Proposal of a Classification System for Patients With Neck Pain

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It is likely that patients with neck pain are not a homogeneous group, but, instead, consist of a variety of subgroups, each of which may benefit from a specific intervention matched to the patient’s signs and symptoms. Studies to date have largely failed to account for this possibility, which may compromise the statistical power of research and ultimately fail to provide guidance for clinical decision making. Classification provides a means of breaking down a larger entity into more homogeneous subgroups of patients, based on examination data. Classification can guide the determination of a patient’s prognosis, and the selection of the most appropriate intervention strategy. Classification has received considerable attention in the management of patients with low back pain, and evidence is emerging regarding its benefits. There has been considerably less effort made towards examining classification as it pertains to patients with neck pain. The purpose of this clinical commentary is to examine the current literature and to propose a classification system for patients with neck pain, based on the overall goal of treatment. The approach is based on published evidence when possible and is also informed by clinical experience and expert opinion. Classification decisions are based on the integration of data from a variety of information from the history and physical examination. The end result of the classification process is to determine the treatment approach believed to be most likely to maximize the clinical outcome for an individual patient with neck pain.


Key Words: conservative treatment, decision making, diagnosis, neck pain, staging

Approximately 54% of individuals have experienced neck pain within the last 6 months,21 and the incidence of neck pain may be increasing.68 The economic burden associated with the management of patients with neck pain is high, second only to low back pain (LBP) in annual workers’ compensation costs in the United States.99 Patients with neck pain are frequently encountered in outpatient physical therapy practice. Jette et al43 reported that patients with neck pain make up approximately 25% of all patients receiving outpatient physical therapy.

The “Guide to Physical Therapist Practice”56 indicates that interventions, such as mobilization/manipulation, therapeutic exercise, traction, and a variety of modalities, are utilized by physical therapists to manage patients with neck pain. Although these interventions are largely accepted as the standard of care for patients with neck pain,74 high-quality evidence from randomized controlled trials (RCTs) that investigate these interventions is frequently absent or inconclusive.2,17,52,54,59,51 For example, the Philadelphia Panel Clinical Practice Guidelines concluded that many commonly used interventions for patients with neck pain lack sufficient evidence for their use.17 Furthermore, guidance in selecting the most beneficial interventions for an individual patient is also lacking, potentially resulting in less effective intervention strategies for these patients. In a review of over 4500 patients receiving physical therapy, Di Fabio and Boissonnault25 found that patients with neck pain experienced smaller improvements in physical function than patients with low back or knee pain.

One explanation for the scarcity of evidence for interventions for patients with neck pain and lack of guidance for decision making is the absence of a mechanism for classifying patients.72 Classification
provides a means of breaking down a larger entity into more homogeneous subgroups of patients based on examination data. In the absence of a classification method, clinicians and researchers are left with the perception that any patient with neck pain is equally likely to succeed or fail with any particular intervention.\(^{17}\) Moreover, classification is likely to be most helpful for physical therapists when it is based on signs and symptoms that match interventions to the subgroup of patients most likely to benefit from them.\(^{72,76}\) The goal of classification is to improve decision making in the determination of patient’s intervention strategy and subsequent prognosis. The difficulties associated with developing a classification system that consists of mutually exclusive subgroups encompassing the spectrum of patients with a particular condition have been well described by Zimny.\(^{701}\) Nevertheless, the development and application of classification systems remain a critical step to further establish the scientific basis for the physical therapy profession.\(^{7}\)

Two groups of researchers have described proposed classification schemes for patients with neck pain. Werneke et al\(^{89}\) described a classification process that categorized patients with either neck or back pain into 2 groups (centralizers and noncentralizers), based on their response to a McKenzie-based evaluation process. The authors reported that patients in the “centralizer” classification experienced significantly greater reductions in pain and disability after a course of physical therapy; however, the choice of interventions was left to the discretion of the therapists, and not explicitly linked to the classification. In addition, only 23% of the subjects had neck pain, and the results of these subjects were not distinguished from the larger sample. Wang et al\(^ {95}\) recently described a classification process designed specifically for patients with neck pain. The classification process categorized patients into 1 of 4 groups, based on the location and presumed source of symptoms (neck pain only, radicular arm pain and neck pain, referred arm pain and neck pain, or headaches). Subcategories within each group are also described. These subgroups are identified primarily through clinical signs and symptoms and are linked to a distinct treatment approach. The authors examined the results of 30 patients treated on the basis of this classification approach, and 27 patients who received no treatment. Statistically and clinically significant reductions in pain and disability were reported in the classification group only.\(^ {95}\)

The sparse and preliminary nature of existing classification systems\(^ {22,28}\) suggests that further research in this area is needed and that no single optimal system has been established. For example, it is difficult to draw conclusions regarding the potential usefulness of the classification system proposed by Wang et al,\(^ {95}\) because patients in the control group were not treated, which is not reflective of physical therapy practice. Additionally, little evidence exists to support the numerous decision-making considerations outlined in the algorithm. Given that the criteria used to classify patients are likely to change with more definitive research,\(^ {28}\) initially proposing a less specific framework for patients with neck pain may be more pragmatic. This general framework can then be used as the basis for future research, the results of which can be used to optimize the classification decision-making process. Therefore, the purpose of this clinical commentary is to examine the current literature on the management of patients with neck pain and to propose a classification system for these patients. Effective classification methods are likely to improve clinical decision making and outcomes of care, and to enhance the power of clinical research by permitting researchers to study more homogeneous groups of patients.\(^ {72,76}\)

The system proposed in this commentary primarily addresses the classification of patients with neck pain attributable to cervical and upper thoracic spine dysfunction. Patients with neck pain referred from other structures (e.g., temporomandibular joint) are not considered. The classification system requires integration of data from a variety of information from the history and physical examination. Whenever possible, the system is based on evidence from the peer-reviewed literature, but also incorporates clinical experience and expert opinion in areas where evidence is insufficient. In these instances, we were intentionally vague to avoid propagating opinion that may or may not be supported by future research attempting to more specifically define characteristics of patients within each classification.

