

**Prognostic factors of whiplash-associated disorders:  
A systematic review of prospective cohort studies**

**Pain**

**July 2003, Vol. 104, pp. 303–322**

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FROM ABSTRACT

We present a systematic review of prospective cohort studies. Our aim was to assess prognostic factors associated with functional recovery of patients with whiplash injuries.

The failure of some patients to recover following whiplash injury has been linked to a number of prognostic factors. However, there is some inconsistency in the literature and there have been no systematic attempts to analyze the level of evidence for prognostic factors in whiplash recovery.

Studies were selected for inclusion following a comprehensive search of MEDLINE, EMBASE, CINAHL, the database of the Dutch Institute of Allied Health Professions up until April 2002 and hand searches of the reference lists of retrieved articles. Studies were selected if the objective was to assess prognostic factors associated with recovery; the design was a prospective cohort study; the study population included at least an identifiable subgroup of patients suffering from a whiplash injury; and the paper was a full report published in English, German, French or Dutch. The methodological quality was independently assessed by two reviewers. A study was considered to be of 'high quality' if it satisfied at least 50% of the maximum available quality score. Two independent reviewers extracted data and the association between prognostic factors and functional recovery was calculated in terms of risk estimates.

Fifty papers reporting on twenty-nine cohorts were included in the review. Twelve cohorts were considered to be of 'high quality'. Because of the heterogeneity of patient selection, type of prognostic factors and outcome measures, no statistical pooling was able to be performed.

Strong evidence was found for high initial pain intensity being an adverse prognostic factor.

There was strong evidence that for older age, female gender, high acute psychological response, angular deformity of the neck, rear-end collision, and compensation not being associated with an adverse prognosis.

Several physical (e.g. restricted range of motion, high number of complaints), psychosocial (previous psychological problems), neuropsychosocial factors (nervousness), crash related (e.g. accident on highway) and treatment related factors (need to resume physiotherapy) showed limited prognostic value for functional recovery.

High initial pain intensity is an important predictor for delayed functional recovery for patients with whiplash injury.

Often mentioned factors like age, gender and compensation do not seem to be of prognostic value.

Scientific information about prognostic factors can guide physicians or other care providers to direct treatment and to probably prevent chronicity.

THESE AUTHORS ALSO NOTE:

“The term whiplash is defined as an acceleration-deceleration mechanism of energy transfer to the neck that results from rear-end or side-impact motor vehicle collisions, but can also result from diving or other mishaps.”

“The impact results in bony or soft-tissue injuries (whiplash injury), which in turn may lead to a variety of clinical manifestations called whiplash-associated disorders (WAD).”

“A significant proportion [of whiplash injured patients] develop chronic and often intractable and disabling symptoms.”

Studies on whiplash-injured patients report:

19 - 60% still have complaints at six months after a whiplash injury  
13 - 50% are still absent from work or not able to perform their usual activities at 6 months

It is problematic to assess factors for delayed recovery utilizing diverse definitions of recovery, such as pain, duration of absence from usual activities, or time-to-claim-closure.

The 1995 Quebec Task Force (QTF) on WAD did not provide evidence-based recommendations concerning prognostic factors for recovery because there was a shortage of adequate prognostic studies.

A 2001 study reviewed whiplash prognosis articles published after 1995, and found that age, gender, baseline pain intensity and radicular signs/symptoms were important prognostic factors for the outcome of whiplash.

[Cote P, Cassidy D, Carroll L, Frank JW, Bombadier C. A systematic review of the prognosis of acute whiplash and a new conceptual framework to synthesize the literature. Spine 2001;26:E445–58.]

“The aim of this review is to systematically review and summarize the current literature regarding the prognostic value of socio-demographic, physical, psychosocial, neuropsychological, crash-related, radiological, treatment and litigation factors for patients with WAD.”

“There is strong evidence that high initial pain intensity is associated with persisting symptoms.”

“We found strong evidence that older age, female gender, high acute psychological response, rear-end collision, angular deformity of the neck and compensation have no prognostic value for delayed functional recovery.”

“There is limited evidence that nervousness, accidents happening on the highway, stationary cars and need to resume physiotherapy are associated with persisting symptoms.”

