxiety, depression, and other factors.

Catastrophizing, or catastrophic thinking, is a tendency of individuals with poorly managed anxiety who employ dysfunctional coping skills of mentally cycling thoughts of worst-case scenarios. This subconscious coping mechanism would provide comfort in cases in which that worst-case outcome did not occur; however, catastrophizing frequently impairs the patient’s ability to process educational information about participating fully in recommended therapies known to benefit the physiologic healing of LBP. Patients, unaware of the degree to which they are preventing improvement by subconsciously resisting even mildly painful treatment, are appropriate candidates for cognitive behavioral therapies to diminish FAB and promote more participation and physical activity (Pincus et al., 2010, & Ramond et al., 2011).

Similarly, depression co-occurring in LBP will likely impede healing. Damush, Wu, Bair, Sutherland and Kroenke (2008) examined the link between depression and pain self-management by comparing depressed patients who had low back, knee, or hip pain with a similar number of patients without the depression. This was a cross-sectional analysis study without any

intervention that involved 500 musculoskeletal pain participants, 250 of whom were affected by depression as diagnosed by a PHQ depression scale score of 10 or greater, and 250 participants without co-occurring depression. Questionnaires that provided self-report information on exercise frequency, type, and duration as a self-management tool, and use of cognitive pain reduction techniques were compared between the depressed and non-depressed groups. Results showed an exercise-time decrease and cognitive skills-use (e.g., breathing techniques) increase as depression became more severe and pain increased. Severe depression altered the way participants self-managed their pain and showed potential value in teaching patients to watch for this pattern in their own pain self-management, and also displayed the benefit of treating severe depression (Damush et al., 2008). Study limitations were the self-report nature of the data-gathering questionnaires and the cross-sectional, rather than longitudinal, focus. Providers may need to encourage strong adherence to the physical movement portion of therapy despite the depressed or anxious patient's seemingly natural inclination to avoid it, in order to optimize treatment and chances for pain remission.

Understanding the psychosocial issues that complicate the lives of patients with low back pain is the first step to developing useful assessment tools, treatment protocols, and patient education for that population. The purpose of this paper is to use a literature review to develop an understanding of factors that inhibit the resolution of low back pain, and review current research into interventions to reduce low back pain symptoms and life disruption by improving patient self-management techniques.

### **Theoretical Framework**

Patients with low back pain spend considerable time focusing on self-managing their pain and its impact on their lives. Many variables must be considered in the study of low back pain:

physiological causes, circumstances of traumatic injury, psychosocial issues, underlying health issues, medical care received, opiate use, and prognosis. Self-management theory applies to all LBP scenarios.

Richard and Shea (2011) define self-management as an individual's consciously used tools meant to control a disease process, "rather than be controlled by it" (Richard & Shea, 2011, p. 257). In addition, the concepts of coping and symptom management are integral parts of self-management theory as it applies to LBP management and require differentiation and inclusion in this paper, particularly in view of how each supports, or at times undermines, efforts to treat or live with LBP. A patient's coping skills may have varying degrees of effectiveness or more negative consequences when coping is seriously maladaptive (e.g., reliance on alcohol for pain relief and emotional escape) or counterproductive (choosing to stay in bed for days).

Symptom management is a conscious focus on reduction of possible bad outcomes, and includes "biomedical, professional, or self-care actions" (Richard & Shea, 2011, p.258), and can also be helpful or harmful. Acute LBP with underlying psychosocial factors, treated solely symptomatically, however, may not resolve, and could transition to chronic pain. Reliance on opioids to treat LBP may mask needed evaluation of underlying problems, interfering with LBP management. Maladaptive coping and symptom management makes pain self-management more difficult and less effective, and at the worst contributes to a sense that pain does control the patient. Strengthening self-management skills is valuable to improving quality of life.

Coping is an individual's reaction to stressful disruptions, and becomes evident with the appearance of behaviors and mental efforts directed at alleviating distress or discomfort. These efforts and behaviors can be active or passive, positive or negative, and may be used without conscious awareness (Benner & Wrubel, 1989). Low back pain's effects on activities of daily

living (ADL's) may result in disruptions and stress, triggering use of helpful coping skills or negative, possibly counterproductive ones. Catastrophic thinking (termed "catastrophizing" in back pain research) is an unconsciously used coping mechanism. Another coping example is the use of street drugs or alcohol if used for somatic pain or psychological stress relief without deliberate awareness of self-medicating. Learned helplessness is yet another example of a dysfunctional coping mechanism that may eventually increase stress of family or caregiver, causing cycles of increased family and patient stress and continuing LBP symptoms, rather than progressive improvement. Unintended consequences of dysfunctional coping complicate self-management and may negate appropriate efforts to control disease and disability.

Self-management that encompasses the aspects of positive functional coping and symptom management is essential in chronic, as well as in acute LBP. All approaches to treatment and patient education related to chronic LBP is aimed at reducing pain and reducing the disruptions LBP causes, and the potential for enhancing self-management techniques that may decrease rates of chronic pain is appealing, since any acute LBP slow to resolve is at increased risk of transitioning to chronic LBP. The fact that chronic pain is more likely to have psychosocial risk factors complicating its treatment makes self-management techniques that can be focused on any diagnosed co-occurring psychosocial problem appealing, but research continues. A self-management framework approach is applicable over the entire time spectrum and for all causes of LBP, and does offer the most logical targets for intervening.

### **Search Strategies**

The literature search for this topic began with queries through the WSU Griffin Library portal, specifically PubMed, CINAHL, and Cochrane Library databases, using combinations of the key phrases "transition from acute to chronic low back pain," "low back pain,"

“musculoskeletal pain,” “psychological risk for pain”, with modifiers of “fear avoidance”, “depression”, “anxiety”, “cognitive therapy”, “self-management”, “coping”, and “symptom management”. Multiple search sessions in October and November 2011 and February, 2012 were done, and reflected refinement of this paper’s purpose statement as its focus narrowed as more knowledge was acquired. Limits were for peer-reviewed, English language articles, patient age 19 years or older, and publication date in or after 2006. This process narrowed the number of randomized controlled quantitative studies, case studies, qualitative research, book chapters, treatment guidelines and background down to about 50 pieces, 40 of which were read for background, purpose statement development, and possible inclusion.