The primary goal of classification is to determine the treatment approach most likely to yield the best clinical outcome for an individual patient. However, before this decision can be made, the clinician must first determine if the patient is appropriate for physical therapy management. Although a specific pathoanatomic source cannot be identified in most patients with neck pain,\(^ {12}\) the vast majority of cases can be attributed to mechanical factors. In a much smaller percentage, the cause may be something more serious, such as cervical myelopathy, ligamentous instability, fracture, neoplastic condition, vascular compromise, etc. Therapists must also be aware of other nonmusculoskeletal causes of neck symptoms that may mimic the presence of mechanical neck pain. For example, an apical (pancoast) tumor of the lung can create pain in the shoulder region and neurologic deficits due to compression of the brachial plexus.\(^ {10}\) Heart disease can present with pain in a C3 dermatome and/or extending into the upper extremity.
A comprehensive discussion on how to properly screen patients with neck pain for potentially serious pathology is beyond the scope of this commentary. More detailed information on the differential diagnosis of these and other potentially serious neck conditions is contained in other sources. Nevertheless, clinicians need to recognize when nonmovement factors may be playing a significant role in the patient’s symptoms and disability. For example, a clinical prediction rule (CPR) was recently developed and validated to improve decision making for determining when to obtain cervical spine radiographs for patients who have experienced trauma.

Table 1 provides a summary of signs and symptoms associated with serious pathological neck conditions. If relevant psychosocial factors are identified, the rehabilitation approach may need to be modified. An emphasis on active rehabilitation and positive reinforcement of functional accomplishments is recommended. Graded exercise programs that direct enforcement of functional accomplishments is recommended. Finally, graduated exposure to specific activities that a patient fears as potentially painful or difficult to perform may be helpful. Evidence from patients with LBP suggests that patients with higher levels of fear-avoidance beliefs do not need to be considered a unique classification, but can be effectively managed within an existing classification system with the above modifications.

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**Table 1. Key signs and symptoms associated with serious pathological neck conditions.**

<table>
<thead>
<tr>
<th>Cervical Myelopathy</th>
<th>Neoplastic Conditions</th>
<th>Upper Cervical Ligamentous Instability</th>
<th>Vertebral Artery Insufficiency</th>
<th>Inflammatory or Systemic Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory disturbance of the hands</td>
<td>Age over 50 years</td>
<td>Occipital headache and numbness</td>
<td>Drop attacks</td>
<td>Temperature &gt;37°C</td>
</tr>
<tr>
<td>Muscle wasting of hand intrinsic muscles</td>
<td>Previous history of cancer</td>
<td>Severe limitation during neck active range of motion in all directions</td>
<td>Dizziness or lightheadedness related to neck movement</td>
<td>BP &gt; 160/95 mmHg</td>
</tr>
<tr>
<td>Unsteady gait</td>
<td>Unexplained weight loss</td>
<td>Signs of cervical myelopathy</td>
<td>Dysphasia</td>
<td>Resting pulse &gt; 100 bpm</td>
</tr>
<tr>
<td>Hoffman’s reflex</td>
<td>Constant pain, no relief with bed rest</td>
<td></td>
<td>Dysarthria</td>
<td>Resting respiration &gt; 25 bpm</td>
</tr>
<tr>
<td>Hyperreflexia</td>
<td>Night pain</td>
<td></td>
<td>Diplopia</td>
<td>Fatigue</td>
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<tr>
<td>Bowel and bladder disturbances</td>
<td></td>
<td></td>
<td>Positive cranial nerve signs</td>
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<tr>
<td>Multisegmental weakness and/or sensory changes</td>
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**Table 2. Clinical yellow flags indicating heightened fear-avoidance beliefs.**

