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## Assessment of patients with neck pain: a review of definitions, selection criteria, and measurement tools

Victoria Misailidou PT, MS<sup>a,b,\*</sup>, Paraskevi Malliou PhD<sup>c</sup>, Anastasia Beneka PhD<sup>d</sup>,  
Alexandros Karagiannidis PT, MS<sup>e</sup>, Georgios Godolias MD, PhD<sup>f</sup>

<sup>a</sup>Laboratory Instructor, Department of Physical Therapy, Technological Educational Institute of Thessaloniki, 57400, Thessaloniki, Greece

<sup>b</sup>Postgraduate Student, Department of Physical Education and Sport Science, Democritus University of Thrace, 69100, Komotini, Greece

<sup>c</sup>Associate Professor, Department of Physical Education and Sport Science, Democritus University of Thrace, 69100, Komotini, Greece

<sup>d</sup>Assistant Professor, Department of Physical Education and Sport Science, Democritus University of Thrace, 69100, Komotini, Greece

<sup>e</sup>Staff Physical Therapist, Department of Physical Therapy, AHEPA University Hospital, 54636, Thessaloniki, Greece

<sup>f</sup>Professor, Department of Physical Education and Sport Science, Democritus University of Thrace, 69100, Komotini, Greece

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### Abstract

**Objective:** The purpose of this literature review was to synthesize the existing literature on various definitions, classifications, selection criteria, and outcome measures used in different studies in patients with neck pain.

**Methods:** A literature search of MEDLINE and CINAHL through September 2008 was performed to gather articles on the reliability, validity, and utility of a wide variety of outcome measurements for neck pain.

**Results:** Different types of definitions appear in the literature based on anatomical location, etiology, severity, and duration of symptoms. Classifications according to severity and duration of pain and the establishment of selection criteria seem to play a crucial role in study designs and in clinical settings to ensure homogeneous groups and effective interventions. A series of objective tests and subjective self-report measures are useful in assessing physical abilities, pain, functional ability, psychosocial well-being, general health status, and quality of life in patients with neck pain. Self-administered questionnaires are commonly used in clinical practice and research projects.

\* Corresponding author. Metsovou 9, 54636, Thessaloniki, Greece. Tel.: +30 2310213468; fax: +30 2310204995.

E-mail address: vicmiss@gmail.com (V. Misailidou).

**Conclusions:** Because of multidimensionality of chronic neck pain, more than just one index may be needed to gain a complete health profile of the patient with neck pain. The instruments chosen should be reliable, valid, and able to evaluate the effects of treatment.  
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## Introduction

The introduction of evidence-based practice in the last years of the 20th century stimulated the development and research of an enormous number of instruments to assess many types of patient variables.<sup>1</sup> Now, more rehabilitation professionals are familiarizing themselves with the use of outcome measures in clinical practice and for research purposes.<sup>2,3</sup> Outcomes assessment is primarily designed to establish baselines, to evaluate the effect of an intervention, to assist in goal setting, and to motivate patients to evaluate their treatment.<sup>4,5</sup> When used in a clinical setting, it can enhance clinical decision making and improve quality of care.<sup>6</sup> Many patients with neck pain visit health care clinics seeking treatment of their problem, and health professionals aim to use the best available evidence for making decisions about therapy. The best evidence comes from randomized clinical trials, systematic reviews, and evidence-based clinical practice guidelines.<sup>7</sup>

One objective of this study is to provide to health care professionals who work with patients with neck pain some useful information about the existing outcome measures and the criteria for selecting the most appropriate ones according to treatment goals. Researchers can use this information to form homogeneous groups of participants and select the right measures for various research studies.<sup>8</sup> The purpose of this study was to conduct a critical review on assessment and measurement tools and various definitions and classifications of the existing literature on neck pain. The main results of a search looking at the evidence regarding the reliability, validity, and utility of objective tests and self-reported impairment and disability assessment in people with neck pain are presented here.