Nineteen articles are reviewed in this paper, eighteen categorized in the literature review into five sections, and one article, Damush, Wu, Bair, Sutherland and Kroenke (2008), was reviewed in the psychosocial section of the introduction for its substantiation of the role of depression in chronic pain. Two articles that had been published earlier than the primary search window were chosen for valuable background information on the study of low back pain in previous decades (Linton, 2000; Rives & Douglass, 2004). Other studies provided information on high quality patient assessment and treatment protocols (Chou et al., 2007; Rives & Douglass, 2004) in the introduction. Five articles provided valuable insight into current understanding of the transition of acute pain to chronic pain. Three other articles were chosen to ascertain whether current scientific knowledge is sufficient to support the idea that chronic pain is predictable from specific findings during acute or subacute pain phases (Grotle, Foster, Dunn, & Croft, 2010; Ramond et al., 2011, Shaw et al., 2010). The fear avoidance behavior model is examined by two research studies (Swinkels-Meewisse et al., 2006, Martel, Thibault, & Sullivan, 2010), a case study (Nagarajan & Nair, 2010) and two important literature reviews (Leeuw et al., 2007; Pincus

et al., 2010). Two studies were chosen to examine the avoidance endurance model to determine potential value of using similar interventions in practice. Finally, three articles were chosen to examine the results of some applied targeted interventions for LBP.

## **Literature Review**

### **Transition of Acute Pain to Chronic Pain**

National guidelines recommend psychosocial assessments of low back pain patients to expose comorbid disorders that increase the risk of transition to chronic LBP. An understanding of the current research into how and why some acute pain patients becomes chronic pain patients may help target self-management techniques directed toward pain resolution. Three literature reviews provided current state of knowledge concerning transition of acute pain to chronic pain.

Linton (2000) extensively searched literature by examining 37 peer-reviewed articles from studies conducted from 1974 to 1999, and investigated psychosocial factors influencing back and neck pain. The author organized study findings to look for links between certain psychosocial factors and both new pain occurrence, and acute LBP transition to chronic LBP. Depression and anxiety were found frequently in new occurrence back and neck pain during the analysis of cohort study data collections, and were also found in results of experimental transition-of-pain studies and acute and/or chronic pain studies, which tested for the presence of behaviors that indicate depression and anxiety (e.g., fear avoidance behaviors) (Linton, 2000).

Linton (2000) identified broad cognitive, emotional, social, and behavioral factors essential to include in future interventional studies about pain risk factors. Cognitive factors were recognized as individuals' problematic understandings of or beliefs about the significance of pain in cases where patients would incorrectly attribute pain exacerbations to physical harm or re-injury (Linton, 2000). Observations of individual coping throughout the studies showed that

social factors, altered family dynamics, and behavioral responses to social stress impacted chronic pain, more than did pathologic causes. Knowledge covering the effect of variables on each other, like the impact of anxiety on pain, pain on depression, or the benefit of secondary gains from social attention garnered by being in pain, would be tremendously valuable if causal relationships could be drawn to LBP. As a result, self-management interventions targeted to mitigate these psychosocial factors need more study (Linton, 2000).

Voscopoulos and Lema (2010) sought to illuminate differences between acute and chronic pain using current research knowledge from neurology, genetics, psychosocial studies, and pharmacology. Neurophysiological human and animal study findings supported chronic pain as a neurological-process-change that created neuronal and neurotransmitter activity different from acute pain: peripheral nerves grew increasingly sensitized with prolonged pain (Voscopoulos & Lema, 2010). Human cognitive issues were among the authors' most significant findings differentiating chronic from acute pain. "Fear of pain" had more impact on pain-caused disability than other factors did, by acting as a dysfunctional coping mechanism. Thought processes were seen as potential controllers for deliberate use in attempts to improve symptoms as positive or functional coping, but if not consciously controlled, could form fear beliefs (catastrophizing) and have detrimental effects (Voscopoulos & Lema, 2010). Pain intensity increased when fear beliefs increased. Mental state, type of injury and tissue affected, and genetics all factored into the severity and intensity with which pain was perceived. Interventions for self-management, coping, and symptom management related to the physiological changes of chronic pain, would need careful design and testing to target them successfully (Voscopoulos & Lema, 2010).

Wang, Hah, and Carroll (2009) reviewed pain-duration study findings from 50 animal and human studies to present current knowledge on chronic pain and the multiple factors that contribute to it. Search methods and source criteria were not divulged, and articles were published in peer-reviewed and medical journals. The authors developed targets for symptom management and coping mechanisms for self-management of chronic LBP, as well as health care interventions based on physiological findings, plus the frequent co-occurrence of depression and anxiety that affects 30% to 65% of chronic pain patients (Wang et al., 2009). Findings from animal neurological studies showed that chronic pain was more related to central nervous system over-activity than to peripheral nervous system activity (typically the transmitter of acute pain sensation), or to the original mechanism of injury (Wang, Hah, & Carroll, 2009). In addition, multiple animal studies that mimicked opioid use showed *increased* sensitivity of pain receptors, not reliably replicated in humans (Wang et al., 2009). One human study correlated opioid use in acute low back pain with chronic pain development.