“There is also limited evidence that a driving occupation, high initial pain intensity, restricted cervical range of motion, low muscle workload, high number of complaints and previous psychological problems are associated with continuing disability.”

“We found inconclusive evidence for factors such as radicular symptoms, sleep disturbances, cognitive impairments, unpreparedness for collision, turned head positions, previous headache, cervical degenerative changes and bulging discs.”

“Education level, head restraint, coping, anxiety or cognition did not show any prognostic value for functional recovery.”

## DISCUSSION

“Strong evidence was found for high initial pain intensity, and strong evidence for no prognostic value for older age, female gender, high acute psychological response, angular deformity of the neck, rear-end collision and compensation.”

“We found limited evidence for some physical, psychosocial, neuropsychological, crash related and treatment related factors having prognostic value.”

A problem in this study is that treatment in the cohorts was not fully described or standardized, and treatment can influence prognostic outcomes.

Another problem is that “there is no accepted definition of functional recovery.” Some studies used symptoms as an outcome measure while others used absence from work. Yet, the relationship between symptoms and absence from work is not strong.

Some studies used “time-to-claim closure” as a proxy for functional recovery, yet correlation with symptoms and work absence is unclear. Consequently, these cohorts could not be used in this review. [such as Cassidy JD, Carroll L, Cote P, Lemstra M, Berglund A, Nygren A. Effects of eliminating pain and suffering on the incidence and prognosis of whiplash claims. *N Engl J Med* 2000;342:1179–86]

These authors note that “reliable, validated and responsive instruments for symptoms, disability/participation” are the:

- 1) Neck Disability Index
- 2) Short Form-36 Health Survey

These authors claim this review is superior to previous systematic reviews for a number of reasons:

- 1) They did not restrict searches to studies reported only in English.
- 2) They only included papers with a prospective study design because this is considered to be the optimal design to identify the presence of prognostic factors and their association with the outcome.

Consequently, three large and well-known studies were not eligible for this review:

- 1) Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Duranceau J, Suissa S, Zeiss E. Scientific monograph of the Quebec Task Force on Whiplash Associated Disorders: redefining ‘whiplash’ and its management. *Spine* 1995;20(8S):8S–58S.
- 2) Schrader H, Obelieniene D, Bovim G, Surkiene D, Mickeviciene D, Miseviciene I, Sand T. Natural evolution of late whiplash syndrome outside the medicolegal context. *Lancet* 1996;347:1207–11.
- 3) Harder S, Veilleux M, Suissa S. The effect of socio-demographic and crash-related factors on the prognosis of whiplash. *J Clin Epidemiol* 1998;51: 377–84.

#### CLINICAL IMPLICATIONS:

“Physicians seeing acute whiplash patients with high initial pain intensity, restricted cervical range of motion, high number of complaints, previous psychological problems, nervousness and/or the accident on the highway should be aware that these are at risk for delayed recovery.”

#### CONCLUSIONS:

“We found positive evidence in the literature of high initial pain intensity being of significance as prognostic value for persisting symptoms.”

“We found strong evidence in the literature review of the following factors not influencing outcome: older age, female gender, high acute psychological response, angular deformity of the neck, rear-end collision and compensation.”

“Several physical (e.g. restricted range of motion, high number of complaints), psychosocial (previous psychological problems), neuropsychosocial factors (nervousness), crash related (e.g. accident on highway) and treatment related factors (need to resume physiotherapy) show limited prognostic value for functional recovery.”

“There was no evidence found to allow any conclusions on the influence of factors such as coping, anxiety, cognition, education level, head restraint, seat belt.”

#### KEY POINTS FROM DAN MURPHY:

1) “A significant proportion [of whiplash injured patients] develop chronic and often intractable and disabling symptoms:”

19% - 60% still have complaints at six months after a whiplash injury

13% - 50% are still absent from work or not able to perform their usual activities at 6 months after injury

2) This is the best quality study published to date (February 2010) pertaining to factors influencing whiplash prognosis, in part because:

A)) It is the only study to “systematically attempt to analyze the level of evidence” and grade such from prior published reviews.

B)) They did not restrict searches to studies reported only in English.