## Methods and results

For this study, we considered neck pain to be a major or minor symptom of disease or disorder that occurs above the shoulder blades.<sup>9</sup> In that aspect, it can be a component of headaches, temporomandibular joint disorder, sprain/strain, tumors, fractures, various infectious diseases, inflammatory arthropathies, and fibromyalgia. We excluded articles with neck pain definitions found in the literature associated with serious local

pathology or systemic disease. We searched MEDLINE and CINAHL and reviewed all relevant articles through September 2008, using *neck pain*, and *measurements*, *functional ability*, *exercises*, and *assessment* as search words and referring to neck pain as *non-specific*, *soft tissue*, or *mechanical neck pain*. Additional articles were identified from references of selected articles. Only articles written in English were included in this report. Eighty-six articles were selected for inclusion for this report.

## Discussion

### Definitions of neck pain

Different types of definitions appear in the literature based on anatomical location, etiology, severity, and duration of symptoms.

### Definitions based on anatomical location

The International Association for the Study of Pain (IASP) in its classification of chronic pain defines *cervical spinal pain* as pain perceived anywhere in the posterior region of the cervical spine, from the superior nuchal line to the first thoracic spinous process.<sup>10</sup> This is clearly a topographic definition, and it states that neck pain is usually perceived posteriorly. This is consistent with patients' notions of neck pain. Pain to the front of the cervical spine is usually described as pain in the throat and not as neck pain.<sup>11</sup> Bogduk and McGuirk<sup>11</sup> also suggest that neck pain may be subdivided into upper cervical spinal pain and lower cervical spinal pain, above or below an imaginary transverse line through C4. From upper cervical segments, pain can usually be referred to the head, whereas from lower cervical segments, pain can be referred to the scapular region, anterior chest wall, shoulder, or upper limb. They also define *suboccipital pain* as the pain located between the superior nuchal line and C2, an area that appears to be the source of cervicogenic headache. In that aspect, the division of neck pain into suboccipital and upper and lower cervical pain may be important for clinicians and researchers in recognizing the area of the source of pain and trying to determine the possible causes.

The Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders describes *neck pain* as pain located in the anatomical region of the neck with or without radiation to the head, trunk, and upper limbs.<sup>12</sup> It defines the posterior neck region from the superior nuchal line to the spine of the scapula and the side region down to the superior border of the clavicle and the suprasternal notch. The IASP definition limits the pain symptoms down to T1 vertebra and does not include the various regions that neck pain can be referred to, whereas the Neck Pain Task Force includes in its definition the areas of referral destination. *Chronic neck pain* is described as an often widespread sensation with hyperalgesia in the skin, ligaments, and muscles on palpation and in both passive and active movements in neck and shoulder area.<sup>13</sup>

### Etiology of symptoms

In many studies,<sup>12</sup> the authors consider that all neck pain has a local pathologic cause that can be identified and treated. Others consider neck pain as a primarily nonorganic problem with psychosocial roots.<sup>14</sup> Some authors tend to categorize neck pain based on precipitating factors such as whiplash-associated neck pain, occupational neck pain, sports-related neck pain, and nonspecific neck pain.<sup>15-18</sup> Bogduk and McGuirk<sup>11</sup> argue that the causes of common neck pain are not known; the only recognizable causes are due to serious but rare conditions like tumors, fractures, etc.

These varied approaches often imply different etiologic models for neck pain. When a pathoanatomical diagnosis of neck pain cannot be made, the IASP recommends the term *cervical spinal pain of unknown origin* to be applied.<sup>10</sup> The Australian Acute Musculoskeletal Pain Guidelines Group<sup>19</sup> also recommended for neck pain with no known cause the term *idiopathic neck pain*.

