

# Course and Prognostic Factors for Neck Pain in the General Population

## Results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders

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### Study Design.

**Best evidence synthesis.**  
**Objective.** To undertake a best evidence synthesis on course and prognosis of neck pain and its associated disorders in the general population.

**Summary of Background Data.** Knowing the course of neck pain guides expectations for recovery. Identifying prognostic factors assists in planning public policies, formulating interventions, and promoting lifestyle changes to decrease the burden of neck pain.

**Methods.** The Bone and Joint Decade 2000–2010 Task Force on Neck Pain and its Associated Disorders (Neck Pain Task Force) conducted a critical review of literature published between 1980 and 2006 to assemble

the best evidence on neck pain. Findings from studies meeting criteria for scientific validity were abstracted into evidence tables and included in a best evidence synthesis.

**Results.** We found 226 articles on the course and prognostic factors in neck pain and its associated disorders. After critical review, 70 (31%) of these were accepted on scientific merit. Six studies related to course and 7 to prognostic factors in the general population. Between half and three quarters of persons in these populations with current neck pain will report neck pain again 1 to 5 years later. Younger age predicted better outcome. General exercise was unassociated with outcome, although regular bicycling predicted poor outcome in 1 study. Psychosocial factors, including psychologic health, coping patterns, and need to socialize, were the strongest prognostic factors. Several potential prognostic factors have not been well studied, including degenerative changes, genetic factors, and compensation policies.

**Conclusion.** The Neck Pain Task Force undertook a best evidence synthesis to establish a baseline of the current best evidence on the course and prognosis for this symptom. General exercise was not prognostic of better outcome; however, several psychosocial factors were prognostic of outcome.

**Key words:** neck pain, systematic review, epidemiology, prognosis. **Spine 2008;33:S75–S82**

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Neck pain is a common human phenomenon.<sup>1</sup> In the general population, up to 30% to 50% of adults will experience neck pain in any given year.<sup>2</sup> Whether neck pain is likely to improve, reoccur, persist, or worsen (in other words, the “course” of neck pain), is an important question—not only to people with neck pain and their health care providers, but also to policy makers and researchers. Knowledge of the course of neck pain helps to guide the expectations of people with neck pain and their health care providers. In addition, this knowledge helps us determine the effectiveness of interventions by establishing whether a particular intervention improves (or worsens) the usual course of recovery from neck pain problems.

Similarly, understanding what determines the course of neck pain (in other words, the prognostic factors), may help patients and providers plan more effective lifestyle changes, and may also lead to more constructive health care policies. This is especially true when it comes to identifying modifiable prognostic factors—

those which can be influenced by some type of action—because these may serve as useful targets for intervention studies. Identifying nonmodifiable prognostic factors—those which are not easily amenable to change—is also important, because it allows us to determine which individuals with neck pain are at high risk for developing persistent and limiting neck pain problems.

Like research into factors which play a role in the new onset of neck symptoms, research on the course of neck pain and the identification of prognostic factors requires longitudinal research designs (for example, cohort or case-control studies), which permit tracking of study participants over time. In contrast, cross-sectional studies are those in which the potential explanatory factors and prevalent neck pain are assessed at the same point, providing a “snapshot” in time. Such studies can only suggest possible prognostic associations because of the impossibility of determining temporal sequencing. Any such factor found to be associated with neck pain at one point in time could be a precursor (risk factor), a prognostic factor for failure to recover, or a consequence of neck pain. Although cross-sectional studies are valuable in informing us about the experience of neck pain and in planning policy, they do not inform us about course of neck pain or about what factors predict that course. Therefore, findings from cross-sectional studies are not reported here, but are included with the findings on the burden and determinants of neck pain.<sup>2-4</sup>

Studies of prognostic factors are frequently confused with studies of risk factors. Both require longitudinal research designs; however, cohort studies of risk factors must start with people with no neck pain at the start of the study. The researchers then track these people over months and years to time to identify what factors and characteristics distinguish those who subsequently develop neck pain from those who do not. Studies of prognostic factors must start with people who have neck pain at the start of the study. These individuals are then tracked through time to identify what factors and characteristics distinguish those people who recover from their neck pain from those who do not. In other words, prognostic factors are those factors or circumstances which predict the course of recovery—or the failure to recover—from neck pain.