Webster, Verma, and Gatchel (2007) evaluated a large United States workers compensation database. The cohort numbered 8,443 after all exclusions. All time-lost-from-work, low back pain claims filed during the two-year period of 2002 – 2003 were extracted and numbered over 12,000. Severe back injuries including fractures, pre-existing back conditions, and patients receiving treatment at the time for any other condition were excluded from the cohort. Individuals' records were also excluded if any psychosocial-related ICD-9 codes were present. Individual cases were classified into one of five groups based on cumulative quantities of opioids (0 mg, 1-140 mg, 141-225 mg, 226-450 mg, & >450 mg) ingested in the first fifteen days after receiving initial care for work-related LBP injuries. Data regarding patient age, gender, length of employment, specific opioid doses, lost-work days, injury-associated

healthcare costs, percent of group requiring surgery, percent of patients receiving opioids after the initial 15 days, and injury severity were also recorded for each group, and were statistically controlled to allow the limited interpretation of findings without confounding problems. The authors specifically noted that controlling for pain intensity and psychosocial factors were not possible and a study limitation.

Webster, Verma, and Gatchel (2007) found a correlation between high pain severity, continued opioid use, and need for eventual surgery and extended lost-work days, relative to the groups receiving no opioids or <140 mg cumulative opioid medication ingestion. The two groups that received either no opioids or less than 140 mg in total looked statistically similar upon review of data collected. These groups had significantly smaller numbers of lost-work days than those receiving higher opioid quantities over time; this comparison allowed prediction of continuing chronic LBP with higher opioid doses and/or prolonged use. Even though the most serious injuries and LBP-causing conditions had been excluded from this study, the results do not distinguish between the relative effects of the contributing factors (opioid use and pain intensity) on the measured outcomes (lost work time or surgery) (Webster, Verma, and Gatchel (2007).

Wolff et al. (2008) investigated a combination of pain-related physiologic processes plus the effects of pain catastrophizing on chronic pain severity. The 94 participants were recruited from chronic pain clinics and via print advertising. The researchers used questionnaire-based self-reports to measure participants' pain catastrophizing tendencies, depression, and their typical daily LBP severity rating. Low back and shoulder muscle tension was measured with EMG equipment in a psychology laboratory setting, both at rest and when under emotional duress deliberately induced with a personal history interview technique. Blood pressure and heart rate

were also measured. Participants were limited to individuals with at least six months of chronic musculoskeletal LBP due to herniated disks, ligament and muscle strain, or degenerative processes like ankylosing spondylitis or osteoarthritis. Exclusions were based on concurrent treatment for cardiovascular disorder or use of any medication that would blunt cardiovascular response to stress (e.g., beta blockers), malignant pain, diagnosed bipolar disorder or psychosis, daily opioid use, and non-proficiency of English. The study limitations primarily involved testing in an artificial setting (the psychology laboratory) and the use of sensors attached to patients, while they underwent the emotional-stress-inducing interviews. The authors noted that these circumstances were not entirely natural and could influence the data.

Wolff et al.'s (2008) analysis of results illuminated a "subgroup of chronic low back pain patients who tend to be on guard for potentially overwhelming bouts with pain, who interpret actual painful stimuli as awful and unbearable, but who may also brace or affect postural changes to protect the affected area, thus increasing resting lower paraspinal muscle tension" (Wolff et al., 2008, p. 112). The most intense chronic LBP experienced on a daily basis was predictable in two groups. First were patients who combined high pain catastrophizing levels with high levels of low back muscle tension at rest, and second, patients with a lack of transient blood pressure escalation when under emotional duress, and who were therefore unable to benefit from a natural blood pressure-induced analgesia (Wolff et al., 2008). Cognitive behavior therapy that targets pain catastrophizing would enhance pain self-management techniques by reliably reducing excessive muscle tension.

### **Predictability of Transition to Chronic Pain**

Evidence that psychosocial issues correlate with LBP is useful, but additional evidence is required to ascertain predictive value within that relationship of the transition of acute or

subacute pain to chronic LBP, or of potential responses to treatment options in chronic LBP.

Targeting interventions appropriately requires study of what conditions co-exist, and what observable behaviors reliably present and then respond to specific treatment.

Ramond et al. (2011) researched chronic LBP and psychosocial risk factors to determine which factors may be predictors of chronic LBP. Articles were searched from Cochrane Library, PubMed, and PsychInfo databases, and were selected for overall high quality, based on their fit criteria scoring system to assess for cohort size, study duration, type of statistical analysis, and dropout rate. The authors considered the influence of 16 contributing factors to LBP, and chose 18 different studies presented in 23 separate articles from an initial field of over 400 articles. The 16 psychosocial factors addressed in the subject research were divided into three categories, social and socio-occupational, psychological, and cognitive/behavioral. Subject article findings were categorized according to the degree of impact each factor had on five pain-related outcomes: pain duration, disability, work status, effect on activities of daily living (ADL's), and satisfaction with resolution of or adaptation to LBP.

Psychosocial links to chronic pain found in earlier studies like Linton's (2000) were not as strongly supported by the Ramond et al.'s (2011) review results. Ramond et al. (2011) found only one large study supporting the predictability of patient depression to a longer pain resolution period. Anxiety-specific studies were few in number and the authors found no consensus of a link between anxiety and chronic LBP. They did find that fear avoidance behavior (a passive coping mechanism) was predictive of disability from chronic pain, and that medical providers' predictions of a patient's likelihood of transition to chronic LBP were reliable. Patients' own perceptions of personal health challenges were good predictors, however, depression or anxiety that is frequently present in LBP may confound this (Ramond et al., 2011).

The authors recommended that each patient's assessment include thorough environmental, occupational, and psychosocial histories at baseline, and stated that coping and self-management would be compromised, if comorbidities were missed. The authors acknowledged weaknesses in their study design of inclusion of only quantitative studies, and their difficulty capturing data about time-variable symptoms (Ramond, et al., 2011). It is also possible that Ramond et al.'s exclusion criteria for articles was inappropriate for their research question, and that the authors have overreached with their conclusions, having based them on less than 6% of the wide array of peer-reviewed study articles initially available.