### Severity of symptoms

The Neck Pain Task Force<sup>20</sup> recommends a clinical classification in 4 grades according to severity of pain: grade I is neck pain with no signs or symptoms of major structural pathology and no or minor interference with activities of daily living, grade II is neck pain with no signs or symptoms of major structural pathology but major interference with activities of daily living, grade III is neck pain with no signs or symptoms of major structural pathology but with neurologic signs of nerve compression, and grade IV is neck pain with signs of major structural pathology. Major structural pathologies include, but are not limited to, fractures, spinal cord injuries, infections, neoplasm, or systemic diseases. To develop this taxonomy, the Neck Pain Task

Force was guided by the classification system developed by Von Korff et al<sup>21</sup> and by the Quebec Task Force on Whiplash-Associated Disorders.<sup>15</sup>

This type of initial assessment seems to help the clinician determine the best evidence-based intervention. The above classification appears also very useful when used in research projects because it can ensure the homogeneity of groups in terms of severity of symptoms. In many studies<sup>20</sup> on neck pain, the researchers failed to show how effective their interventions are because they used patients with grade I pain that usually do not seek health care and the improvements they had were minimal. In addition, if a patient is classified as grade III, he or she should be referred for further medical management for nerve root compression.<sup>11,20</sup> Bogduk and McGuirk<sup>11</sup> state that the distinction between somatic referred pain and radicular pain is sometimes difficult to make, but the radicular pain is associated with neurologic signs and it is usually accompanied by paresthesia, numbness, weakness, and/or loss of reflexes. Patients with neurologic signs are a separate entity in terms of diagnosis and management and should be excluded<sup>11,20</sup> from research projects or best evidence treatment interventions on neck pain unless the neurologic signs have subsided and the patient can now be classified as grade II.

### Duration of symptoms

Another type of classification proposed by IASP<sup>22</sup> is based on the duration of neck pain. Acute neck pain usually lasts less than 7 days, subacute neck pain lasts more than 7 days but less than 3 months, and chronic neck pain has a duration of 3 months or more. The same time frames but with different terminology are proposed by the Neck Pain Task Force<sup>12</sup>; they propose the term *transitory* neck pain instead of acute, *short-duration* for subacute, and *long-duration* for chronic neck pain.

Investigators<sup>11</sup> usually do not distinguish subacute neck pain from acute or chronic pain. In the literature, there are no studies showing a difference in response to the same treatment between patients with subacute neck pain and those with either acute or chronic neck pain. Therefore, it seems correct to identify and distinguish only acute and chronic neck pain.<sup>11</sup> The evidence for acute neck pain is distinctly different from that for chronic neck pain; establishing which of the 2 the patient has predicates what interventions are appropriate.

### Selection criteria

Study samples must be selected with care and health care providers should clearly define the population of

persons with neck pain. This is very important because the predictive outcome of a test is highly dependent and validated on the population in which it is intended to be used.<sup>6,8</sup>

Neck pain is multifactorial in its etiology and in its impact on the individual. The origin and exact pathophysiologic mechanisms of chronic neck pain often remain obscure because trauma or severe degenerative conditions at working age are found only in a few cases.<sup>23</sup> Excessive physical strain may cause microtrauma in connective tissues, and psychosocial stress may lead to increased muscular tension and pain.<sup>24</sup>

### **Inclusion criteria based on symptoms and clinical diagnosis**

Most studies<sup>12,25,26</sup> select their participating patients on the basis of their clinical diagnosis. This can be “neck pain” or “chronic neck pain” or “chronic nonspecific neck pain.”

Inclusion criteria based on symptoms include duration of pain, pain intensity, and frequency of symptoms. For example, in a study by Dzedzic et al,<sup>25</sup> the selection of patients was based on “chronic or recurrent neck or shoulder pain of at least 3 months duration with or without arm pain.” Another study recruited patients with constant or frequently occurring neck pain for more than 3 or 6 months.<sup>13</sup>

### **Other inclusion criteria**

The age of the participants may vary from 18 to 70 years. In some studies, the target population consists only of people of working age who are employed at various jobs.<sup>23</sup> Epidemiologic studies have shown that women experience chronic neck pain more often than men; and therefore, patient populations commonly consist of women.<sup>23,27</sup> Pain perception in response to exercise appears to be influenced by sex differences; and therefore, some researchers<sup>23</sup> include only female participants in their studies. O’Leary et al<sup>27</sup> included in their study only patients that scored 5 or greater of 50 on the Neck Disability Index (NDI), which assesses perceived pain and physical disability. Furthermore, most authors<sup>23,25,27</sup> mention that participants should be motivated for rehabilitation and able to comply with a treatment schedule to be included in studies.