In examining findings from longitudinal studies, the strength of the evidence should always be considered. One paradigm classifies cohort studies into a 3-level hierarchy of knowledge. This model has been used to interpret evidence obtained in prognostic studies of breast cancer, whiplash-associated disorders (WAD), and mild traumatic brain injuries.<sup>5-8</sup>

- Phase I studies explore associations between potential prognostic factors and health outcomes in a descriptive way, so that only crude (descriptive) associations are reported. For example, a phase I study would only investigate the association between age and recovery from neck pain.

- Phase II studies involve more extensive analyses, but are still exploratory. These studies use well formulated comparison groups, stratified analyses, and/or multivariable analyses to focus on sets of prognostic factors. For example, a phase II study might include age, gender, physical and mental health status, and frequency of exercise in a multivariable analysis to predict recovery from neck pain.

- A phase III study is confirmatory. The goal is to test a specific hypothesis, that is, to confirm or refute the independence of any apparent relationship between a particular prognostic factor and the outcome of interest. This type of cohort study explicitly identifies and controls for confounding. A “confounder” is defined as a third factor which is (a) associated with the prognostic factor of interest; (b) predicts the outcome; (c) accounts for (explains) some or all of the observed relationship between the prognostic factor of interest and the outcome; and (d) is not caused by the prognostic factor of interest. For example, a phase III study might involve an explicit hypothesis about the relationship between physical fitness and recovery from injury; confounders would be explicitly identified and controlled for in the multivariable analysis. This type of study would confirm (or refute) the independent association between a particular prognostic factor (in our example, physical fitness) and the outcome (in our example, recovery from neck pain).

In the current article, we have used this hierarchy to assist in the interpretation of the findings from prognostic studies. We present separate articles for the course and prognostic factors of neck pain in the general population (the current article); of neck pain in workers<sup>9</sup>; and of neck pain in traffic-related WAD.<sup>10</sup> Although there maybe many similarities across these populations, we believe that this way of organizing our findings will be most useful to audiences.

The current article reports our findings on course of neck pain and prognostic factors for neck pain in the general population. Studies reporting the impact of treatment on recovery from neck pain are reported elsewhere.<sup>11,12</sup>

## ■ Methods

### **Design and Data Collection**

We conducted a systematic search and critical review of the literature. The search and review strategies are outlined in detail elsewhere.<sup>13</sup> In brief, we systematically searched the electronic library database Medline for literature published from 1980 through 2005 on neck pain and its associated disorders, we systematically checked the reference lists of relevant articles and we updated our search to include key articles from 2006 and early 2007. Details of our electronic search strategy are outlined in Carroll *et al*<sup>13</sup> and online through Article Plus.

### **Relevance Screening**

We screened each citation for relevance to the Neck Pain Task Force mandate, using *a priori* inclusion and exclusion criteria. We made no attempt to assess the scientific quality of each study when establishing its relevance to the Neck Pain Task Force mandate. Studies were considered relevant if:

- They pertained to the assessment, incidence, prevalence, determinants or risk factors, prevention, course, prognosis, treatment and rehabilitation, and/or the economic costs of neck pain.
- They contained data and findings specific to neck pain and/or disorders associated with neck pain or described a systematic review of the literature on neck pain.
- They included at least 20 persons with neck pain or at risk for neck pain.