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<tr>
<th>Attitudes and Beliefs</th>
<th>Behaviors</th>
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<tr>
<td>Belief that pain is harmful or disabling, resulting in guarding and fear of movement</td>
<td>Use of extended rest</td>
</tr>
<tr>
<td>Belief that all pain must be abolished before returning to activity</td>
<td>Reduced activity level with significant withdrawal from daily activities</td>
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<tr>
<td>Expectation of increased pain with activity or work, lack of ability to predict capabilities</td>
<td>Avoidance of normal activity and progressive substitution of lifestyle away from productive activity</td>
</tr>
<tr>
<td>Catastrophizing, expecting the worst</td>
<td>Reports of extremely high pain intensity</td>
</tr>
<tr>
<td>Belief that pain is uncontrollable</td>
<td>Excessive reliance on aids (braces, crutches, etc)</td>
</tr>
<tr>
<td>Passive attitude to rehabilitation</td>
<td>Sleep quality reduced following the onset of back pain</td>
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<tr>
<td></td>
<td>High intake of alcohol or other substances with an increase since the onset of back pain</td>
</tr>
<tr>
<td></td>
<td>Smoking</td>
</tr>
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The majority of patients with neck pain will recover, but a sizable percentage of individuals will experience persistent pain and disability. The presence of abnormal illness behavior or psychosocial factors may be a contributing factor in these cases and can interfere with recovery. Considerable research has shown that psychosocial factors are an important prognostic indicator of prolonged disability. Similar to LBP, the literature suggests that fear-avoidance beliefs may play an important role in patients with neck pain. Attitudes and behaviors that may represent concern for psychosocial factors to be present are listed in Table 2. If relevant psychosocial factors are identified, the rehabilitation approach may need to be modified. An emphasis on active rehabilitation and positive reinforcement of functional accomplishments is recommended. Graded exercise programs that direct attention towards attaining certain functional goals and away from the symptom of pain have also been recommended. Finally, graduated exposure to specific activities that a patient fears as potentially painful or difficult to perform may be helpful. Evidence from patients with LBP suggests that patients with higher levels of fear-avoidance beliefs do not need to be considered a unique classification, but can be effectively managed within an existing classification system with the above modifications.
DETERMINING THE MOST EFFECTIVE INTERVENTION

Once it is determined that a patient is appropriate for physical therapy management, an intervention approach must be determined. We propose 5 subgroups, or classifications, of patients, each with a label intended to capture the primary goal of treatment: (1) “mobility,” (2) “centralization,” (3) “conditioning and increase exercise tolerance,” (4) “pain control,” and (5) “reduce headache.” Assignment of a patient to a classification depends upon the overall impression formed from the history and physical examination (Table 3).

We believe each classification is homogeneous with respect to the treatment approach most likely to benefit the patient, and not necessarily homogeneous, as based on etiology or pathoanatomy. We have labeled each classification based on the goal of the treatment approach, and not on the specific interventions proposed, because future research may change our understanding of the most efficacious interventions to achieve a particular goal. We believe each patient has a primary goal of treatment at a given period during the course of management, making the classification categories mutually exclusive at a single point in time. We recognize, however, that the process of classification is ongoing, and it is anticipated that a patient’s presentation will change with time and treatment. Ongoing reassessment is, therefore, necessary to determine the most appropriate intervention at any point in time.

Mobility Classification

Evidence from RCTs\textsuperscript{16,27,40} and a recent Cochrane systematic review\textsuperscript{35} suggests that mobilization/manipulation is beneficial for at least some patients with neck pain. Hoving et al\textsuperscript{40} reported in a high-quality randomized clinical trial that manual therapy consisting of mobilizations performed by a physical therapist was more effective in improving outcomes and more cost effective\textsuperscript{53} than a physical therapy intervention that did not incorporate a manual therapy approach, or than continued care by a

<table>
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<tr>
<th>Classification</th>
<th>Examination Findings</th>
<th>Proposed Matched Interventions</th>
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| Mobility       | • Recent onset of symptoms  
|                | • No radicular/referred symptoms in the upper quarter  
|                | • Restricted range of motion with side-to-side rotation and/or discrepancy in lateral flexion range of motion  
|                | • No signs of nerve root compression or peripheralization of symptoms in the upper quarter with cervical range of motion  
|                | • Cervical and thoracic spine mobilization/manipulation  
|                | • Active range of motion exercises |
| Centralization | • Radicular/referred symptoms in the upper quarter  
|                | • Peripheralization and/or centralization of symptoms with range of motion  
|                | • Signs of nerve root compression present  
|                | • May have pathoanatomic diagnosis of cervical radiculopathy  
|                | • Mechanical/manual cervical traction  
|                | • Repeated movements to centralize symptoms |
| Conditioning   | • Lower pain and disability scores  
| and increase   | • Longer duration of symptoms  
| exercise       | • No signs of nerve root compression  
| tolerance      | • No peripheralization/centralization during range of motion  
|                | • Strengthening and endurance exercises for the muscles of the neck and upper quarter  
|                | • Aerobic conditioning exercises |
| Pain control   | • High pain and disability scores  
|                | • Very recent onset of symptoms  
|                | • Symptoms precipitated by trauma  
|                | • Referred or radiating symptoms extending into the upper quarter  
|                | • Poor tolerance for examination or most interventions  
|                | • Gentle active range of motion within pain tolerance  
|                | • Range of motion exercises for adjacent regions  
|                | • Physical modalities as needed  
|                | • Activity modification to control pain |
| Reduce headache| • Unilateral headache with onset preceded by neck pain  
|                | • Headache pain triggered by neck movement or positions  
|                | • Headache pain elicited by pressure on posterior neck  
|                | • Cervical spine manipulation/mobilization  
|                | • Strengthening of neck and upper quarter muscles  
|                | • Postural education |
general practitioner. Limited evidence suggests that mobilization/manipulation tends to be more beneficial for younger patients with acute neck pain. However, a recent Cochrane systematic review on the benefits of manual therapy interventions for patients with mechanical neck pain was unable to determine whether certain subgroups exist. Studies comparing mobilization with other treatments in patients with chronic neck pain (greater than 12 weeks in duration) have not found superior outcomes for patients receiving mobilization, whereas 75% of subjects in the trial by Hoving et al had symptoms for less than 12 weeks. It is also suggested that patients with restricted cervical range of motion and symptoms isolated to the neck (ie, no upper extremity symptoms) may also be more likely to benefit from mobilization/manipulation. Evidence also suggests that manual therapy is more effective when used in combination with exercise.

