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# THE QUEBEC CLASSIFICATION AND A NEW SWEDISH CLASSIFICATION FOR WHIPLASH-ASSOCIATED DISORDERS IN RELATION TO LIFE SATISFACTION IN PATIENTS AT HIGH RISK OF CHRONIC FUNCTIONAL IMPAIRMENT AND DISABILITY*

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**Unlike the Quebec classification system, which is based primarily on pathoanatomy, a new Swedish classification system is based on the site of functional impairment and disability. A prospective study was performed on 85 patients with whiplash-associated disorders grade II according to the Quebec classification. The patients were examined 3–36 months following trauma. A team of professionals with different training performed the diagnostic procedure. An independent assessor classified these patients according to a Swedish classification system. All patients answered questionnaire regarding life satisfaction. Logistic regression demonstrated significant differences in 6 of 10 specific dimensions of life satisfaction between the classification categories C and D (presence of arm symptoms) in a Swedish classification. Patients with whiplash-associated disorders grade II and neuropsychological symptoms seem to have a worse prognosis for spontaneous recovery than those without. A new Swedish classification system seems to be an important complement to the Quebec classification.**

*Key words:* quality of life, WAD, neck trauma, Quebec classification.

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Whiplash neck injury was first described by Crowe in 1928 (1, 2). In recent years, whiplash-associated disorders (WAD) have increased in both incidence and prevalence as a result of a rising number of road accidents caused by greater traffic density, car construction (3) and the use of vehicle seat belts (4–7). The prognosis is good for the majority of patients with a whiplash trauma (8–10). In Sweden, with a population of 8.7 million, approximately 10 000 persons each year sustain a neck injury (8) with 10% still showing symptoms after 6–9 months. In order to give these individuals better care within the health care system, the first structured management programme for WAD in Sweden was adopted by the Health Surveillance Committee of Skaraborg County Council in November 1997 (11). In the present paper the term cervical distortion will be used as a denominator for the different trauma types, including WAD or other types of causes of neck injury.

The most common cervical distortion symptoms are neck pain, headache, arm pain, temporomandibular joint dysfunction (12–15), dizziness, visual disturbances (14, 16) and cognitive dysfunction (17–19). These symptoms all influence the patient's quality of life, an important outcome measure in modern rehabilitation medicine (20). In the present study we preferred to use instruments focusing on the subjective experience of life satisfaction as a measure of quality of life, rated on a scale widely used in the Swedish health care context (21–23).

Because of diagnostic difficulties, most experts on whiplash injuries agree that a systematic classification of WAD is necessary (7). The Quebec Task Force presented one such WAD classification (the Quebec classification) in 1995 (7). The severity and extent of neck complaints was graded on a scale from 0 to IV. There has been some controversy regarding the role of the Quebec classification (QC) as a predictive instrument and the subgroups it produces (9, 24). Therefore, a new Swedish system (SS) was based on the site of impairment and disability (25). Classification consists of three stages: the first stage involves determination of site(s) of impairment and disability; the second stage is a categorization of the patient's condition based upon the first stage; finally, the third stage groups patients symptoms with respect to time elapsed after the trauma (acute group *vs.* chronic group) (25). The new SS was evaluated using comments from patient organizations, in particular the National Association for Victims of Traffic and Polio (RTP). Written conclusions concerning the program were sent for review to a large group of specialists and medical departments in Sweden.

The aim of the study was to investigate whether the new SS could be used as a complement to the QC concerning functional impairment and disability on quality of life outcomes. Another

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Table I. *Vocational situation before and at the time of assessment. Number of patients before and after whiplash trauma according to vocational situation. For explanations regarding categories A, B, C and D, see Table III, step 2*

| | Before trauma | | | | | At the time of assessment | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Category | At work | Unemployed | Sick leave 25–75% | Sick leave 100% | Retired | At work | Unemployed | Sick leave 25–75% | Sick leave 100% | Retired |
| *A* | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| *B* | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| *C* | 28 | 3 | 3 | 4 | 1 | 16 | 3 | 16 | 3 | 1 |
| *D* | 30 | 2 | 6 | 3 | 0 | 11 | 1 | 26 | 3 | 0 |

aspect was to see whether the new classification system could assist in the allocation of rehabilitation resources to the most needy patients.