We excluded studies on neck pain that was associated with serious local pathology or systemic disease, such as neck pain from infections, myelopathy; rheumatoid arthritis and other inflammatory joint diseases; or tumors. We also excluded neck pain from fractures or dislocations, except for diagnostic studies relating to ruling out fractures and dislocations in neck pain, which were included critical review. Screening criteria are outlined in more detail in Carroll *et al.*<sup>13</sup>

### Quality Assessment

Rotating pairs of Scientific Secretariat members performed independent in-depth critical reviews of each article, identifying methodologic strengths and weaknesses. The forms used in the methodologic appraisal of the studies can be seen online through Article Plus. Our methodologic appraisal focused on sources of potential selection bias, information bias, and confounding. We also considered whether or not these biases would likely result in erroneous or misleading conclusions. After discussions of each article, judgments were made about the article's scientific merit.

Studies judged to have adequate internal validity and to be methodologically rigorous, such that the results could be accepted with reasonable confidence, were considered to be scientifically admissible and were included in the best evidence synthesis.

### Analysis

Within the studies related to prognosis of neck pain in the general population, we present separate tables for those studies reporting the course of neck pain and those reporting prognostic factors for recovery from neck pain. We used the term "course" of neck pain because "natural history" is generally understood to mean the course of disease in the absence of interventions, and the presence or absence of interventions was frequently not mentioned in the studies.

The methodologically rigorous articles (the scientifically admissible articles) on this topic were synthesized according to the principles of best evidence synthesis.<sup>14,15</sup> This consists of (a) the development of evidence tables, which summarize the evidence from those studies judged to be scientifically admissible studies; and (b) a qualitative synthesis—clearly linked to the evidence tables—of these studies.<sup>14–16</sup>

We classified the scientifically admissible studies which identified prognostic factors into phase I, II, or III studies (described earlier in this document). We used this framework in our development of summary statements of the evidence; where the evidence from different studies varied, more emphasis was given to evidence from well-conducted phase III studies, and secondarily, to evidence from well-conducted phase II studies. These summary statements were discussed and debated by the Neck Pain Task Force Scientific Secretariat as a whole, and conclusions were endorsed by all members of the Scientific Secretariat.<sup>13</sup>

In accordance with our conceptual frame work on the course and care of neck pain,<sup>17</sup> and similar to the organization of risk factors for new onset (incidence) of neck pain,<sup>2–4</sup> we further classified prognostic factors into the following general categories.

- Demographic and socioeconomic factors: These are usually either nonmodifiable (for example, age and gender) or not easily modifiable (for example, socioeconomic status).
- Health factors and pain history: These can be classified as "impairments" according to the World Health Organization's International Classification of Function, Disability and Health (ICF) framework.<sup>18</sup>
- Workplace factors: Many of these are potentially modifiable.
- Psychologic factors: Again, many of these are potentially modifiable.
- Societal factors such as compensation systems and laws: These are potentially modifiable, although not on an individual basis.
- Genetic factors: These are potentially important prognostic factors, although not considered modifiable.
- Health behaviors: These include health lifestyle factors, such as physical exercise, and are potentially modifiable.

## ■ Results

We found 226 articles in our literature search pertaining to the course and prognostic factors for neck pain. After critically reviewing these studies, we judged that 70 were scientifically admissible, that is, to be of sufficient scientific merit to be included in the best evidence synthesis. Nine of these studies pertained to course and prognostic factors for neck pain in the general population and in primary health care settings. These studies are summarized in Tables 1 and 2 (available online through Article Plus). The heterogeneity of the study populations, prognostic factors considered, follow-up periods, outcomes, and analyses do not support statistical pooling of results; therefore our findings are presented for each study in our evidence tables and form the basis for our summary and conclusions.