Based on this evidence, patients initially assigned to a mobility classification tend to be younger individuals with a more recent onset of symptoms and a primary impairment of decreased range of motion (Table 3). In our experience, active range of motion testing will often reveal a side-to-side discrepancy in lateral flexion or rotation range of motion. Symptoms are typically localized to the neck and usually do not peripheralize into the upper quarter during active range of motion. Signs of nerve root compression are uncommon.

The primary aim of treatment for this subgroup of patients is to improve mobility. Initial treatment will likely include mobilization/manipulation directed to the cervical, cervicothoracic, and/or thoracic spine, possibly accompanied by specific active range of motion, self-mobilization, or stretching exercises designed to increase pain-free range of motion. There is no evidence to support a preference for manipulation over mobilization for patients with neck pain, but the inherent risks related to the use of manipulation should be considered in the decision-making process. Indeed, a recent study found equal improvement in patients with neck pain randomized to receive either manipulation or mobilization treatments. Manual or mechanical cervical traction performed for the purpose of producing passive mobilization may also be used in this classification, possibly for older patients who may be experiencing degenerative conditions of the neck with multilevel involvement.

Centralization Classification

Many patients with neck pain and limitations in active range of motion also present with symptoms into the upper extremity and signs of nerve root compression. When patients present with radiating or radicular symptoms, the goal of the initial interventions shifts from improving mobility to achieving centralization of symptoms. Centralization occurs when movement of the neck results in symptoms moving from an area more distal in the upper quarter to a location more central or near the midline position of the neck. Although the mechanism by which centralization occurs is poorly understood, its occurrence is important because of its potential use in identifying those patients who will respond to conservative management. Studies have demonstrated that patients with LBP who are able to centralize symptoms at baseline return to work sooner and exhibit greater improvements in pain and function than patients who are unable to centralize their symptoms. Wernke and Hart examined a group of patients with spinal pain and found the ability to centralize symptoms at the initial visit, or during the course of treatment, was a favorable prognostic finding. Only 23% of the sample in these reports had neck pain, and the results for these patients could not be distinguished from the larger group. Evidence and clinical experience suggest that achieving centralization is an important treatment goal for patients with neck pain who have radiating/radicular symptoms.

The hallmark finding leading to a centralization classification is, therefore, the achievement of centralization during the examination. Patients appropriate for this classification may be further characterized by radicular or referred symptoms into the upper quarter or mid-scapular area, particularly when those symptoms are reported to be affected by neck movements (Table 3). Signs of nerve root compression such as weakness in a myotomal pattern, decreased deep-tendon reflexes, and sensory loss in a dermatomal pattern may be present. Patients with a diagnosis of cervical radiculopathy based on imaging studies will often be classified in the centralization category. It is important, however, that the clinical examination be consistent with a centralization classification before proceeding with treatment. Wainner et al recently developed a CPR to diagnose cervical radiculopathy. The rule consists of the following 4 clinical examination findings: (1) positive Spurling test, (2) positive neck distraction test, (3) positive upper-limb tension test, and (4) the presence of less than 60° of cervical rotation range of motion to the involved side. When at least three fourths of these findings are present, radiculopathy should be strongly suspected (specificity, 94%; positive likelihood ratio, 6.1). If all 4 findings are present, the therapist can be quite certain the patient has a cervical radiculopathy and, thus, may be appropriate for the centralization classification (specificity, 99%; positive likelihood ratio, 30.3). The upper-limb tension test described by Elvey was the single best screening test (sensitivity, 97%; negative likelihood ratio, 0.12), therefore, a negative upper-limb tension test consider-
ably reduces the likelihood of a diagnosis of cervical radiculopathy.

For the goal of centralizing symptoms, interventions using manual or mechanical traction are often recommended.20,75,77 The patient position during traction may be varied to produce maximal centralization.19 Although cervical traction is frequently recommended for patients with neck pain and radicular pain,74,75,77 its efficacy for this subgroup of patients has not been adequately studied.17,39,88 Most studies have consisted of small case series designs,20,65,75 and have not studied a homogeneous subgroup of patients thought to be likely to benefit from the intervention.88 One retrospective study on home cervical traction reported excellent results.85 It may be that cervical traction has not shown to be effective because only a specific subgroup may benefit from it. Clinical experience suggests that traction can be beneficial when the appropriate patient is selected.