## MATERIALS AND METHODS

*Patients*

Skaraborg County has approximately 260000 inhabitants who can seek medical care at hospitals in four different towns and at a number of primary care centres in the region.

During 1998 a series of 131 consecutive patients with cervical distortion were referred to the Department of Rehabilitation Medicine, County Hospital, Skövde, Sweden, for examination and treatment. Eighty-five patients were referred by general practitioners (GPs) and 46 by other specialists. The inclusion criteria for this study, fulfilled by 35 men and 50 women (age 18–74 years, median 36) was a grade II whiplash injury, that is neck pain and musculoskeletal sign(s) (see below). The interval between accident and examination varied from three to 36 months (median = 9.3 months) without a significant difference between subgroups C and D described below. Exclusion criteria were a history of central nervous system trauma (patient chart, computer tomography of the brain with findings of trauma or in the skull) associated psychiatric findings according to DSM IV (26).

Twelve patients had 9 years of basic education. Twenty-six had followed a vocational training and 35 had the equivalency of a college education. Twelve patients had completed university studies. Eighty patients were born in Sweden, 1 in Finland and 4 outside Scandinavia. Twenty-three were living alone and 62 lived with other persons. Thirty-one were manual workers, 17 had intellectually demanding occupations and 37 had mixed work demands. Vocational situation before and at the time of assessment is given in Table I.

Sixty-five patients had been injured in a road traffic accident and 20 in other ways, such as in horseback riding accidents and in falls (stairs, carpets etc.) or blows to the head/neck. The foremost neuropsychological symptoms were attention deficiencies, memory problems and reduced simultaneous capacity.

*Method*

At the time of the first post-injury visit, a physical examination was done and documentation made according to written guidelines. Injuries were registered according to a structured form. Each patient received formal written and verbal information concerning the presently accepted advice on early activation and a self-exercise programme (27, 28). If the patient still had symptoms 3 weeks after the injury, examination by a GP was recommended. When symptoms persisted longer than 3 months, the patient was referred to Skövde Hospital for assessment by a team. The team consisted of a physician specialized in rehabilitation medicine and orthopedic surgery, a nurse, a social worker, an occupational therapist, a physiotherapist and a neuropsychologist.

*Structured management organizational procedure*. On the day of assessment, the patient met with all the team members to objectively verify the patient's subjective complaints. The social worker gathered information on the patient's social situation and gave information on insurance matters. The occupational therapist evaluated the patient's functions in the activities of daily life (ADL). The perseverance level was evaluated twice during the day, when the patient was asked to carry out practical tasks according to written and verbal instructions. The physiotherapist concentrated on functions regarding active, passive and segmental movement tests of the neck, shoulders, thoracal/lumbar dorsum and temporomandibular joint. The physician evaluated all cases. The medical history and physical examination were carried out and documented in a structured manner. The combined findings of the physiotherapist, the occupational therapist and the physician formed the basis for the classification that follows. The team nurse was responsible for the questionnaire regarding life satisfaction. The patients were instructed to answer one questionnaire about their quality of life before the accident and one regarding their present situation.

*Classification*

The patients were first classified according to the QC (7) (Table II). To qualify for participation in the study it was required that the patients be classified as WAD II. An independent assessor (RA) then classified the patient according to a new SS (25) with its A, B, C and D categories, based on combinations of different sites of impairment and disability (Table III). The first step in this classification involves determination of the area(s) of impairment and disability, using a code for the presence of symptoms: head/neck/shoulder = 'a', arm = 'b', neuropsychological symptoms = 'c'. Step two is a categorization of the patient's condition, using the codes from stage 1: 'a' is classified as category A; the occurrence of both 'a' and 'b' corresponds to category B; occurrence of both 'a' and 'c' corresponds to category C; and category D is a combination of 'a', 'b', and 'c'. Step 3 consisted of grouping patients with respect to time elapsed since the trauma, with $\leq$12 weeks as acute and >12 weeks as chronic. On the basis of any and all impairment and disability, category C thus involves symptoms in the head/neck/shoulder and neuropsychological symptoms, category D symptoms in the head/