### The Course of Neck Pain

We deemed 6 studies (involving 5 separate cohorts of persons with neck pain) on the course of neck pain in the general population and in primary health care settings to be scientifically admissible (Table 1, available online through Article Plus). These were:

- Bot *et al's* study of general practice patients in the Netherlands who were seeking health care for new episodes of neck pain.<sup>19</sup>
- Hill *et al's* study of adults in the general population in the United Kingdom (registered in general practice registries) reporting having neck pain for more than 1 day during past month.<sup>20</sup> Given the general practice registry system in the United Kingdom, this can be considered to be a general population sample.
- Côté *et al's* study of adults in the general population in Canada with a 6-month period prevalence of neck pain.<sup>21</sup>
- Pernold *et al's* study of adults in the general population in Sweden with a history of health care for neck pain, but who had not sought health care for their pain in the 6 months before the start of the study.<sup>22</sup>
- Two reports by Mikkelsen *et al* concerning grades 3 and 5 schoolchildren in Finland who had experienced neck pain at least once a week in the previous 3 months.<sup>23,24</sup>

Most of the evidence indicates that between half and three quarters of people who experience neck pain at some initial point will report neck pain 1 to 5 years later. Specific findings from the studies reporting on the course of neck pain in the general population and in primary health care settings are as follows:

Forty-eight percent of the children with initial neck pain at least once a week reported neck pain of at least the same severity 1 year later.<sup>23,24</sup> Similarly, 48% of the general practice patients who experienced initial neck pain for longer than 1 day during the previous month reported having neck pain of at least the same frequency 1 year later.<sup>20</sup>

Reflecting somewhat more stringent criteria to define cases (the Chronic Pain Questionnaire),<sup>25</sup> the Canadian study of adults in the general population reports that only 36.6% (of those with prevalent pain at baseline) experienced resolution (no neck pain) within the following year, with 37.3% reporting no change (over follow-up) in neck pain intensity or disability (defined in this context as days off work due to pain and/or limitations in activities of daily living). In this study, 32.7% of those with initially intense and/or disabling neck pain reported some degree of improvement (without complete resolution); and 9.9% of those with initially nondisabling neck pain reported disabling (that is, worse) neck pain at follow-up. A recurrent course (recovery to no neck pain, followed by aggravation), was reported by almost one quarter of those with initial neck pain who had experienced complete recovery at the interim follow-up.<sup>21</sup> Findings were similar in general practice patients in the Netherlands (presenting with new episodes of neck pain) with 32% reporting recovery in neck pain.<sup>19</sup> In the Swedish general population sample, 22% of the men and 15% of the women with a history of seeking health care for neck pain reported having no neck pain 5 years later, although most (75% of the men and 59% of the women) had experienced some decrease in neck pain intensity at the 5-year mark.<sup>22</sup>

#### **Prognostic Factors for Neck Pain**

We accepted 4 cohort studies of prognostic factors for neck pain in the general population and in those seeking primary health care (Table 2, available online through Article Plus), and another study of persons with chronic pain in a rehabilitation setting. These studies included the following subjects/settings:

- Côté *et al*'s study of adults in the general population in Canada with 6-month period prevalence of neck pain<sup>21</sup> (also reported in the previous "course of neck pain" section).
- Pernold *et al*'s study of adults in the general population in Sweden with neck pain, but who had not sought treatment for neck or shoulder disorders in the 6 months before the study onset<sup>22</sup> (also reported in the previous course of neck pain section).
- Hill *et al*'s study of adults registered at 2 primary care practices in the United Kingdom (general population sample) who had reported neck pain for longer

than 1 day in the previous month<sup>20</sup> (also reported in the previous course of neck pain section).

- Bot *et al*'s study of adult general practice patients in the Netherlands who were seeking health care for new episodes of neck pain<sup>19</sup> (also reported in the previous course of neck pain section).
- Michaelson *et al*'s study of adult patients with chronic neck pain assigned to a Swedish inpatient rehabilitation center.<sup>26</sup>

Two other studies were cohort analyses of data collected within the context of a randomized trial. Specifically, these were studies of:

- Hurwitz *et al*'s study of adult patients presenting with neck pain to a healthcare organization in California and enrolled in a randomized trial.<sup>27</sup>
- Stanton *et al*'s study of adult patients in Australia with cervicogenic headache, recruited by referrals from primary care physicians and newspaper ads, and enrolled in a randomized trial.<sup>28</sup>

Although prognostic findings from highly selected samples such as randomized controlled trials and tertiary treatment programs may be internally valid, one should be cautious in generalizing such findings beyond the specific groups involved in these studies.