Another approach to the treatment of patients in the centralization classification is to instruct patients to perform repeated active neck movements in a direction that results in centralization of their symptoms. McKenzie61 recommended the use of chin retraction exercises to promote centralization. Abdulwahab and Sabbahi4 studied the effect of chin retraction on patients with cervical radiculopathy and reported a significant increase in the H-reflex amplitude after repeated chin retraction exercises. More importantly, this electrophysiologic change was associated with a decrease in the patient’s radicular symptoms as reported on a visual analog scale. The authors also observed significant decreases in the H-reflex amplitude, which was associated with an increase in radicular symptoms due to assuming a slumped posture, indicating that postural advice may also be helpful when the goal of treatment is centralization.1 Bjelland and Oberg49 randomized patients with chronic neck pain to receive either treatment based on principles advocated by McKenzie, a general exercise group, or a control group. Patients in the McKenzie group generally had better outcomes than those in the control group, but did not show any superiority over patients receiving general exercise. The extent to which chin retraction exercises were used in the McKenzie group was not clear, and the study included any patient with chronic neck pain, without attempting to identify a priori those most likely to respond to a McKenzie approach.49 Further research is clearly needed on interventions such as repeated movements and traction, which are often used with the intent to centralize symptoms.

Classification

Conditioning and Increased Exercise Tolerance Classification

Some patients with neck pain do not present with significant mobility restrictions or a need for centralization. These patients tend to be further characterized by lower disability and pain scores and a longer duration of symptoms. Patients commonly referred to as having “clinical instability” may be appropriate for this classification. Improving motion or achieving centralization cannot be used to guide treatment for these patients. Instead, patients fitting this profile may respond best to treatment with an exercise approach focusing on strength and conditioning.

Recent RCTs16,27,44,86,100 and systematic reviews17,78 provide evidence for the effectiveness of exercise in patients with neck pain. In particular, studies examining exercise programs without manual therapy interventions appear to indicate that strengthening and endurance exercises for muscles of the upper quarter, possibly combined with aerobic conditioning, may be the most beneficial type of exercise for patients with chronic neck pain who do not have signs of nerve root compression.16,27,44,86,100 Intensive strengthening exercise yields results superior to those of interventions focusing on either manipulation or mobilization in this subgroup.16,44 One recent RCT100 demonstrated the effectiveness of both strengthening exercises and endurance training of the deep neck flexor muscles to reduce pain and disability at a 1-year follow-up in patients with chronic neck pain. Therefore, interventions combining strengthening, conditioning, and possibly deep neck flexor exercises may be most effective for patients in this classification.

Experience also suggests that individual patients may present with impairments of flexibility of key muscles related to the lower cervical and upper thoracic spine, such as the upper trapezius, levator scapulae, and pectoralis major, which need to be addressed with stretching exercises. Although research generally does not support the effectiveness of interventions that focus on stretching and flexibility, clinical experience suggests that addressing specific impairments of muscle length for an individual patient may be a beneficial addition to a comprehensive treatment program; however, it appears that the emphasis should be placed on strengthening and conditioning activities. Experience also suggests that many patients in this classification may benefit from interventions designed to decrease stress on the cervical spine during daily activities or while at work. Research focusing on ergonomic interventions is lacking for patients with neck pain52; however, for a patient whose symptoms are provoked by repetitive activities, modifications may be useful.

Reduce Headache Classification

Some patients with neck pain present with a chief complaint of headache that appears to be of cervical origin. When this is the case, the goal of treatment focuses on reducing the headache symptoms. Diagnostic criteria for cervicogenic headaches have been the subject of much debate.50 It has been suggested
that the 2 most important diagnostic criteria for distinguishing cervicogenic headaches from other headache etiologies are a pattern of symptoms that start in the neck and progress to the fronto-ocular area and unilateral headache (sensitivity, 100% for each finding). Other findings common to patients with cervicogenic headache include pain triggered by neck movement or position and pain elicited by pressure on the ipsilateral posterior neck. Symptoms may fluctuate or be continuous in nature, but are not typically described as excruciating or throbbing. Symptoms may also include ipsilateral shoulder and arm pain of a vague, nonradicular nature. Patients with a predominant complaint of headache that does not fit this pattern may need to be referred for further diagnostic testing.

Interventions for patients with a chief complaint of cervicogenic headache may include manual therapy for the cervical, and/or thoracic regions, soft tissue mobilization, strengthening of muscles of the upper quarter, and postural/ergonomic education. Evidence from RCTs and systematic reviews suggests that mobilization/manipulation is effective for reducing the duration and intensity of headache symptoms in these patients, particularly when combined with exercise. Other RCTs and systematic reviews, however, question the usefulness of manual therapy for these patients and suggest that positive findings may be more related to placebo effects. Jull et al, in a recent large RCT of patients with cervicogenic headaches, compared a control group to groups receiving cervical mobilization/manipulation, strengthening of the deep neck flexor and scapular muscles, and a combined manual therapy and exercise group. The results showed significant reductions in headache symptoms in all treatment groups versus the control group and were maintained at a 1-year follow-up. At shorter-term follow-ups (7 and 12 weeks), the combined exercise and manual therapy group showed some advantages over the other groups. Hammill et al used a combination of postural education and stretching/strengthening exercise to reduce the frequency of headaches and improve disability in a series of 20 patients, with results being maintained at a 12-month follow-up.