### **Exclusion criteria**

Exclusion criteria include serious injury, tumor, infection, or other nonmechanical cause of neck pain.<sup>23,25-27</sup> Other studies exclude clinically significant herniated disk with positive radicular arm pain, spinal fractures, and recent cervical surgery. Furthermore,

shoulder diseases (tendonitis, bursitis, capsulitis), inflammatory rheumatic diseases, severe psychiatric illness, and pregnancy are typically excluded from research studies.<sup>23</sup> Participants are usually excluded if they have neck pain from nonmusculoskeletal causes, signs of neurologic involvement, or any other medical disorder that would contraindicate physical exercise.<sup>23,25</sup>

The source of study participants must be well described and the inclusion and exclusion criteria clearly outlined and appropriate to ensure that the study population is representative of the population of interest. The diagnostic criteria must be clear, specific, and relevant. Some studies<sup>13,28</sup> evaluate the effectiveness of different treatments in patients with minor pain. These subjects often do not seek help from their health care providers; and if they do, their symptoms are easily treated with ergonomic advice and home exercise program. Rehabilitation research therefore needs to be targeted at the right patient population. If patients are entered into a study only on the basis of severe current neck pain, many may experience spontaneous relief from their symptoms over the course of the study, as has been observed in control groups in several randomized studies.<sup>13</sup> This places importance on the methodology of patient selection. The block randomization procedure that some researchers use ensures that patients with equal severity of neck symptoms are present in each group.<sup>13,26</sup> However, this method of sampling requires an efficient number of available participants simultaneously, which is not always possible.

### **Clinical assessment and outcome measurement**

When taking a patient’s history, the system of “red flags” allows clinicians to rule out serious pathology; this system is widely used and accepted in the literature.<sup>11,28,29</sup> The suggested red flags by the Neck Pain Task Force<sup>28</sup> include, but are not limited to, pathologic fractures, neoplasm, systemic inflammatory diseases, infections, cervical myelopathy, and previous neck surgery. After ruling out serious underlying structural disease and establishing the diagnosis of nonspecific mechanical neck pain, a series of objective tests and subjective self-report assessments will be conducted in assessing the patient’s present status, monitoring the patient’s course, and observing response to treatment, and in clinical research.<sup>28</sup>

The most common reason patients with symptoms seek treatment is pain. Traditionally, health care professionals have based their evaluation and treatment approach on the biomedical model that views a patient’s pain and associated disability merely as



symptoms of underlying tissue pathology.<sup>30</sup> Presently, the multidimensionality of neck pain, as with many chronic musculoskeletal disorders, is fully accepted; and the biopsychosocial model is implemented increasingly in diagnostics and in treatment of patients with neck pain. This model places a complaint of pain into a more holistic context and views the patient's experience of pain and disability as a system that comprises the pain itself, the person's attitudes and beliefs about the pain, elements of psychologic distress experienced, illness behaviors exhibited, and parameters of the social environment in which the person functions.<sup>31,32</sup> Loeser<sup>33</sup> has developed a conceptual model of pain that depicts the strong relationship between somatic dimension, psychologic dimension, and the social dimension in patients with musculoskeletal pain. Tissue damage results in pain perception (somatic dimension). When pain perception leads to suffering, a psychologic dimension is reached. Finally, a social dimension is added when suffering leads to pain behavior preventing the patient from assuming his/her normal social role.<sup>1</sup> The implication of this is that either multidimensional indexes are required or more than just one index is needed to gain a complete health profile of the patient with neck pain.

According to the International Classification of Functioning, Disability, and Health,<sup>34</sup> the relevant domains for examination and evaluation are impairments in body structures and function (pain), disabilities in daily activities and problems in participation (activities of daily living, sport, and work), and external and personal factors (negative cognitions about pain, passive coping strategy, general health perception). The instruments chosen must be reliable, valid and able to evaluate the effect of treatment.