Table II. *Clinical classification of whiplash-associated disorders (WAD). Symptoms and disorders that can be manifest in all grades include deafness, dizziness, tinnitus, headache, memory loss, dysphagia and temporomandibular joint pain. The dotted lines in the table denotes different needs of clinical care after injury*

| WAD grade | Clinical presentation |
|---|---|
| 0 | No neck complaint<br>No physical sign(s) |
| I | Neck complaint of pain, stiffness or merely tenderness<br>No physical sign(s) |
| II | Neck complaint and musculoskeletal sign(s)* |
| III | Neck complaint and neurological sign(s)** |
| IV | Neck complaint and fracture or dislocation |

* Musculoskeletal signs include restricted range of motion and point tenderness.

** Neurological signs include decreased or absent deep tendon reflexes, weakness and sensory deficits.

Table III. *Steps of a new Swedish classification after whiplash trauma. The table is structured with three steps (levels): Steps 1–3*

| *Step 1. Determination of area(s) of impairment* | |
|---|---|
| *Area* | *Code* |
| Head/neck/shoulder[a] | a |
| Arm[b] | b |
| Neuropsychological[c] | c |

| *Step 2. Categorization of condition based on area of impairment according to step 1* | |
|---|---|
| | *Category* |
| a | A |
| a + b | B |
| a + c | C |
| a + b + c | D |

| *Step 3. Time course. A grouping is made based on time after the trauma* | | |
|---|---|---|
| *Definition* | *Term* | *Abbreviation* |
| Acute <12 weeks | X weeks | Xv |
| Chronic >12 weeks | Y months | Ym |

[a] Primarily problems in the neck and/or shoulder region and from headache but often also some pain in the chest and loin.

[b] Includes for example numbness, pain, restricted mobility, for instance caused by a (nerve root syndrome) ritzopathy or myelopathy.

[c] Intensive, frequent or widespread neuropsychological problems such as dizziness, cognitive problems (attention and memory), stress-sensibility, irritability, sound- and light-sensitivity. As understood from the parts above, patients with obvious brain damage are excluded.

neck/shoulder, neuropsychological symptoms and arm symptoms. The difference between categories C and D is thus symptoms in an arm. The similarity in groups C and D is the patient's cognitive and neuropsychological symptoms and disability, which differentiates them from groups A and B.

*Life satisfaction*

The relationship between trauma and life satisfaction was considered in this study by focusing on the various dimensions of a Life Satisfaction Scale, developed by Fugl-Meyer et al. (21). All the data were dichotomized in two groups, unsatisfactory (answer level 1–4) or satisfactory (answer level 5–6) life situation, as earlier described (21). The validated scale was based on comprehensive studies of life satisfaction in 18- to 64-year-old Swedes (21).

*Statistical analysis*

Logistic regression, using a proportional odds model for life satisfaction dimensions (ordinal scales), was used to ascertain differences in reported life satisfaction between the groups when classified according to a new SS. A similar analysis, including the factors of gender, age and baseline score (i.e. the difference between pre- (retrospectively) and post-traumatic grading results on the life satisfaction scale), was also made to establish the possible influence of these factors on life satisfaction.

## RESULTS

The 85 patients judged to have WAD grade II and who fulfilled the inclusion criterion were classified according to the new SS as follows: 3 patients in category A, 2 patients in category B, 39 in category C and 41 in category D. Life satisfaction scores before and after whiplash trauma in categories C and D are shown in Table IV. All the 11 dimensions tested for life satisfaction were slightly or appreciably worse after the trauma in category C and appreciably more so in category D.

The global experience, "life as a whole", and specific items, such as "vocational situation", "leisure time", "contact with friends and acquaintances", "ability to manage my own self-care", "physical health" and "mental health", all revealed significant differences between the groups.

The influence of symptoms in the arms is evidenced in the differences in test scores between categories C and D (Table V). Our results indicate that the life satisfaction of the patients in category D was significantly worse than that in category C as regards vocational situation, leisure time, contact with friends, ability to manage one's own self-care and somatic and mental health. The difference observed between the two was not affected by sex or age factors or by baseline scores. There was no significant difference between the groups with regard to time elapsed between trauma and evaluation, amount of sick leave or patients' cognitive symptoms.