#### **Demographic and Socioeconomic Factors**

The evidence for the prognostic role of gender in neck pain outcome varied. We accepted 5 studies which examined gender as a prognostic factor.<sup>19–22,26</sup> Two phase I studies looking at general population samples found a modest effect of gender, in that men were 33%<sup>21</sup> and 47%<sup>22</sup> more likely than women to have complete resolution of neck pain over a 1-year and 5-year follow-up period, respectively. The former study also reported that women were 19% more likely than men to have persistent pain. However, there were no gender differences in rates of improvement, aggravation, or recurrence of neck pain over a 1-year period.<sup>21</sup> The second study which noted a gender effect at a single 5-year follow-up point found that men were 27% more likely than women to have experienced some degree of improvement in their neck pain.<sup>22</sup> However, the 3 phase II studies found no gender differences in recovery from neck pain.<sup>20,26,29</sup>

There is consistent evidence that younger age is prognostic of better recovery from neck pain in the general population. Younger age was associated with better outcome in all 4 studies (phase I and II studies) assessing this prognostic factor. Three of the 4 studies reported a decrease in positive outcome with increasing age (*i.e.*, the older the age, the worse the prognosis). In a general practice sample of persons presenting with new episodes of neck pain, older age was incrementally associated with less improvement in functional disability (defined in that study as difficulty performing a variety of activities). However, in that same study, age was not associated with self-assessed global recovery or change in pain intensity.<sup>19</sup> Older age (age was dichotomized at 45 years)

was also linked to less complete resolution of pain and to more persistent pain in a general population of persons with neck pain.<sup>21</sup> Older age was also incrementally associated with less reduction in neck pain intensity in patients with chronic pain who attended inpatient rehabilitation.<sup>26</sup> However, Hill *et al* found that whereas the youngest age group (under 30 years old) recovered the fastest, those general practice patients aged 45 to 59 years were almost 4 times more likely than those under age 30 to continue reporting neck pain (which lasted longer than 1 day) in the previous month. Those aged 30 to 44 and 60 to 75 were approximately twice as likely to report continued neck pain as the youngest age group.<sup>20</sup>

### **Prior Health, Prior Pain, Comorbidities**

There is consistent evidence from 3 phase II studies and 1 phase III study that health and pain-related factors are prognostic of neck pain outcome in the general population. These factors include: initial pain intensity, duration, and pain-related difficulties in performing activities<sup>19</sup>; prior neck/shoulder symptoms,<sup>19</sup> prior neck injury<sup>20</sup>; comorbid low back pain<sup>20</sup>; and self-perceived poor general health.<sup>19,27</sup> All these factors predicted the presence and/or greater intensity of neck pain at follow-up. However, the impact of these factors was modest, with odds ratios (ORs) of 2 or less in most studies. In addition, among persons with chronic neck pain attending an inpatient rehabilitation program, the presence of other (nonpain) symptoms at the beginning of the program was a weak predictor of less reduction in neck pain intensity 1 year later (OR = 0.91); however, other health indexes (prior sick leave, physical endurance, and pain duration) were not associated with pain reduction.<sup>26</sup>

We found no scientifically admissible studies examining the role of degenerative changes as a prognostic factor in recovery from neck pain in the general population.

### **Workplace Factors**

Only 1 scientifically admissible study (Hill *et al*, a phase II study) assessed the prognostic role of employment status (employed *vs.* not employed) and workplace factors (job satisfaction, physical demands at work including standing, sitting, digging, driving, lifting) in a general adult population.<sup>20</sup> In a general population sample with prevalent pain at baseline (defined as pain which had lasted longer than 1 day in the previous month), those who were not employed at baseline were 60% more likely than those who were employed to report the same frequency of pain (again, defined as pain lasting longer than 1 day in the previous month) 1 year later. However, because pain at baseline was preexisting (rather than new onset), the temporal relationship between employment status and prior pain is unclear. In the group of persons who were employed, however, none of the other workplace factors under consideration predicted pain presence at 1 year.<sup>20</sup> Employment status did not predict the degree of pain reduction in chronic neck pain patients 1 year after inpatient rehabilitation.<sup>26</sup>