Shaw et al. (2010) studied whether co-morbid psychiatric disorders, existing but untreated at the baseline LBP assessment, could be used to predict transition from acute to chronic LBP. The participants were selected from patients at a military orthopedic clinic in Southern California in the early 1990's. Only first time, subacute LBP male patients were included in the study (pain of between six and ten weeks' duration, N=140). Interviews of all participants to assess for psychiatric disorders according to the DSM-III-R were conducted away from orthopedic clinic visits during the first two months of LBP, and then again at six months after onset; off-site interviews allowed for objectivity as to the prior existence of psychiatric issues. The predictor relationships found were major depressive disorder, general anxiety disorder (GAD), PTSD, and nicotine dependence. More specifically, male patients with diagnosable depression existing prior to initial treatment for LBP were five times more likely to transition to chronic LBP, rather than having it resolve, which strongly supports the link between depression and transition to chronic LBP.

Full DSM-III criteria were met for all psychiatric diagnoses, which was not necessarily true in similar studies, as comparison studies used single point in time depression-scale

questionnaires that could inappropriately label transient depression symptoms caused by the LBP situation itself (Shaw et al., 2010). The homogeneous and small sample size prevented generalized application, but internal validity was good, and inside the study, the predictor relationships were strong. The authors recommended treatment of psychiatric symptoms, if found, because recurrent LBP was likely for depressed patients with chronic pain. Self-management of combined major depression and chronic LBP would include daily use of pharmaceuticals, counseling, and cognitive therapy teaching functional coping strategies (Shaw et al., 2010).

Grotle, Foster, Dunn, and Croft (2010) investigated whether predictors of transition from acute LBP to chronic LBP could also predict cases of chronic LBP that would end in disability. Large data sets were collected from primary care settings during two separate cohort studies in England, 935 in the 2001-2002, and 1,595 in the 2004-2006 studies. The researchers looked at physical variables, fear, pain catastrophizing and fear avoidance behaviors (FAB), and anxiety and depression symptoms in both acute LBP and chronic LBP patients for use in determining predictive value of those characteristics on development of eventual disability due to pain. Comparisons were made between the acute/subacute LBP group and the chronic LBP group at baseline and 12-month follow-up visit. At baseline, the acute/subacute LBP patients scored differently than participants with chronic LBP on physical and nearly all psychological-factor testing and employment status. The same physical and psychosocial factors that indicated high risk of transition to chronic pain were found to predict disability 12 months later, particularly catastrophizing behavior and lack of employment, along with physical factors, such as multiple body sites affected by pain, and pain intensity (Grotle, Foster, Dunn & Croft, 2010).

Large sample size and the longer follow-up time of 12 months obtained for both acute LBP and chronic LBP participants were among the Grotle et al. study's strengths. A low response rate at the 12-month markers may have led to underestimates of chronic LBP prevalence (Grotle et al., 2010). Questionnaires for depression and anxiety were thorough, but those used for factors of anxiety, fear of pain, and catastrophizing were not as extensive. Despite reduced emphasis on fear and catastrophizing, those two factors showed more significant impact on transition to chronic LBP and lack of resolution of chronic LBP at 12 months, than depression did. According to the authors, the relationship between potential physical effects of catastrophizing and findings of widespread pain, possibly from increased muscle tension and movement avoidance (similar to that studied by Wolff et al. (Grotle et al., 2010)). Due to findings that fear of pain predicted disability, the authors suggested early screening for all psychosocial predictors in order to target interventions. Cognitive therapy directed at recognizing the physical effects of catastrophizing and FAB, and utilizing non-pharmaceutical muscle relaxation techniques, would add to patients' functional coping mechanisms and enhance self-management of LBP (Grotle et al., 2010).

It appears from these articles that transition to chronic LBP is predictable based on various co-occurring psychosocial factors (Grotle et al., 2010; Shaw et al., 2010, and in small measure per Ramond et al., 2011), however, there is no consensus on ranking of factors regarding which factors most reliably predict the transition of acute LBP to chronic LBP. Psychosocial factors and behaviors do provide targets for therapies that work on improving underlying issues interfering with LBP resolution. Cognitive behavioral therapies aimed at improving coping and self-management appear to be natural choices.

### **Fear Avoidance Behavior Model**

Swinkels-Meewisse et al. (2006) undertook a quantitative prospective cohort study of 555 acute low back pain patients, and were able to complete follow-up of 431 participants at the end of a six-month study period, to identify an influence of fear-avoidance behavior on future low back pain-caused disability. Findings of fear-avoidance, termed “fear of movement/(re)injury” (Swinkels-Meewisse et al., 2006, p. 658) at baseline predicted the likelihood of disability at the six-month measuring point; the authors recommended that attempts to prevent chronic LBP should target reduction of “pain-related fear and pain, and fear of harm in particular” (Swinkels-Meewisse et al., 2006, p. 662). Strengths of the study were the large sample size drawn from a sufficient geographic region to provide a demographic mix in the back pain cohort sample. This study had some limitations, but the most problematic was use of a questionnaire developed specifically for the study, which ideally would have been fully validated prior to its use. Data collection based on self-report questionnaires for data collection was another limitation (Swinkels-Meewisse et al., 2006).

Leeuw et al. (2007) authored a comprehensive evidence-based literature review to examine the current state of knowledge of the fear-avoidance model’s explanation of chronic musculoskeletal pain, with specific attention on LBP. Three sections specific to LBP and its relation to pain-related fear referenced 29 studies and articles published from 1999 to 2006 in peer-reviewed, scholarly journals. Well-known pain researchers’ works were thoroughly represented. Sections on treatment directed at fear avoidance behavior referenced an additional 32 articles; treatment emphasis was on cognitive behavioral therapies and exposure to pain during physical therapy as a gradual fear-reduction process.