### **Self-assessment of pain, function/disability, general health status**

Self-administered questionnaires are commonly used in clinical practice and research projects. There is consistent evidence that these questionnaires provide useful information about (a) the impact of neck pain on the patient; (b) the patient's perceived functional ability, deficit, and psychosomatic status; (c) change of the condition over time; and (d) the effectiveness of treatment intervention for both clinicians and patients.<sup>28</sup> After the selection of the participants and their categorization into different intervention programs, researchers or clinicians should select the appropriate measurement tools to evaluate treatment outcomes.

### **Self-assessment pain scales and questionnaires**

An initial recording of the individual's pain and its characteristics is necessary to draw safe conclusions related to changes. The IASP<sup>22</sup> has described pain as "an unpleasant sensory and emotional experience." Because pain is a subjective experience, clinicians and researchers rely on what the person reports about his/her own pain. This approach to assessing pain has its limitations because the accuracy of reports cannot be evaluated against criteria like the mental status or the communication ability of the person. Although the concept of pain as a personal experience is widely accepted, great variation exists in how neck pain is described and considered in the published literature.

### **Pain scales**

According to the Interactive Guide to Physical Therapist Practice, careful evaluation of the patients' perception of the intensity, quality, and distribution of their pain is important in the assessment of treatment outcomes. There are several methods of pain evaluation used in the clinical setting including verbal, visual, numeric, and semantic differential scales.<sup>35</sup>

#### **Simple descriptive scale**

The simple descriptive scale (SDS), also called the *verbal pain report*, uses a 4- or 5-point scale based on the patient's selection of a word that best describes current pain intensity. The value of this scale appears to be limited by its lack of sensitivity in detecting small changes in pain intensity.<sup>36</sup>

#### **Visual analog scale**

The visual analog scale (VAS) is a 10-cm line, oriented vertically or horizontally, with one end representing "no pain" and the other end representing "pain as bad as it can be." The patient is asked to mark a place on the line corresponding to the current pain intensity. The VAS is the most frequently used pain measure because it is simple to use and has good psychometric properties.<sup>29,37-42</sup>

#### **Numeric rating scale**

The numeric rating scale (NRS) is a verbal or written determination of a pain level on a scale from 0 to 10, in which 0 represents no pain and 10 represents excruciating pain. Sternbach has expanded the NRS to a rating from 0 to 100, and the patient is asked to describe current or average pain intensity as a percentage of 100. According to a study by Downie et al,<sup>43</sup> the NRS provides better discrimination of small changes in pain

intensity than the SDS does. When comparing the VAS with the NRS, some investigators state that the NRS is not as sensitive to patients' ability to express distress; and therefore, they recommend using the VAS because it is better suited to parametric analysis and because it provides a continuous score.<sup>36</sup>

### Semantic differential scales

These are composed of word lists and categories developed by physicians, students, and patients and measure the quality of pain in 3 dimensions: affective, evaluative, and sensory. Words are categorized by whether they describe fear, anxiety, and tension in the pain experience (affective); the overall cognitive experience of pain based on learned behaviors (evaluative); and temporal, spatial, pressure, or thermal characteristics of pain (sensory). Words within each category are ranked in terms of intensity. One of the most popular pain scales that uses word lists and has been adopted for many clinical trials is the McGill Pain Questionnaire (MPQ) and especially the short form (SF-MPQ).<sup>44</sup> Whereas the VAS measures only pain intensity, the SF-MPQ, which includes the VAS, measures also the quality of pain. In general, semantic differential scales are difficult and time consuming to complete and require a higher literacy level and a normal cognitive state. Although they are less convenient to use, they are valuable when a more detailed analysis of a patient's perception of pain is needed, as in a clinical research setting or a pain clinic.

### Reliability and validity of pain scales

The issue of reliability has been addressed in many reports particularly for the VAS and the MPQ. Most of the reports suggest that reliability varies based on

the patient groups examined. Generally, the VAS measurements have been found to be both valid and reliable. In many studies, the VAS has been considered to be the most easy to use and is believed to provide the most reliable measurements of pain intensity and is therefore used as the criterion standard against new rating methods.<sup>28</sup> Melzack and Torgerson<sup>44</sup> argue that the MPQ provides reliable, valid, and consistent measurements. The short form also has proven to provide reliable and valid measurements when the intensity of pain is the primary subject of the examination. A major advantage of the MPQ is the fact that it has been validated in many multilingual versions<sup>45</sup> (Table 1).