**Pain Control Classification**

Some patients present with severe neck pain that dramatically alters activities of daily living. These patients do not tolerate an examination well, or any form of manual or movement based intervention. These findings characterize patients assigned to the pain control classification (Table 3). It is expected that patients in the pain control classification will have higher levels of pain and disability, and will likely have pronounced active range of motion restrictions, possibly with referred or radiating symptoms into the upper quarter. The onset of symptoms should be acute and likely related to trauma, such as a motor vehicle accident. Completion of a comprehensive examination will be difficult secondary to symptom exacerbation, and the severity of symptoms is expected to preclude the performance of interventions to enhance strength or conditioning, promote centralization, or address specific mobility restrictions. Once the patient’s symptoms are reduced, he or she should be progressed into one of these classifications, as appropriate. A subset of patients within this classification may demonstrate more severe symptoms over a longer period of time in patients with whiplash-associated disorder. Entire classification systems have been previously proposed just for patients with whiplash-associated disorder; thus a detailed discussion of this subset of patients within the pain control classification is beyond the purpose of this paper.

The primary aim of treatment for patients in the pain control classification is to manage symptoms and facilitate the patient’s ability to tolerate a more active rehabilitation program. Evidence supports early, gentle, active range of motion exercise in patients with acute, posttraumatic neck pain, for whom pain relief is the primary goal. McKinney et al randomized patients with neck pain due to MVA within 48 hours after injury to early advice on active motion, manipulative therapy, or a period of rest and immobilization. Patients receiving early activity were less likely to have persistent pain than those receiving the other interventions. Rosenfeld et al compared early, gentle range of motion exercises to a standard protocol recommending a soft collar. The active exercise group had less pain and more range of motion at 6-month follow-up. Other interventions recommended for patients in the pain control classification have either not been sufficiently studied or have been shown to be ineffective. Modalities such as heat/cold, electrical stimulation, and biofeedback have not been studied sufficiently, while interventions such as transcutaneous electrical nerve stimulator (TENS) devices and ultrasound have been studied and found to be ineffective. Gross et al reviewed 13 RCTs assessing the effectiveness of various physical medicine modalities for patients with mechanical neck pain and found limited evidence for their use.

Considering the evidence, the treatment of patients in the pain control classification should focus on gentle range of motion exercise, and active exercise or mobilization to adjacent nonirritable regions (ie, thoracic spine, shoulder, or rib cage). Physical modalities (ie, ice, heat, electrical simulation, etc) may be used if they are helpful for reducing symptoms, but therapists should attempt to keep patients as active as tolerated. The patient’s signs and symptoms need to be closely monitored, and the patient should...
be progressed to a more active classification as soon as possible.

DISCUSSION

We have proposed a classification system for patients with neck pain, using published evidence whenever possible to support the proposed framework. The system is based on the goals of treatment and the interventions used to achieve these goals, rather than an attempt to classify patients by pathology or symptom distribution. This approach has proven to be more effective in improving care in patients with LBP.\(^{28}\) The only other classification system for patients with neck pain published to date\(^{95}\) uses symptom location (neck pain only, arm pain with or without neck pain, or headache) and presumed pathological mechanisms (radicular versus referred pain) in the initial subgrouping of patients. Although classification systems for patients with LBP primarily based on symptom location and presumed pathology (e.g., the Quebec system\(^{79}\)) have generally been shown to be useful for prognostic purposes,\(^{58}\) their ability to specifically match patients to interventions has not been demonstrated.\(^{70}\) Additionally, although Wang et al\(^{95}\) presented outcomes from a group of patients who received treatment based on the decision points outlined in their classification scheme, the control group was untreated. Therefore, the observed changes in the treatment group may simply be attributable to the fact that some treatment was provided, rather than providing validity for the system itself. Answering questions regarding the best methods for treatment decision making for patients with neck pain will ultimately be answered by outcomes data and controlled clinical trials.

Terms such as "exercise," "mobilization," etc., are often used without more specific indications of the techniques used or the intended goals of the intervention, primarily because studies published to date have generally not been designed to identify the unique characteristics of patients likely to respond to particular interventions. Based on the literature and current practice patterns, it appears that there are at least some patients with neck pain who will respond to interventions that include mobilization/ manipulation, exercise, and possibly traction. By further examining the literature and considering clinical experience, it appears that the patients likely to respond to each of these interventions may possess some unique characteristics that can be used to form the basis of a classification system. As the evidence base for the management of patients with neck pain continues to grow, new classification criteria and interventions may be identified and will need to be incorporated.

Therapists who manage patients with neck pain, or any other musculoskeletal condition, recognize that an individual patient’s clinical presentation will likely change as he or she moves through a course of treatment. If this does not occur, most therapists would consider the management of the patient to have failed. It is therefore likely, and indeed expected, that patients will shift from one classification to another during an episode of care. For example, a patient may present with severe neck pain and referred pain into the arm. If the therapist cannot find a position, movement, or intervention that will centralize the symptoms, this patient may be classified in the pain control subgroup. Once the patient's pain has been reduced, the therapist may be able to find a movement that centralizes the patient’s symptoms, and the patient would then move into the centralization classification. Further, once a patient’s radicular symptoms centralize, a loss of motion may need to be addressed, with mobilization/manipulation, for example. We believe that the goal for most patients with neck pain is to arrive at the conditioning and increased exercise tolerance classification. Neck pain has high rates of recurrence,\(^{12}\) and although no research has been conducted on the topic, it is possible that addressing impairments of strength, conditioning, and flexibility could reduce the risk of recurrence.