Leeuw et al. (2007) recognized and discussed the emotion of fear as a trigger that stimulates a defensive response to a threat. Chronic pain patients commonly perceive painful sensation as a threat, reinforcing the relationship of fear and pain, and establishing pain beliefs that are rigidly held and difficult for the patient to recognize. The role of anxiety in affecting pain behaviors is distinct from fear, because it is an emotion based on anticipation of threats, and creates a desire to avoid, rather than defend against, action that could create pain. Distinguishing fear and anxiety is helpful, although behaviors that result from either can be counterproductive in the case of LBP, when they diminish a patient's mental capacity to equate movement with safety, strength, or well being (Leeuw et al., 2007). Mood disorder symptoms of depression and personality-based negative affect have a cumulative effect on pain perception. Targeting interventions would have to address the actual mental composition of an individual's pain beliefs and emotional state in order to improve self-management skills (Leeuw et al., 2007).

According to Leeuw et al., (2007) pain catastrophizing is a behavior produced as a result of anxiety as a future-oriented, worst-case projection-oriented thinking interfering with intellectual processing of information about pain, and is predictable in certain vulnerable patients. The authors support the predictability claim with multiple evidence-based sources covering the role of anxiety and even the desire to avoid anxiety, and the pain-threshold lowering capability of a negative affect to create vulnerability to chronic pain. In addition, pain severity compounds avoidance behaviors, but at issue is how much increase in severity is due to anxiety of a physical (e.g., muscle tension) versus anticipatory cause. Leeuw et al.'s (2007) position is that severity is important to consider in pain at any stage. Avoidance behavior in cases of chronic pain is an anticipatory protection, but escalating cycles of avoidance leads to de-conditioning weakens and decreases ability to perform activities (Leeuw et al., 2007).

Leeuw et al.'s (2007) discussion of therapies focused on reducing "pain-related fear", and examined cognitive behavioral and "exposure-in-vivo" to pain during physical therapy. Treatment protocols that appeared to be consistently successful across various studies were ones that addressed pain catastrophizing behaviors specifically. The inclination to catastrophize was addressed with a cognitive approach in multiple studies by adding education directed toward changing movement-avoidance behavior. Physical symptom improvements resulted, and were found repeatedly to decrease incidence of disability due to chronic pain (Leeuw et al., 2007). Studies that tested exposure to pain during physical therapy (exposure *in vivo*) showed only limited success for patients with chronic pain. Even when patients experienced decreased pain with specific movements, any other movement type was still considered fearfully, and movement was still avoided: patients were unable to extrapolate knowledge of decreased pain of one movement to any other. Future studies of early intervention teaching directed at fear itself and catastrophizing were encouraged, in addition to study of provision of physiology-based patient education (Leeuw et al., 2007).

Pincus, Smeets, Simmonds, and Sullivan's (2010) review of evidence of the fear avoidance model argued important factors to explain some of the difficulty obtaining desired results with targeted therapies like those discussed in the Leeuw et al. (2007) article. Their review of evidence and discussion utilized 70 pain-study related articles from peer-reviewed, scholarly journals dating from 1993 to 2009. Pincus et al. (2010) argued that the definition of fear-avoidance had been overly broad, had incorporated multiple phenomena, that conditions and relationships were insufficiently understood and differentiated, and that targeted interventions based on reduction of fear were therefore premature. The authors argued the need for researchers to differentiate fear-avoidance behavior among three possible categories: first,

belief-related concerns about potential harm from movement; second, true fear related to movement and activity, and third, those behaviors due to physical and mental ramifications from avoiding movement, like physical deconditioning, helplessness, and social reinforcements gained from pain behaviors (Pincus et al., 2010).

This perspective of differentiated fear-avoidance behaviors supported the idea of screening chronic musculoskeletal pain patients for those specific behaviors, to allow targeted and appropriate interventions. The first subclass, “affective avoiders,” would include those patients with co-occurring affective disorders like depression; the authors cited earlier works of their own to support their claim that tendencies toward negativity “in combination with pain is closely related to changes in cognitive processing, so that negative information about personal health are better recalled, and ambiguous information is interpreted as being related to negative health” (Pincus et al., p. 774). Anxiety and pervasive negativity were also noted among the constellation of affective issues that contribute to catastrophizing and fear avoidance. The second subclass was labeled “misinformed avoiders” for patients concerned that pain implies re-injury or harm, and while not likely to display serious distress like someone in the affective avoider subclass, would still be vigilant in avoiding movement (Pincus et al., 2010).

The third subclass, “learnt avoidance”, would encompass patients who self-manage pain according to learned experiences based around social or familial expectations that provide some benefit for sustained chronic pain, described as “avoidance behavior without fear, especially when receiving positive reinforcement from significant others” (Pincus et al., 2010, p. 743). This subclass would not have significant pain-related beliefs or fear, but would subconsciously use social rewards gained from pain behaviors as part of their coping. Pincus et al.’s (2010) subclasses illustrate why increased understanding of the relationship of these factors to pain is

needed to reliably address the issue with interventions, especially because of the possibility that behaviors common to more than one subclass may co-exist in individuals. Their proposed approach is to screen for these conditions, as each presents serious impediments to pain resolution or functional adaptation to pain, and if they are found, to refer for prompt treatment when appropriate (as in affective disorders), or to develop tailored therapies to address them (Pincus et al., 2010).

Martel, Thibault, and Sullivan (2010) studied 70 chronic back pain patients to measure and examine factors related to the constancy over time of communicative pain behaviors and protective pain behaviors. The studied concern was that pain behaviors are known to persist at a stable level, even when pain intensity has diminished (Martel et al. 2010). Communicative pain behavior encompassed verbalizations and sounds, plus facial contortions or expressions. Protective pain behaviors encompassed all physical movement aimed at reduction or alleviation of pain, like guarding or rubbing. Participants were recruited from pain clinics and by print advertising in a Canadian city. Measurement of variables was done with self-report questionnaires, videotaping of participants during testing procedures, and from data collected during question/answer by a technician, while the test was being performed.