C)) They only included papers with a prospective study design because this is considered to be the optimal design to identify the presence of prognostic factors and their association with the outcome.

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[This is the original “Lithuania” study, often cited by insurance personnel to deny physical treatment.]

C)) Harder S, Veilleux M, Suissa S. The effect of socio-demographic and crash-related factors on the prognosis of whiplash. *J Clin Epidemiol* 1998;51: 377–84.

- 3) Several physical (e.g. restricted range of motion, high number of complaints), psychosocial (previous psychological problems), neuropsychosocial factors (nervousness), crash related (e.g. accident on highway) and treatment related factors (need to resume physiotherapy) showed limited prognostic value for functional recovery.
- 4) High initial pain intensity is an important predictor for delayed functional recovery for patients with whiplash injury.
- 5) Often mentioned factors like age, gender and compensation do not seem to be of prognostic value.
- 6) It is problematic to assess factors for delayed recovery utilizing diverse definitions of recovery, such as pain, duration of absence from usual activities, or time-to-claim-closure.  
[A)) Some who are pain-free may have altered their work or leisure activities to remain asymptomatic.  
B)) Many who have symptoms will continue to work.  
C)) Insurance claim closure may occur for procedural reasons or as a consequence of biased insurance medical examinations. Claim closure may occur in patients still in pain and/or unable to perform prior work/leisure activities.]
- 7) This study found:  
A)) "There is strong evidence that high initial pain intensity is associated with persisting symptoms."  
B)) "We found strong evidence that older age, female gender, high acute psychological response, rear-end collision, angular deformity of the neck and compensation have no prognostic value for delayed functional recovery."  
C)) "There is limited evidence that nervousness, accidents happening on the highway, stationary cars and need to resume physiotherapy are associated with persisting symptoms."  
D)) "There is also limited evidence that a driving occupation, restricted cervical range of motion, low muscle workload, high number of complaints and previous psychological problems are associated with continuing disability."  
E)) "We found inconclusive evidence for factors such as radicular symptoms, sleep disturbances, cognitive impairments, unpreparedness for collision, turned head positions, previous headache, cervical degenerative changes and bulging discs."  
F)) "Education level, head restraint, coping, anxiety or cognition did not show any prognostic value for functional recovery."

- 8) "Strong evidence was found for high initial pain intensity, and strong evidence for no prognostic value for older age, female gender, high acute psychological response, angular deformity of the neck, rear-end collision and compensation."
- 9) A problem in this study is that treatment in the cohorts was not fully described or standardized, and treatment can influence prognostic outcomes.
- 10) Another problem is that "there is no accepted definition of functional recovery." Some studies used symptoms as an outcome measure while others used absence from work. Yet, the relationship between symptoms and absence from work is not strong.
- 11) Some studies used "time-to-claim closure" as a proxy for functional recovery, yet correlation with symptoms and work absence is unclear. Consequently, these cohorts could not be used in this review. [such as Cassidy JD, Carroll L, Cote P, Lemstra M, Berglund A, Nygren A. Effects of eliminating pain and suffering on the incidence and prognosis of whiplash claims. *N Engl J Med* 2000;342:1179–86]
- 12) These authors note that "reliable, validated and responsive instruments for symptoms, disability/participation" are the:
- A)) Neck Disability Index
  - B)) Short Form-36 Health Survey
- 13) "Physicians seeing acute whiplash patients with high initial pain intensity, restricted cervical range of motion, high number of complaints, previous psychological problems, nervousness and/or the accident on the highway should be aware that these are at risk for delayed recovery.
- 14) "We found positive evidence in the literature of high initial pain intensity being of significance as prognostic value for persisting symptoms."
- 15) "We found strong evidence in the literature review of the following factors not influencing outcome: older age, female gender, high acute psychological response, angular deformity of the neck, rear-end collision and compensation."
- 16) "Several physical (e.g. restricted range of motion, high number of complaints), psychosocial (previous psychological problems), neuropsychosocial factors (nervousness), crash related (e.g. accident on highway) and treatment related factors (need to resume physiotherapy) show limited prognostic value for functional recovery."
- 17) "There was no evidence found to allow any conclusions on the influence of factors such as coping, anxiety, cognition, education level, head restraint, seat belt."