We recognize that additional decision making is necessary within each classification to more specifically guide the application of the selected intervention. For example, detecting a side-to-side discrepancy in range of motion alone does not provide sufficient information to guide selection of a particular treatment technique or suggest that treatment be directed to a specific region of the cervicothoracic spine. However, the first step in the development of the classification system is to direct patients toward the optimal treatment. Future research is necessary to more specifically guide decision making within each classification.

Like any aspect of diagnosis or decision making, classification systems need to be subjected to study and scrutiny.\(^{17}\) Various aspects of a system need to be assessed, including the reliability of individual examination components as well as the overall reliability of the classification decision. Most important, however, is an assessment of the impact of the use of the classification system on patient outcomes. An effective classification system must improve the outcomes of care. Ultimately this is demonstrated by showing that patients in a certain classification have a better outcome when interventions matched to the classification are received versus unmatched interventions.

CONCLUSION

This commentary outlines a general framework for identifying subgroups of patients based on the primary goal of treatment, with the ultimate aim of matching patients to specific interventions from which they are most likely to benefit. However, the
validity of this classification system will ultimately be based on the extent to which it improves decision making and outcomes of care. Therefore, readers are cautioned to reserve judgment until more definitive studies are performed and to expect that modifications will inevitably occur as new evidence emerges. We hope that this proposal of a classification system for patients with neck pain will stimulate further research in this area. The process of refining and validating a classification system is lengthy; however, the potential to increase the power of clinical research and increase the effectiveness and efficiency of rehabilitation for patients with neck pain make these extended efforts worthwhile.

**REFERENCE LIST**


Invited Commentary

It is timely that a paper proposing a new classification system for neck pain is put forward. Whilst classification systems exist for low back pain, there have been few attempts made to achieve classification of neck pain. Evidence is accumulating that demonstrates neck pain to be a heterogeneous condition likely involving complex underlying mechanisms of varying degrees in individual patients. In light of this, and as the authors of this review point out, treatments directed to neck pain viewed as a homogenous group are likely to fail and, indeed, this may be one reason why investigations of treatments for neck pain have been less than conclusive.

The authors correctly state that a pathoanatomical classification of neck pain is not pain useful either in terms of prognostic capacity or as a guide for intervention. However, it is more recently emerging that neck pain may be characterized in terms of both physical impairments and psychological function. Much of this research has been conducted in whiplash-associated disorders, but it can be seen that idiopathic neck pain also shows characteristic features. Neck pain of both traumatic (in this case, whiplash injury) and idiopathic origin demonstrate deficits in motor function, including range of movement loss and altered muscle recruitment patterns of both the cervical spine and shoulder girdle. Kinesthetic deficits manifested by increased joint repositioning errors are also present in both neck pain groups, with patients who report dizziness as a symptom showing greater loss of kinesthetic awareness. Sensory disturbances, including mechanical and thermal hyperalgesia, allodynia, and heightened flexor withdrawal responses, have also been found in whiplash-injured individuals and likely indicate the augmentation of central pain processing mechanisms. Interestingly, preliminary evidence suggests that this sensory hypersensitivity may not be a feature of idiopathic neck pain, but, rather, that it may be unique to whiplash-associated disorders. Whilst the research is less extensive than that of low back pain, psychosocial and psychological factors also play a role in neck pain. There is no doubt that patients with neck pain are psychologically distressed, but, again, it may be useful to differentiate whiplash injury from idiopathic neck pain, as the former condition shows a unique psychological reaction in the form of a posttraumatic stress reaction that has been shown to influence recovery from the injury. Therefore, it can be seen that neck pain is a multifaceted condition involving varying degrees of motor and sensory impairments, as well as psychological factors that will need to be considered in the assessment and management of these patients.

Classification systems can be devised using a variety of criteria, and the authors of this paper propose a classification system based primarily on treatment goals. This is potentially useful for clinicians managing patients with neck pain. The classification categories are seemingly based on clinical examination findings and then interventions proposed to achieve the particular goal of treatment. The authors acknowledge that each category is homogenous with respect to the treatment approach that will be of most benefit to the patient. In broad terms, this may be the case, but it is possible that there will be overlap in the treatment approach applied to each category. For example, whilst the goal of treatment in the “mobility” group is argued as improving mobility, this is unlikely to be the only goal of treatment. Patients with idiopathic neck pain who would be categorized in the mobility group may also show deficits in muscle recruitment strategies and, perhaps, kinesthetic dysfunction, both likely requiring specific rehabilitation. It has been shown that pain reduction and movement restoration by themselves are not sufficient to address the neuromuscular control deficits in patients with neck pain, as these deficits require specific rehabilitation techniques. Persistence of motor deficits may render the patient at risk of developing symptom recurrence. Therefore, addressing only the lack of mobility in this patient category may not be the most efficacious approach to treatment. A similar scenario could be argued for the other categories. Nevertheless, the classification system proposed by Childs and colleagues is a good starting point to facilitate the concept of considering neck pain as a heterogeneous condition. It may be possible to improve the proposed classification by taking into consideration and including additional physical (eg, altered muscle recruitment patterns, kinesthetic deficits, sensory disturbances) and psychological factors (eg, psychological distress and, in the case of whiplash injury, posttraumatic stress reaction) shown to be features of neck pain.