Comparison data was gathered during a specially designed lift test and from questionnaires on one date, and then the entire process was repeated three weeks later. Participant sex, pain severity, depression, fear avoidance, and pain catastrophizing were the measured variables. The authors found that over the three-week interval, both communicative pain behaviors and protective pain behaviors remained stable, but constant pain symptoms were not always responsible for that stability, nor were the psychosocial variables tested fully responsible, either. "Pain behaviors are likely to persist if treatment efforts are exclusively

devoted towards the reduction of patients' pain intensity, catastrophic thinking or fear of movement...it might become necessary to address the social environmental reinforcement contingencies that contribute to the persistence of pain behaviors." (Martel, Thibault, & Sullivan, 2010, p. 335). Study limitations included the test setting of a laboratory and familiarity with the process on the return visit, and more importantly, that only a limited number of the psychosocial variables that impact chronic pain behaviors could be included in the test, and controlling for them all was not possible (Martel, et al., 2010). The authors' call for future pain studies to cover central nervous system motor programs, and also to incorporate patients' significant others in response provoking scenarios and during observations, is broad in scope, but promising.

Nagarajan and Nair (2010) presented a descriptive design case study of a single adult female with low back pain and marked negative pain beliefs, ineffective coping, and co-morbid depression. The pertinent finding discussed in the case study was the report of a successful cognitive behavioral therapy intervention combined with physical therapy that consisted of an education program designed to alleviate fear avoidance behaviors, followed by specific physical exercises (Nagarajan & Nair, 2010). The strength of the case study report is its thorough description of the subject's ability to complete the physical conditioning; as a single case study, its findings cannot reliably be applied universally (Nagarajan & Nair, 2010).

### **Avoidance Endurance Model**

Rusu and Hasenbring (2008) categorized behaviors of chronic pain participants in their study of the avoidance endurance model, measuring end effects of various coping techniques. Valid and reliable questionnaires and analog scales were used to collect data from 120 participants seen initially at three primary care practices in a northern region of Germany, 106 of whom provided sufficient data to be classified. Behavioral categories were dysfunctional (DYS)

(n=19), interpersonally distressed (ID) (n=13), and adaptive copers (AC) (n=74). Many data points were collected from each participant from the battery of questionnaires covering pain, ability to endure both physical and social activity tasks, and affective, stress, and cognitive information; tendencies were determined after scoring and sorting of results. Participants scoring into the DYS group showed increased affective issues of depression or anxiety, more helplessness and hopelessness behaviors, and more thought suppression than the AC group. The ID and DYS groups displayed non-verbal pain behaviors more frequently than the AC group, an operant conditioning-induced social reinforcement providing increased personal attention (Rusu & Hasenbring, 2008).

Two variables related to the expression of pain were examined and measured by scales. The first scale measured non-verbal behavior and the other measured participant requests for social support. The ID and DYS groups used similar high levels of non-verbal communication to express pain relative to the AC group. However, the DYS group requested social support more frequently than either the AC or ID groups. These findings held true even after the authors controlled for depression and pain intensity. This attention-based mechanism may reinforce helplessness, and the incentive to become well may diminish subconsciously over time. Self-management and coping mechanisms for dealing with chronic LBP could work at counter-purpose, if there are significant unconsciously received social rewards for staying in pain (Rusu & Hasenbring, 2008). Limitations of the study were the small size of the DYS and ID subgroup populations, the self-report questionnaire responses, and the initial selection of all participants already referred from outpatient primary care practices to pain clinics. The findings cannot be generally applied, but participants who heeded appropriate activity endurance clues

demonstrated functional coping and self-management skills; the benefits of positive mood despite and during pain were also apparent (Rusu & Hasenbring, 2008).

Hasenbring et al. (2012) used a different set of division criteria, one based on patient reaction to stress to categorize subacute back pain patients. Participants (n=177) were recruited from primary care or orthopedic practices, and completed reliable questionnaires that assessed for mood and behaviors at baseline and 6 months. Questionnaire responses were categorized into fear-avoidance, distressed-endurance, or eustress-endurance classifications. The authors' three categories of dysfunctional self-management and coping responses were fear-avoidance (FAR) (n=17), distressed-endurance (DER) (n=34), and eustress-endurance (EER) (n=29); all were compared with the well-functioning group, categorized as adaptive response (AR) (n=97) patients. Truly significant is the recognition of a group of patients with pain that did not resolve by the 6-month, follow-up measure in the study, but who continued activities equivalent to those done prior to pain onset with little compromise; pain did not need to completely resolve for patient life to resume a normal pace and activity level (Hasenbring et al., 2012). The authors' recognized as a limitation the difficulty in classifying avoidance behaviors, some of which are appropriately protective and others are dysfunctional movement-avoidant (Hasenbring et al., 2012).