### **Psychologic and Social Factors (Non-Work Related)**

The preponderance of evidence indicates that psychologic factors are important in neck pain outcome within general and clinical populations. Psychologic and social factors were investigated in 4 phase II and III studies, although each study investigated different psychologic factors. Passive coping (worrying, fear avoidance) predicted poorer outcome,<sup>19</sup> as did coping strategies that involved getting angry or frustrated.<sup>27</sup> Vitality,<sup>19</sup> greater social support, and coping that involved self-assurance predicted better outcome.<sup>27</sup> In addition, being more optimistic and having less of a need to be social predicted greater reduction in neck pain intensity.<sup>26</sup>

The associations between the psychologic and social prognostic factors under evaluation and recovery were generally stronger than the associations seen in other categories of prognostic factors (that is, most of the ORs for these factors were between 2 and 6). Hill *et al*'s findings suggested an association between poor psychologic health and persistent pain (OR = 1.7), but these findings lacked precision and did not reach statistical significance (95% confidence interval 1.0–3.2).<sup>20</sup> Furthermore, in a randomized controlled study of interventions (Stanton *et al*), persons with higher external locus of control were somewhat more likely (OR 1.2–1.3) to experience a reduction in headache frequency from the manipulation/exercise treatment compared with patients who were taking medication only (the comparison arm of the trial).<sup>28</sup>

The single phase II study of a tertiary care population (by Michaelson *et al*), consisting of patients receiving inpatient rehabilitation for chronic neck pain, did not find an association between pretreatment depression and pain intensity reduction at 1 year.<sup>26</sup>

### **Societal Factors**

We found no scientifically admissible study or studies examining the effect of prevailing compensation or other legal/policy on the prognosis for neck pain in these populations.

### **Genetic Factors**

We found no scientifically admissible study or studies examining the effect of genetic factors on prognosis of neck pain in the general population or in primary health care patients.

### **Health Behaviors**

Evidence was mixed about the prognostic value of exercise or physical activity in the outcome of neck pain in the general population. Of the 3 studies examining physical activity as a potential prognostic factor for neck pain,<sup>19,20,22</sup> the 2 phase I and II studies (by Bot *et al* and Pernold *et al*) of general physical activity level at baseline found no association.<sup>19,22</sup> However, Hill *et al* (a phase II study) found that after a year of follow-up, those who reported regularly bicycling (at the time of the baseline questionnaire) were more than twice as likely to report experiencing neck pain lasting longer than 1 day in the previous month.<sup>20</sup> The same study found that physical

strain (at work or in leisure activities) was not associated with recurrence or persistence of neck pain.<sup>20</sup>

## ■ Discussion

Like neck pain in workers and neck pain in WAD, neck pain in the general population is frequently persistent and/or recurrent.<sup>9,10</sup> Studies suggest that between 50% and 85% of people in the general population (or in primary care setting) who experience neck pain at some initial point will report neck pain 1 to 5 years later. Estimates varied by populations studied and across case definitions for neck pain. Moreover, in all but 1 study (Côté *et al*),<sup>21</sup> it was impossible to determine what proportion of participants experienced persistent *versus* recurrent neck pain. This particular study assessed 6-month period prevalence of neck pain at 6-month intervals in a general population, and thus provides more detailed information on the course of neck pain.<sup>21</sup> In this sample, approximately 10% of subjects with initially mild or intense but nondisabling neck pain reported neck pain that became disabling over the follow-up period; whereas one-fifth experienced recovery followed by worsening; and almost 40% experienced persistent levels of neck pain. However, even in this study, it is unclear what proportion of individuals experienced continuous neck pain. Even so, the evidence is clear that most people with neck pain do not experience a complete resolution of this problem.