The authors are to be applauded for the inclusion of a “pain control” category that they suggest will likely include patients with whiplash injury. This is an astute clinical observation that is supported by recent research. Research of whiplash-associated disorders is demonstrating that a subgroup of those experiencing a whiplash injury will develop, from soon after injury, widespread sensory and sympathetic nervous system...
disturbances that are indicative of altered central pain processing mechanisms.\textsuperscript{15} Whilst Childs and colleagues suggest that patients in this category may have symptom onset very soon after injury, it has been shown that this early sensory hypersensitivity persists in those who show a poor recovery from the injury,\textsuperscript{15} perhaps indicating that not only patients with acute injuries should be included in this category. I also note the authors’ excellent point that clinicians “should attempt to keep these patients as active as tolerated.” This is a refreshing change from the “act as usual” mantra that is often suggested as management for patients of this sort, and which, in fact, may exacerbate their condition if such activities are provocative of pain. It should be noted, however, that not all patients with whiplash will sit in the “pain control” category. Most persons with whiplash injuries do not show high levels of pain and disability and sensory hypersensitivity\textsuperscript{15} and it is likely these patients may well be classified into one of the other categories.

The authors do not specifically include psychosocial and psychological factors in their classification system, except to say that the rehabilitation process may need modification should these factors be identified. The authors draw on the vast expanse of literature on the influence of psychosocial factors in low back pain. It is not yet clear whether the same factors play a similar role in the development of chronic neck pain. Whilst the literature of psychosocial factors in cervical spine pain is less extensive, some studies suggest that the role of fear-avoidance beliefs, for example, may be less important than in low back pain.\textsuperscript{17,20} Perhaps the temptation to extrapolate from one musculoskeletal condition to another should be avoided.

The classification system of Childs and colleagues is a starting point for the classification of neck pain. It remains to be seen whether or not it will prove to be useful in terms of improving clinical outcomes for this patient population. The main difficulty with this approach is that the interventions proposed for most of the categories have little evidence of efficacy and, as outlined previously, there may be some overlap of treatment goals between the individual categories. It could be possible to improve the classification system by the assessment and inclusion of the varied physical and psychological impairments that have been shown to be features of those with neck pain.\textsuperscript{5,10,15,17} The inclusion of such features are in line with calls to differentiate mechanisms underlying the patient’s pain condition\textsuperscript{20} and to then direct treatment toward these mechanisms. Physical therapists are in a prime position to lead the way in this approach to the assessment, classification, and management of neck pain conditions.

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We appreciate Dr Sterling’s insightful commentary on our proposed classification system for patients with neck pain. We would like to provide additional comment on a few of the issues she has raised. First, we agree with Dr Sterling’s suggestion that it may be useful to differentiate whiplash injury from idiopathic neck pain altogether, and we readily acknowledge the existence of the subgroup of patients with whiplash-associated disorder (WAD) in our paper. However, given that entire classification systems have been previously proposed unique to this subgroup (including Dr Sterling’s own work), we intentionally omitted a detailed discussion of these patients here in deference to the existing literature. We also agree with Dr Sterling that patients suspected to have WAD may include more than just patients with acute injuries, based on the poor prognosis associated with patients who have persistent physical and/or psychological factors known to interfere with recovery.

Secondly, we readily agree with Dr Sterling’s assertion that psychosocial and psychological factors be considered in any classification system for patients with neck pain, and we examine the importance of these considerations for both prognostic and treatment purposes in our paper. However, we elected not to more specifically elaborate on detailed screening and management strategies, because the effectiveness of biopsychosocial interventions for patients with neck pain has not been sufficiently studied (compared to the proliferation of evidence supporting the use of these interventions in patients with low back pain). Furthermore, evidence in patients with low back pain suggests that individuals who present with relevant psychosocial issues may not need to be considered a unique classification. Rather, these issues can be addressed within the context of an existing classification system, using rehabilitation strategies that emphasize active rehabilitation, positive reinforcement of functional accomplishments, graded exercise programs, gradual exposure to specific activities that a patient fears, etc.

Dr Sterling correctly recognizes the potential for some overlap to occur in the treatment approach that is used for patients in each category. In fact, patients are expected to shift from one classification to another, because of underlying changes in the patient’s clinical presentation over time, which necessitates accompanying changes in management strategy. Dr Sterling gives the example of patients initially categorized in the “mobility” group as being expected to have other impairments, such as alterations in muscle recruitment strategies, which indeed requires attention during rehabilitation. Nevertheless, we contend that each patient will have a primary goal of treatment at a given point during an episode of care, attesting to the importance of ongoing assessment throughout the episode of care. Clearly, the goal for most patients with neck pain is to arrive at the conditioning and increased exercise tolerance classification, where muscle recruitment considerations and strength and endurance issues can be examined in more detail. Interventions, such as aerobic conditioning and strengthening and endurance exercises, can then be matched to these impairments to optimize muscle function and overall functional recovery.

Finally, Dr Sterling suggests that one difficulty with this approach is that some of the suggested interventions within each category lack evidence for their use. Although we generally agree with this assertion, attempts to identify subgroups of patients will result in more homogeneous subsets of patients with neck pain, increasing the power of clinical research to identify effective interventions for patients with neck pain. Ultimately, these efforts should improve decision making for clinicians in matching patients to specific interventions from which they are likely to receive the most benefit. We thank Dr Sterling for her valuable insight and look forward to future research that will more specifically develop and refine the framework proposed here.

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