### **Targeted Interventions**

Ang et al.'s (2010) randomized controlled trial (RCT) based on bio-psychosocial modeling tested optimal anti-depressant therapy for 12-weeks in patients with depression co-morbid with back, knee, and hip pain against standard treatment for the pain alone. The study's initial relation to self-management of low back pain is through symptom management of co-occurring depression with anti-depressant medications, for which it has strong findings that show

lessened pain intensity with optimal pharmaceutical treatment for depression. Predictors for poor outcomes were sought, and found to be unemployed status, the highest levels of baseline pain, the highest levels of fear avoidance behavior, Caucasian race, and a perception of the ability to self-control pain; all led to escalated pain and activity interference when measured at follow-up, after 3 months (Ang et al., 2010). The authors' discussion and conclusion notes that analgesia medication may be helpful or harmful with regard to the level of movement it allows (adequate analgesia) or prevents (no movement willingness, unless medicated), further linking coping and self-management. Often, coping mechanisms consist of unconscious behaviors like movement avoidance, and the repercussion is that deliberate self-management is less effective in actively producing a resolution to pain (Ang et al., 2010). Results also showed that fear avoidance behavior correlated with higher levels of pain intensity and movement avoidance, and that patients with strong perception of personal ability to self-control pain levels actually have more trouble maintaining activity levels than anticipated (Ang et al., 2010). Beliefs of control of pain may be counterproductive as a positive coping mechanism and self-management tool, especially when expected pain levels exceed the perceived self-controllable levels (Ang et al., 2010). Designing optimal interventions to add to pain-treatment regimens would have to include exercise and cognitive behavioral therapy in addition to the anti-depressant treatments to enhance self-management. Limitations of this RCT were self-reporting on questionnaires and the potential for patients' tempered responses into socially acceptable answers; other "attention effects" were expected and controlled (Ang, Bair, Damush, Wu, Tu, & Kroenke, 2010).

Whitfill et al. (2010) presented a randomized clinical trial of 142 participants with acute to subacute low back pain (lasting three months or less) assigned randomly into an intervention group of different early-intervention protocols for low back pain or the control group.

Significant findings were the marked benefit seen at the one-year measure of the early intervention protocol consisting of physical therapy, cognitive behavioral classes including coping and self-management skills, with time for practice (Whitfill et al., 2010). Sufficient sample size and random assignment to group were research strengths, and the major limitation was an inability to use the results to make predictions, although a larger sample size would have allowed that (Whitfill et al., 2010).

Kroenke et al. (2009) performed a randomized controlled trial with a sample size of 250 participants found in primary care settings with chronic musculoskeletal pain (including low back pain) and comorbid depression split into control (n=127) and intervention groups (n=123). The intervention was improved depression medication management over three months, then three months of cognitive therapy directed at developing pain self-management techniques and active and passive coping skills. Treatment produced significant improvement in depression and pain symptoms over the control (Kroenke et al., 2009). The control group received “usual care”, the full extent of which was being told that their assessment findings showed depression after the initial assessment, and told to “seek advice” regarding care; neither depression nor pain were addressed in any other manner. Results showed that the intervention group had improved depression and improved pain, both of which were evident in the 6-month and 12-month follow-up data. The study’s strength was its random control; its limitations were the demographic homogeneity of the participants due to the recruitment process (patients from Veterans Affairs and urban clinics in one mid-western city), the inability to determine exact cause of benefit to one intervention, lack of study blinding, and patient self-reports (Kroenke et al., 2009).

### **Significance to Nurse Practitioner Practice**

Patients self-manage the great majority of back pain episodes without medical assistance by relying on their own established coping mechanisms, knowledge of symptom management with over-the-counter medications, heat, or ice, appropriate rest, and time. The nurse practitioner has to understand that a patient coming in with LBP is likely experiencing significant disruption to daily life, may have concerns about serious damage or illness, or LBP may be ongoing, with the individual facing pain that has unexpectedly not resolved.

The nurse practitioner's holistic care perspective is a good fit for treating LBP patients. As with any other medical complaint, attention to possible red flag diagnoses is primarily important at the first visit, with appropriate treatment and referral if found. Observations and questions during the physical exam provide valuable information not just on the physical state of the patient's back but also signs of guarding, helplessness, or evidence of depression or anxiety that should be followed with use of proven assessment tools (e.g., GD-9 or Beck's Depression Inventory). During this process, the nurse practitioner will learn whether this is a repeat episode of a chronic LBP problem, and if so, whether the patient expects to leave with a prescription for opioids. Asking the patient for ideas as to the cause of pain when there is no obvious mechanism of injury gives further insight into anxiety the condition is causing. If based on misconceptions, anxiety-produced fear of movement (catastrophizing) may be alleviated during patient teaching on back and spine physiology, and the need for continued movement is emphasized. Openly discussing concerns for findings of mental health or psychosocial issues is necessary, and the nurse practitioner is able to state that evidence shows untreated psychosocial issues make recovery from LBP more difficult. Ideally, this approach will help the patient accept a plan that includes various therapies and/or medications for mental health disorders in addition to back

pain, but many patients will resist this decision. Biweekly or even weekly follow-up visits are important for patients with acute LBP, especially when the patient appears to be at high risk transition to chronic LBP.

Patients will want assurance that physiological conditions are under consideration while they have unresolved pain, sometimes even at follow-up visits during periods of physical therapy or after the patient has been told to remain active despite pain. The physical exam at follow-up visits reinforces the validity of the patient's condition, reflects continued caring and empathy for the patient, and should help limit perceptions that the nurse practitioner treating comorbid depression or anxiety may not take the patient's painful condition seriously. It would also be helpful in the process of orienting treatment goals toward a return to optimal function and improved quality of life, as opposed to a complete absence of LBP achieved through chronic opioid use. Evidence presented in this paper suggests that opioid use beyond several hours to days is not helpful and may also be counterproductive and potentially harmful due addictive properties and sedation. It would be helpful for the nurse practitioner to frequently review current evidence regarding opioid prescribing as research findings are updated.

Although patients may accept pharmaceutical treatment for depression or anxiety as part of the plan to treat LBP, research examining cognitive behavioral therapy directed at fear avoidance behaviors had important findings. The evidence suggests the necessity to differentiate between different types of fear because each type responds to different therapeutic approaches. Anxiety-related fear manifests itself as catastrophizing behavior, really a fear based on anticipation of pain or harm, and different from fear that is a defensive response to somatic pain. Fear awareness may be an educational target for patients and nurse practitioners alike to focus therapy and educational awareness on coping skills and self-management. Recognition by the

nurse practitioner of the avoidance endurance model's different classifications based on the functional level of self-management, in particular the coping strategies would help with development of appropriate cognitive therapy approaches. Although the two studies presented in this paper took different categorization approaches, both studies analyzed and found behaviors that differentiated functional self-management, which produced greater participation in life activities, from counterproductive coping skills that interfered with good function. Both studies support the nurse practitioner's enhancement of patients' self-management and coping skills as an important part of a treatment plan for LBP.