Like the studies examining gender as a risk factor for new onset of neck pain in these populations,<sup>2</sup> the evidence on gender as a predictor of recovery from neck pain is equivocal—approximately half the studies examining this issue found that women had poorer outcomes compared to men, whereas the remaining studies noted no effect of gender. Interestingly, although Bot *et al* reported a higher incidence of neck pain among women found no gender differences in prognosis.<sup>19,29</sup> No study found that men with neck pain had a poorer prognosis. However, even in the studies reporting poorer prognosis for women with neck pain, the impact was generally modest. We conclude, therefore, that gender is, at best, a weak predictor of recovery for neck pain in this population.

The evidence regarding age as a prognostic factor in neck pain was consistent: young age was associated with better prognosis in all studies examining this issue. However, again, there was not a large impact of age, suggesting that although older age played a consistent role in predicting poorer prognosis for neck pain, it was a weak predictor of recovery. Although most studies of age dichotomized younger *versus* older or examined age as a continuous variable, 1 study which trichotomized age (divided people into 3 age groups) reported the largest impact on recovery in the middle group (those aged 45–59 years).<sup>20</sup> This group was almost 4 times more likely to experience chronic, recurrent, or continuous neck pain compared with the older or younger groups. This is congruent with the literature on risk,<sup>2</sup> and provides preliminary evidence suggesting that the highest risk and poor-

est prognosis for neck pain is during the middle aged years. This should be confirmed in further studies.

There was a wide variety of indexes of health and health-related factors in the reviewed literature. In general, prior pain and/or injuries and poor health predicted greater presence and/or greater intensity of neck pain at follow-up, although the associations were modest. Despite preliminary findings that regular physical activity protects against onset of neck pain in the general population,<sup>2</sup> and that exercise is an important component of treatment for neck pain,<sup>12</sup> the prognostic studies evaluating this factor found that initial levels of exercise were not associated with persistence or with recurrence of neck pain at follow-up. In fact, regular bicycling was associated with poorer prognosis in 1 study.<sup>20</sup> However, physical fitness and exercise levels are difficult to measure in self-report questionnaires; and, moreover, increases in exercise levels over the follow-up period have not been evaluated. Prognosis may also depend on whether or not the exercises themselves were designed to impact the neck and shoulder areas.

Better psychologic health (measured in a variety of ways) and greater social support predicted a better outcome in primary care and general population samples with initial neck pain, whereas passive coping predicted a worse outcome. The associations between these psychologic factors and continued pain at follow-up were generally stronger than the associations seen for other types of prognostic factors. These findings are in keeping with the best evidence on risk for new episodes of neck pain, where poor psychologic health was associated with neck pain and was also a risk factor for new episodes. Although psychologic functioning is a potentially modifiable prognostic factor (and therefore a potential intervention target for trials), few trials have explored the impact of psychologic interventions alone, outside the context of multimodal treatment approaches to neck pain.

In summary, to the extent that common factors have been studied, the evidence suggests that most factors which predict poor outcome in persons with neck pain are consistent with those factors that increase the risk for new neck pain (or neck pain episodes).

### **State of the Literature and Study Limitations**

The scientifically admissible literature on prognostic factors within the general population and for persons in primary health care settings is not extensive, although the studies included in the best evidence synthesis were well designed. It is likely that the 2 populations considered here—the general population and patients seeking primary care—are quite similar with respect to prognostic factors for neck pain outcome. Most studies used multivariable analyses to identify the presence and strength of prognostic factors. However, our best evidence synthesis of prognosis in these settings is based on only 6 studies. A seventh study used a distinct sample of persons with longstanding, functionally-limiting pain which had led them to be referred for inpatient rehabil-

itation. One might expect prognostic factors in this particular population to be different from those in general populations and in primary health care settings.