## DISCUSSION

The aim of the study was to investigate whether a new SS could be used as a complement to the QC concerning functional impairment and disability in quality of life outcomes.

In a proportional odds model of the everyday life satisfaction dimensions, logistic regression revealed differences in life satisfaction between categories C (absence of arm symptoms) and D (presence of arm symptoms) in the SS. This study shows that the SS can be applied as a complement to the QC of patients suffering from WAD. Groups C and D are patients with cognitive and neuropsychological symptoms; these symptoms are frequently seen in patients at high risk of chronic impairment and disability. Since a vast majority of the patients with WAD grade II belonged to the categories C and D, one might expect that the occurrence of congnitive symptoms in an individual indicates an increased risk of developing a chronic cranio-cervical syndrome.

There are several classification systems that attempt to improve the quality and optimize the allocation of resources for the treatment of injuries. These systems focus on the localization and type of injury, loss of function and survival probability. For example, AIS ("Abbreviated Injury Scale"), which is used throughout the world, uses the following categories: '0' no injury, '1' minor injury, '2' moderate injury, '3' serious injury, '4' severe injury, '5' critical injury, '6' virtually unsurvivable injury. The cervical distortions occurring most frequently in traffic accidents are the AIS 1 and AIS 2. The QC (7) was created with the intention of better describing these types of injuries, focusing primarily on whiplash-associated injuries. The QC WAD has been discussed in terms of its

Table IV. *Life satisfaction before (retrospectively) and after whiplash trauma in categories C and D according to a new Swedish classification. Median values, 25% (Q1) and 75% Q3 quartiles are given*

| | Category C ($n = 39$) | | | | | | Category D ($n = 41$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Before | | | After | | | Before | | | After | | |
| Dimension | Q1 | Median | Q3 | Q1 | Median | Q3 | Q1 | Median | Q3 | Q1 | Median | Q3 |
| 1. Life as a whole | 5 | 5 | 6 | 2 | 4 | 4 | 5 | 5 | 6 | 2 | 3 | 4 |
| 2. Vocational situation | 4 | 5 | 5 | 1 | 3 | 4 | 4 | 5 | 5 | 1 | 2 | 3 |
| 3. Financial situation | 4 | 5 | 5 | 3 | 4 | 5 | 4 | 5 | 5 | 3 | 4 | 5 |
| 4. Leisure time | 4 | 5 | 6 | 2 | 3 | 5 | 4 | 5 | 6 | 2 | 2 | 3 |
| 5. Contact with friends and acquaintances | 5 | 6 | 6 | 4 | 5 | 6 | 5 | 5 | 6 | 2 | 4 | 5 |
| 6. Sexual life | 4 | 5 | 6 | 3 | 4 | 5 | 4 | 5 | 6 | 3 | 4 | 5 |
| 7. Ability to manage own self-care | 6 | 6 | 6 | 4 | 5 | 6 | 6 | 6 | 6 | 3 | 4 | 4 |
| 8. Family life | 5 | 5 | 6 | 4 | 5 | 5 | 5 | 6 | 6 | 4 | 4 | 5 |
| 9. Partner relationship | 4 | 5 | 6 | 4 | 4 | 6 | 5 | 6 | 6 | 4 | 5 | 6 |
| 10. Physical health | 5 | 5 | 6 | 2 | 3 | 4 | 5 | 5 | 6 | 2 | 2 | 3 |
| 11. Mental health | 5 | 5 | 6 | 3 | 4 | 5 | 5 | 5 | 6 | 2 | 3 | 4 |

predictive role and its adequacy as a classification system (24). When first presented, the QC was a significant breakthrough and enabling classification as well as structuring the gradually increasing problems with whiplash associated injuries (7).

Quality of life is unavoidably a subjective measure reflecting both individual experiences and sociocultural values of the time. Life satisfaction can be considered a measure of how successfully people cope with their life situation. Successful coping may be assumed to be an important determinant of how we experience quality of life. Rehabilitation can be viewed as the learning of a coping process directed toward the achievement of meaning in life. Rehabilitation is therefore intended to improve quality of life (29–31).