### Pain questionnaires

Questionnaires that incorporate assessments of pain include the Extended Aberdeen Spine Pain Scale (ASPS),<sup>46</sup> the Bournemouth Questionnaire (BQ),<sup>47</sup> the Cervical Spine Outcomes Questionnaire (CSOQ),<sup>48</sup> the Current Perceived Health 42 Profile (CPH42),<sup>49</sup> the NDI,<sup>42,50-52</sup> the Northwick Park Neck Pain Questionnaire (NPQ),<sup>52</sup> the Problem Elicitation Technique (PET),<sup>52</sup> and the Whiplash Disability Questionnaire (WDQ)<sup>53</sup> (Table 2).

The Aberdeen Back Pain Scale was extended to fit to patients with neck and upper back pain, and it measures pain behavior during various activities and rest. Authors suggest that the scale is reliable, valid, and responsive.<sup>46</sup> The modified BQ covers the salient dimensions of the biopsychosocial model of pain; and it is reliable, valid, and responsive to clinically significant change in patients with nonspecific neck pain.<sup>47,54</sup>

**Table 1** Self-report measures of pain characteristics that may be used in neck pain

Measure	Style	Psychometric status	Utility
SDS (verbal pain report)	4- to 5-point scale describes current pain intensity	Lack of sensitivity in detecting small changes	Measures pain intensity. Simple
VAS	10-cm line oriented vertically or horizontally	Good reliability and validity; criterion standard. Continuous score	Measures pain intensity. Easy to use
NRS	Verbal or written scale from 0 to 10 or 0 to 100. Describes pain intensity as a percentage of 100	More sensitive than SDS but less sensitive than VAS in detecting small changes	Measures pain intensity
MPQ. Also has short form (SF-MPQ) <sup>45</sup>	20 Sets of adjectives to select one in each relevant category. Short form has 15-item adjective checklist and includes VAS and SDS for pain intensity	Well-established reliability and validity. Validated in many languages.	Measures quality of pain; 3 dimensions: affective, evaluative, and sensory. Includes also pain intensity measures

**Table 2** Self-assessment questionnaires used for patients with neck pain

Questionnaire	Constructs measured	Psychometric status
ASPS (extended) <sup>46</sup>	Pain behavior during activities and rest	Extended to fit to neck pain. Reliable, valid, and responsive
BQ (modified) <sup>47</sup>	Covers all dimensions of the biopsychosocial model of pain	Reliable, valid, and responsive in nonspecific neck pain
CNFDS <sup>55</sup>	Function/disability; 15 questions of normal daily activities	Similar to NDI
Global Assessment of Neck Pain <sup>56</sup>	Function/disability; 5 categories from “free of neck trouble” to totally disabled by neck trouble	Correlates well with CNFDS
Neck Pain and Disability Scale <sup>57,58</sup>	Function/disability	Scores strongly correlated with NDI; $r = 0.86$ . Good content validity
NDI <sup>50,59,60</sup>	Pain; function/disability; 10 sections	Criterion standard revalidated in different study populations
NPQ <sup>52</sup>	Pain; function/disability; 10 parameters	Similar to NDI
CSOQ <sup>48</sup>	Pain; function/disability; psychosocial status; health care utilization	High reliability, good validity, and responsiveness to change
PSFS (neck) <sup>51</sup>	Function/disability	Very sensitive to functional changes in individual patients
PET <sup>52</sup>	Pain; function/disability; psychosocial status	Cannot be used in research; no standardization of content (like PSFS)
WDQ <sup>53,58</sup>	Pain; function/disability; psychosocial status	Whiplash specific; ICC = 0.96
Short Core Neck Pain Questionnaire <sup>61</sup>	Function/disability	Good reliability and validity in mechanical neck pain
NHANES-ADL (neck) <sup>62</sup>	Function/disability; physical, social, emotional; 16 items of ADLs	Good reliability and validity in cervical pain
CPH42 <sup>63</sup>	Pain; function/disability; psychosocial status	ICC = 0.91, $\alpha = 0.90$ . Sensitive to changes in severity over time
Fear-Avoidance Beliefs Questionnaire (neck) <sup>64,65</sup>	Psychosocial status: how physical activity and work affect pain, 16 statements	Modified for neck patients. ICC = 0.81, $\alpha = 0.90$ . Good construct validity, medium responsiveness
SF-36 Item Health Survey <sup>66</sup>	Health-related quality of life physical and mental components	Measures general health status; widely used