Identification of prognostic factors can guide expectations for recovery and, where these prognostic factors are modifiable, can guide considerations of what intervention targets will be the most productive. This is especially true when the effect of that factor on neck pain outcome is large. Most of the prognostic factors identified in this literature had only a modest association with outcome of neck pain. In addition, we should point out the wide variety of case definitions of neck pain and prognostic factors that we encountered in the literature. This suggests we should use caution in drawing firm conclusions at this time.

One promising exception involves psychologic factors, although few studies looked at the same psychologic constructs. The importance of this group of prognostic factors needs to be confirmed in additional phase III studies; in addition, if these are to be studied in the context of intervention trials, we need confirmation that they are indeed modifiable. Some such evidence exists—for example coping strategies in chronic pain samples have been reported to be amenable to change via cognitive-behavioral or multimodal interventions.<sup>30–32</sup>

Limitations in the literature we reviewed are outlined above. However, the methodology used in the synthesis of the best evidence also has some limitations (outlined in more detail elsewhere).<sup>13</sup>

In particular, although there is a large overlap among journals indexed in Medline and in other electronic health databases, it is possible that using only Medline resulted in missing studies that may have informed this best evidence synthesis. There is also controversy about whether systematic literature reviews should report findings from all relevant studies or use a best evidence synthesis, as we did. We believe that using a best evidence synthesis approach, that is, reporting evidence only from those studies we judged to have adequate validity, increases the validity of the conclusions.

There are also some limitations specific to our systematic review of prognosis of neck pain in the general population. First, although all articles used in our analysis were judged to be scientifically admissible, the quality and methodology of the studies still varied considerably. In particular, the adequacy of control of confounders varied widely among studies. We attempted to address this potential source of bias by classifying studies into phase I, II, and III and by giving greater scientific weight to studies that explicitly controlled for confounders (*i.e.*, phase III studies).

Second, we made no conclusions about some prognostic factors, indicating that the evidence varied too much among studies to reach firm conclusions. In some cases, this variability may have been due to an attempt to combine studies which diverged because of population-specific effects (that is, the strength and direction of the association varies in the populations in

question), and that there was no genuine contradiction between studies.

### Research Priorities

We propose the following high priorities for future research in this area.

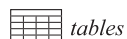
- There should be closer tracking of the usual course of neck pain. Although continuous neck pain and recurrent neck pain both reflect failure to recover, there may be different consequences and prognostic factors for these states.
- Studies are needed to confirm or refute the suggestion that middle-aged persons are at the greatest risk of persistent neck pain.
- Studies to assess the role of degenerative disc changes in recovery from neck pain are required.
- Studies examining the role of compensation systems, policies, and legal factors in prognosis for recovery are also required.
- Studies examining the effect of genetic factors on neck pain prognosis would be useful.
- Further studies are needed to examine the role of exercise and fitness levels on the outcome of neck pain episodes. Given uncertainty about self-reports of fitness or exercise levels, these factors should preferably be assessed using objective criteria rather than self-report. It might also be important to determine the type of exercise as part of this research.

Research priorities and recommendations to improve the quality of prognostic studies are outlined in more detail in Carroll *et al.*<sup>33</sup>

### Key Points

- Most people (50%–85%) in the general population with neck pain do not experience a complete resolution of this problem.
- Younger people have a better prognosis, and 1 study suggests that those in middle age have the poorest prognosis.
- Poor health and prior pain episodes are associated with a poorer prognosis; however, the effect of these factors was modest. Psychologic factors are important in prognosis for neck pain in the general population. Poor psychologic health, and worrying, becoming angry, or becoming frustrated in response to neck pain, were associated with poorer prognosis. Greater optimism, coping that involves self-assurance, and having less need to socialize, were all associated with better prognosis. The impact of psychologic factors was of at least moderate strength (*i.e.*, most ORs in these studies were between 2 and 6).

- There is preliminary evidence from 2 studies that general exercise at baseline is not associated with prognosis; however, 1 study found those who engage in regular bicycling have a poorer prognosis.



tables

Tables available online through Article Plus.

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