

ORIGINAL RESEARCH

Association of Shoulder Problems in Persons With Spinal Cord Injury at Discharge From Inpatient Rehabilitation With Activities and Participation 5 Years Later



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Abstract

Objective: To examine whether musculoskeletal shoulder pain and limitations in shoulder range of motion (ROM) at discharge from first rehabilitation are associated with activities and participation restrictions 5 years later in persons with spinal cord injury (SCI).

Design: Prospective cohort study.

Setting: Eight specialized SCI rehabilitation centers.

Participants: Subjects (N=138) with an SCI admitted for first rehabilitation.

Interventions: Not applicable.

Main Outcome Measures: Peak power output (POpeak), Wheelchair Skills Test (WST), FIM motor score, ability to transfer, Physical Activity Scale for Individuals with Physical Disabilities (PASIPD), mobility range and social behavior subscales of the Sickness Impact Profile 68 (SIPSOC), and employment status.

Results: Mean age of the subjects at discharge was 39 years, 72% were men, 32% had tetraplegia, and in 65% the SCI was motor complete. At discharge, 39% reported shoulder pain and 32% had a limited shoulder ROM. In the analyses of variance, shoulder ROM limitation, but not shoulder pain, was associated with all but 1 outcome at 5 years. In the regression analyses, ROM limitations of the shoulder were negatively associated with the ability to transfer ($P = .004$), FIM motor scores ($P < .001$), and return to work ($P = .027$) 5 years after discharge. No significant associations were found with POpeak, WST performance time, SIPSOC, and PASIPD.

Conclusions: The presence of limitations in shoulder ROM, but not shoulder pain, at discharge is associated with limitations in activities and employment status 5 years later.

Archives of Physical Medicine and Rehabilitation 2016;97:84-91

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Presented as an abstract to the International Spinal Cord Society, October 29, 2013, Istanbul, Turkey; and as a poster to the University of Groningen, April 23-25, 2014, Groningen, The Netherlands.

Supported by the Dutch Health Research and Development Council, ZonMw Rehabilitation Program (grant nos. 1435.0003, 1435.0025).

Disclosures: none.

Persons with a spinal cord injury (SCI) are more at risk for developing overuse-related shoulder problems than those without SCI.¹ Estimations of limitations in shoulder range of motion (ROM) vary between 29% and 70%,^{2,3} while shoulder pain is reported in up to 67% of persons with SCI.⁴⁻¹⁴

Persons with limited shoulder ROM at discharge show a lower FIM motor score, are less likely to be able to perform an independent transfer, and need more time to complete the Wheelchair Skills Test (WST) 1 year after discharge.¹⁵ Of those persons with shoulder pain, 86% report limitations in daily activities and restrictions in participation because of shoulder pain,^{5,16,17} and 84% report restrictions in sports and leisure activities.^{5,18} In addition, shoulder pain has been shown to be associated with lower perceived health,¹⁹ lower quality of life,^{18,20,21} and an increased use of assistive devices.⁹ To provide timely intervention for these patients, it is therefore necessary to know the association between shoulder problems at the time of discharge from inpatient rehabilitation and long-term activity limitations and participation restrictions.

Discharge was chosen as the measurement time point because it is a major milestone in the rehabilitation process, and patients are still seen by rehabilitation professionals who can intervene when necessary. The current study is a follow-up study of our earlier studies on shoulder pain and on the association between shoulder ROM and activities and participation 1 year after discharge from inpatient rehabilitation.¹⁵

In addition to our previous study¹⁵ on the predictive value of shoulder ROM limitations at discharge from inpatient rehabilitation on the performance of activities and participation, the objective of the current study was to examine whether musculoskeletal shoulder pain and limitations in shoulder ROM at discharge from first rehabilitation are associated with activity limitations and participation restrictions 5 years after discharge by using the biopsychosocial *International Classification of Functioning, Disability and Health* as a framework.²²

Methods

Study design

A multicenter, prospective cohort study—Physical Strain, Work Capacity and Mechanisms of Restoration of Mobility in the Rehabilitation of Persons With Spinal Cord Injuries²³—was conducted with measurements at discharge from inpatient rehabilitation and 5 years after inpatient rehabilitation.

Participants

Participants were persons with a recently acquired SCI, admitted for first rehabilitation, who were included in the longitudinal Dutch cohort study. Inclusion criteria were as follows: (1) age between 18 and 65 years; (2) American Spinal Injury Association Impairment Scale grade A, B, C, or D; (3) and expected, permanent wheelchair dependency for long distances.²⁴

List of abbreviations:

PASIPD	Physical Activity Scale for Individuals with Physical Disabilities
POpeak	peak power output
ROM	range of motion
SCI	spinal cord injury
SIP68	68-Item Sickness Impact Profile
SIPSOC	mobility range and social behavior subscales of the Sickness Impact Profile 68
WST	Wheelchair Skills Test

For the current study, subjects (N=138) who completed the measures of shoulder ROM and pain assessment at discharge and completed at least the questionnaire data 5 years after discharge were included.

The research protocol was approved by the medical ethics committees of the Rehabilitation Association Limburg, iRv Knowledge Center for Rehabilitation and Handicap, and University Medical Center Utrecht. All subjects gave written informed consent.

Instruments

All clinical measurements were assessed by trained physicians and research assistants.

Musculoskeletal shoulder pain

Subjects were first asked whether they experienced any pain in their joints or muscles. If so, patients were asked to rate the severity of shoulder pain for both shoulders separately on a scale of 0 to 5 (0, no pain; 1, very mild pain; 2, mild pain; 3, moderate pain; 4, severe pain; 5, very severe pain).¹⁴ A patient was considered to have shoulder pain if he/she had pain in at least 1 shoulder (no pain, 0; pain, 1). In cases where both shoulders were affected, the shoulder with the highest pain score was included in the analysis.

The questionnaire tried to distinguish musculoskeletal pain from neuropathic pain as best as possible by also asking about the character of the pain.²⁵

Shoulder ROM

Passive ROM of both shoulders was measured using goniometry in the sitting position for forward flexion, external rotation, and abduction.²⁶ Normal ROM was defined as 90° for glenohumeral abduction, 180° for shoulder forward flexion, and 60° for external rotation.²⁷ A decrease in ROM of $\geq 10^\circ$ in 1 of the movements in 1 or both shoulders was considered to be an impaired ROM (0, no impaired ROM; 1, impaired ROM). This cutoff point was chosen by experts working in the field of SCI and used in our earlier publications.^{3,15} In cases where both shoulders were affected, the shoulder with the most limited ROM score was included in the analysis.

FIM motor score

The FIM motor score consists of 4 domains and 13 items (self-care, continence, transfers, mobility). Each item can be scored from 1 (fully dependent) to 7 (fully independent). The FIM total score can vary from 13 to 91.²⁸

Wheelchair Skills Test

From the Wheelchair Circuit we selected 2 items as outcomes for this study: (1) the total time needed to perform a figure-of-8 shape; and (2) a 15-m sprint.^{29,30} Excluded from the test were those subjects with physical complications such as major shoulder pain or the presence of pressure sores.

Transferring oneself

We used the FIM motor score item on transfers to specify this outcome. Based on expert opinion, we dichotomized the outcome into 1 or 0, for “transfer independently” (FIM motor scores, 5–7) and “transfer with assistance” (FIM motor scores, 1–4), respectively.²⁸

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