### Self-assessment of functional performance

Questionnaires that evaluate functional performance in patients with neck pain include the CSOQ,<sup>48</sup> Copenhagen Neck Functional Disability Scale (CNFDS),<sup>55,56</sup> CPH42,<sup>67</sup> Global Assessment of Neck Pain,<sup>56</sup> NDI,<sup>50,51</sup> Neck Pain and Disability Scale,<sup>29,41,42,57</sup> NPQ,<sup>42,52,67</sup> Patient-Specific Functional Scale (PSFS) (neck),<sup>51</sup> PET,<sup>52</sup> WDQ,<sup>53</sup> Short Core Neck Pain Questionnaire,<sup>61</sup> and the National Health and Nutrition Examination Surveys NHANES-ADL Scale (neck)<sup>62</sup> (Table 2).

Pietrobon et al<sup>68</sup> argues that NDI, CNFDS, and NPQ are similar in terms of structure and psychometric properties; but only NDI has been revalidated in heterogeneous study populations and in many languages. The NDI, a neck-specific questionnaire, has been cited in the literature as the criterion standard for many other questionnaires.<sup>69</sup> The PET and PSFS

evaluate problems specific to the individual patient and have the disadvantage that they cannot be used in research because without standardization of content, the scale is different for each patient and comparisons between them are impossible.<sup>70</sup>

### Self-assessment of psychosocial and general health status

The CSOQ,<sup>48</sup> PET,<sup>52</sup> WDQ,<sup>53</sup> NHANES-ADL,<sup>62</sup> CPH42,<sup>67</sup> FABQ,<sup>64</sup> and the SF-36 Health Survey<sup>66</sup> also assess the psychosocial status of patients with neck pain (Table 2). The CSOQ is a disease-specific questionnaire that assesses pain severity, functional disability, psychological distress, physical symptoms, health care utilization, and satisfaction.<sup>48</sup> The PET identifies problems that are important to the individual patient including emotional and social items such as anger, frustration, and depression.<sup>52</sup> The NHANES-

ADL Scale measures physical, social, and emotional disability in patients with a cervical impairment.<sup>62</sup> The SF-36 Health Survey is a generic questionnaire that measures the general health status and includes physical and mental components. It is a quality of life measure used in many research studies.

### Reliability and validity of pain and functional performance questionnaires

Most self-assessment questionnaires are more sensitive in detecting health improvement than deterioration. The NDI discriminates between those who improved or deteriorated and, as expected, does not detect change in score in those who remained stable.<sup>42</sup> The NDI, a neck-specific questionnaire, has been cited in the literature as the criterion standard for many other questionnaires and is the most valid of the tools reported.<sup>41,50,52,69</sup> The ASPS, CSOQ, CPH42, and NDI were all responsive to change with some variation.<sup>46,48</sup> The CNFDS was tested on patients with chronic neck pain and showed moderate to good validity.<sup>55</sup> The CSOQ and the CNFDS both showed good reliability.<sup>48,55</sup>

### Assessing physical abilities

#### Range of motion of the cervical spine

Studies reporting range of motion (ROM) include intersegmental ROM of the cervical spine and passive and active ROM of the neck measured in patients with neck pain and in controls. Intersegmental cervical spine motion, tested by physical therapists, had slight to moderate interrater reliability ( $\kappa = 0.05-0.61$ ).<sup>71-73</sup> Interrater examination reliability for passive cervical ROM has also been shown as slight to moderate.<sup>29,71</sup> Active ROM of the cervical spine can be visually estimated by clinicians or measured with external devices.<sup>40,74-80</sup> Only one of the studies for active ROM of the neck used a criterion standard (radiography in asymptomatic subjects) as a comparison.<sup>79</sup> Active ROM of the neck estimated visually was as reliable as using an external device for intrarater and interrater reliability.<sup>28</sup> The variations in ratings were about 10° for intrarater and 20° for interrater measurements irrespective of method used.<sup>80</sup> Measurements of protraction and retraction of the head showed less reliability compared with flexion, extension, side bending, or rotation of the head.<sup>76,77</sup>