Education has to be tailored to the most important concerns of each LBP visit, and at early visits, explanation of the physiological causes of pain is necessary. It also reinforces patients' understanding that the provider believes their complaints of pain, and desires to help them, despite the possibility of having treatments prescribed that address non-physiologic conditions. Educating the patient to enhance self-management by adding to functional coping skills should not be missing even from pharmaceutical-based treatment plans for LBP. Nurse practitioners must also pay particular attention to their own non-verbal or unintended messages, because "healthcare providers may inadvertently increase the threat value of pain," (Leeuw et al., 2007). Patients with comorbid depression and/or anxiety, and those patients with an inclination to use guarding and other fear avoidance behaviors can be vigilant in looking to the nurse practitioner's non-verbal messages for clues. Unintended messages can undermine an otherwise fine treatment plan.

### **Summary**

The prevalence of comorbid psychosocial disorders with LBP has been a subject of research for decades, and it has been established that these conditions heavily effect the transition from acute to chronic pain. The complexity that untreated depression alone adds to

LBP is daunting. A trusting, empathetic relationship between patient and nurse practitioner is necessary here, because the patient deserves to know that the best treatment options are being provided even if those options are not directly pain-focused. Having evidence at hand may help the nurse practitioner in explaining the relationship between pain and psychosocial issues as common, well-researched, and a valid concern, and that a comorbid mental health disorder (if present) needs treatment for the best chance of pain resolution. Even when completely participating in multi-disciplinary treatment plans, patients cannot respond instantly to counseling, psychotherapy, or anti-depressant medications. They still run high risk of transition to chronic LBP.

Despite large amounts of research into chronic pain and the transition of acute LBP to chronic LBP, there are areas of disagreement among researchers. Depression and anxiety pre-dating LBP raises the risk of transition to chronic pain, and yet that is not true for all. Fear avoidance behavior in LBP is a promising aspect for future research. As more refinement of the term fear avoidance has occurred, it is evident that fear avoidance applies to multiple behavior types that respond to different interventional approaches. Research on behavioral responses to, or dependence on, social reinforcement for exhibitions of pain behaviors should also provide insight into maladaptive coping and avenues for improved self-management of pain.

Treating low back pain is complicated. Just as it is difficult to examine every contributing factor to LBP in one paper, it is understandably challenging to nurse practitioners with limited patient-visit time to fully assess and treat the full spectrum of pain, pain-related mental health issues, and behavioral issues of a LBP patient. However, evidence presented here shows that not fully assessing for or treating comorbid psychosocial conditions and behaviors can be missed opportunities to appropriately address important contributors to unresolved LBP.

Ideally, future research will provide to nurse practitioners the tools to reliably and holistically assess and recognize high risk-for-transition LBP patients during early visits, as well as provide evidence-based, targeted treatment plans of therapies to address comorbid mental health disorders and associated behaviors in chronic LBP patients. Together with evidence-based pharmaceutical use, treatment that strengthens self-management and functional coping holds promise for improving LBP outcomes.

Table 1

## Differential Diagnosis for Acute and Chronic Low Back Pain

Pain Origin	Acute Conditions	Chronic Conditions
Trauma, Structural Causes	Muscle spasm; ligament or tendon strain; fractures of vertebrae, hip, or pelvis; herniated disk with or without nerve impingement; spondylolisthesis; abdominal aortic aneurysm	Same as acute conditions
Degenerative	Initial onset of degenerative chronic pain conditions	Osteoarthritis including spondylosis; osteoporosis; Ankylosing spondylitis; spondylolisthesis
Inflammatory	Inflammation of muscle fascia, visceral organs; prostatitis; inflammatory bowel disease; pancreatitis; hepatitis; or initial onset of chronic inflammatory pain conditions	Ankylosing spondylitis; psoriatic arthritis; inflammatory bowel disease; chronic pancreatitis; hepatitis; fibromyalgia
Infection	Osteomyelitis; pancreatitis; hepatitis; myositis; other visceral organs	Infections typically have acute pain duration
Neoplasm	Primary cancer (e.g., Multiple Myeloma) Secondary: metastasis from near or distant cancers	Same as acute conditions
Gastrointestinal	Hepatitis, pancreatitis, peptic ulcer, diverticulitis, colitis	Same as acute conditions
Renal	Renal calculi	Kidney disease
Genitourinary	Ectopic pregnancy, prostatitis; neoplasm, dysmenorrhea, endometriosis	Neoplasm; dysmenorrhea; endometriosis
Chronic diseases	Initial onset of pain from chronic disease sequelae (e.g., Diabetes Mellitus; hyperthyroidism; hypothyroidism; hepatic disease; rheumatoid arthritis)	Same as acute conditions; fibromyalgia

*Note:* Chronic pain will have had an acute phase (pain with duration less than 3 months), but patients may not have sought care for pain until chronic. Conditions may fall into multiple categories (e.g., diverticulitis in Inflammatory and Gastrointestinal). Sources: Chou, R., Qaseem, A., Snow, V., Casey, D., Cross, J.T., Shekelle, P., & Owens, D.K. (2007). Diagnosis and treatment of low back pain: A joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Annals of Internal Medicine*, 147(7), 478-491, W-118-W-120. Retrieved from <http://www.guideline.gov/content.aspx?id=11515&search=low+back+pain>; also Rives, P.A. & Douglass, A.B. (2004). Evaluation and treatment of low back pain in family practice. *Journal of the American Board of Family Practice*, 17, S23-31. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/15575027>

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