Table V. *Logistic regression using a proportional odds model for the ordinary life satisfaction dimensions. The results shows that patients with arm symptoms added to other symptoms (category D; see Table III) are worse off. The life satisfaction before the injury has an impact on the present situation after the injury. Four dimensions showed an association in baseline (retrospectively) pre- and post-injury (dimensions 3, 5, 6, 9)*

| Logistic regression | | |
|---|---|---|
| | *p*-values comparing | |
| Dimension | C with D | with baseline scores |
| 1. Life as a whole | 0.068 | |
| 2. Vocational situation | 0.028* | |
| 3. Financial situation | 0.968 | <0.001 |
| 4. Leisure time | 0.006** | |
| 5. Contact with friends and acquaintances | 0.012* | 0.009 |
| 6. Sexual life | 0.480 | 0.001 |
| 7. Ability to manage own self-care | | <0.001*** |
| 8. Family life | 0.241 | |
| 9. Partner relationship | 0.486 | 0.002 |
| 10. Physical health | 0.045* | |
| 11. Mental health | 0.036* | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The presence of arm symptoms definitely affects life satisfaction. An arm that functions without pain makes it easier for the individual to carry out ADL functions, both at work and in leisure activities. This may be one of the reasons why arm symptoms particularly affect life satisfaction. In our opinion, certain symptoms such as hand or arm weakness may belong to the borderline area between WAD 2 and 3. Symptoms of cognitive dysfunction, e.g. memory and attention deficits, impairment and disability of simultaneous capacity (18, 32), are important as well, but do not imbue the QC. Both occurrence and intensity of neuropsychological symptoms are of great significance when estimating and planning rehabilitation needs, both medical and vocational ones.

The material seems to be representative and on the basis of the incidence of cervical distortions in Sweden (115 per 100000) and the prevalence of WAD (10%) (32), an annual additional number of WAD patients in our area of Sweden is calculated to be about 30; i.e. 90 individuals during the 3-year period that the data was gathered. Eighty-five patients were included in the present study, representing a group of cervical distortion patients consecutively referred to a specialist clinic. The sample is supposedly representative of the county and has been controlled against the Register of Injuries, where all injuries given care in hospitals and primary care units are reported. In 1998, 280 cervical distortions injuries were reported (with a dropout rate for registration under 14%). Ten per cent of these patients had residual symptoms and were referred to the department for team evaluation according to the management programme.

In our opinion, the main drawback of the QC is the fact that it does not take into consideration the patient's cognitive and neuropsychological symptoms and disability. The QC WAD is primarily pathoanatomical in nature. The new SS can be viewed as an important complement to the QC (WAD) for patients with cervical distortion. It focuses not only on the patient's physical impairment but also takes into account the patient's cognitive and neuropsychological symptoms. The patient's particular needs in everyday life and in rehabilitation programs should

be based on the level of functional impairment and disability. A classification that combines the use of the established QC and an alternative SS would probably better reflect the individual's cognitive and neuropsychological symptoms and disability when the whiplash injury progresses toward a more chronic condition.

Another aspect was to see whether the new classification system could assist in the allocation of rehabilitation resources to the most needy patients. The fact that the majority of patients in this study with residual symptoms after 3 months were classified as group C or D, while only 5 patients were classified as A or B deserves attention. The difference between groups A + B and C + D is the absence of "c", which represents "intensive, frequent or widespread neuropsychological problems such as dizziness, cognitive problems, stress-sensibility, irritability, light and sound sensitivity". If patients classified as WAD II with neuropsychological symptoms (C and D) have a worse prognosis for spontaneous recovery than do patients classified as WAD II without neuropsychological symptoms (A and B), it would then be logical to focus the health care system's limited resources on these patients. However, if rehabilitation is more fruitful for these needy patients, needs to be shown.

To conclude we think that a new impairement/disability-related classification system (SS) for patients with cervical distortion (WAD) adds information to the QC system and can be used as a complement.

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