Patients with neck pain had slightly decreased active ROM when compared with individuals with no neck pain, but there was a large degree of overlap between groups.<sup>75,76</sup> Chronic whiplash-associated disorders (WAD) patients had significantly lower volitional

ROM in the cervical spine compared with controls.<sup>79</sup> It appears that functional active ROM of the neck is used widely as a diagnostic tool in many studies regarding patients with neck pain. It is also used in research as an assessment tool to test the usefulness of various treatment interventions. Interrater and intrarater reliability in active ROM measurements is moderate with or without external devices especially for neck flexion, extension, side bending, and rotation.

#### Muscle strength and endurance

Muscle testing of the neck and upper extremity for diagnostic purposes had consistent slight to moderate interexaminer reliability ( $\kappa \leq 60$ ) in patients with neck pain.<sup>40,81</sup> There is some evidence that patients with chronic neck pain have slightly lower neck strength compared with control subjects.<sup>75</sup> In subjects with neck pain, self-reported pain and disability ratings showed no correlation with strength measurements.<sup>29,75,82</sup>

One study evaluated neck muscle endurance in patients with WAD compared with age-matched healthy controls.<sup>83</sup> Cervical flexor endurance tested in a supine position could distinguish well between WAD patients and the controls. Muscle endurance measurement by electromyography for repeated forward flexion of the arm tested in people with neck pain and myalgia compared with symptom-free subjects was significantly lower.<sup>82</sup>

#### Palpation of trigger and tender points

Assessments of trigger points around the neck by clinicians have fair to moderate interrater reliability ( $\kappa = 0.24-0.56$ ) in patients with acute or chronic neck pain.<sup>81</sup> In a study with patients with chronic neck pain, using an algometer increased interrater reliability for trigger point examination from moderate to excellent.<sup>77</sup> When palpation around the neck in patients and nonpatients was tested against a criterion standard (pain elicitation on physical examination), the sensitivity and specificity for trigger points were about 80% for both.<sup>84,85</sup>

#### Objective functional tests: lifting, stepping, and walking tests

There is some evidence from a construct validity study that patients with chronic neck pain and high neck pain intensity during functional testing have low performance.<sup>86</sup>

#### Limitations

There are limitations to this study. The computerized search included only MEDLINE and CINAHL, and all



searches were limited to English-language studies. It is possible that other relevant outcome measures were not identified based upon the search terms and strategies that we used. This article is a qualitative review that summarizes and critically synthesizes the relevant findings in a narrative fashion with its inherent limitations. Because our focus was not on a single research question, we did not follow the strict criteria to evaluate the methodological quality that most systematic reviews use. Each study that was identified through the literature search was evaluated for inclusion based on the relevance of its context to the purpose of our study and not on level of evidence.

## Conclusion

Different types of neck pain definitions appear in the literature based on anatomical location, etiology, severity, and duration of symptoms. Classification according to severity and duration of symptoms and the establishment of clearly outlined inclusion and exclusion criteria help researchers to form homogeneous groups representative of the population under study and also help clinicians to apply the best evidence-based treatment. The multidimensionality of chronic neck pain is fully accepted, and the biopsychosocial model is implemented increasingly in diagnostics and the treatment of patients with neck pain.

Outcome measures assessing patients with neck pain are used widely in research and in clinical settings to establish baselines, to evaluate the effect of an intervention, to assist in goal setting, and to motivate patients to evaluate their treatment. Because of the multifactorial nature of chronic neck pain, either multidimensional indexes or more than one index may be needed to gain a complete health profile of the patient with neck pain. The instruments used including clinical tests and self-administered questionnaires should be reliable, valid, and able to evaluate the effect of treatment.

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