

ORIGINAL REPORT

## IDENTIFICATION OF RELEVANT INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH CATEGORIES IN PATIENTS WITH SHOULDER PAIN: A CROSS-SECTIONAL STUDY

Yngve Roe, MSc<sup>1,3</sup>, Erik Bautz-Holter, PhD<sup>2,3</sup>, Niels Gunnar Juel, MSc<sup>2</sup> and Helene Lundgaard Soberg, PhD<sup>1,2</sup>

From the <sup>1</sup>Faculty of Health Sciences, Oslo and Akershus University College of Applied Sciences, <sup>2</sup>Department of Physical Medicine and Rehabilitation, Oslo University Hospital Ullevål and <sup>3</sup>Faculty of Medicine, University of Oslo, Oslo, Norway

**Objective:** To identify the most common problems in patients with shoulder pain, using the International Classification of Functioning, Disability and Health (ICF) as a reference.

**Design:** A cross-sectional study.

**Subjects:** Outpatients at a hospital with shoulder pain lasting longer than 3 months.

**Methods:** Patients were interviewed with an extended version of the ICF Checklist version 2.1a. Patients' problems in functioning, and the magnitude of the problem, were registered separately for each category. Categories identified as a problem in at least 5% of patients were reported. To describe the population, age, diagnosis, work participation and the Shoulder Pain and Disability Index (SPADI) were recorded.

**Results:** A total of 165 patients with a mean age of 46.5 years (standard deviation 12.5) and a SPADI score of 47.4 (standard deviation 21.1) were included. Of the participants, 92.8% were either employed or students, 35.2% of whom were on sick leave. The primary result was the identification of 61 condition-specific second-level ICF categories: 19 in the body functions and structures component, 34 in activities and participation, and 8 in environmental factors.

**Conclusion:** The findings provide a comprehensive picture from the patient-perspective of the disability associated with shoulder pain. The findings may enhance multidisciplinary communication in clinical settings.

**Key words:** ICF; outcome assessment (health care); shoulder pain; cross-sectional studies; disability evaluation; World Health Organization; recovery of function; rehabilitation/cl [classification]; rehabilitation.

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Correspondence address: Yngve Roe, Faculty of Health Sciences, Oslo and Akershus University College of Applied Sciences, Postboks 4 St Olavs plass, NO-0130 Oslo, Norway. E-mail: yngve.roe@hioa.no

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### INTRODUCTION

Shoulder pain is a common condition, with an estimated prevalence of between 7% and 26% (1). In a Norwegian middle-aged

population cohort, pain in the neck or shoulder during the previous month was the most common health complaint, and almost three-quarters reported work-related pain (2). Many cases of shoulder pain are persistent or recurrent, and shoulder pain is a common cause of work absenteeism (3, 4).

The disability associated with shoulder pain has traditionally been explained by deficits in muscular and movement-related functions (5, 6). Findings from more recent research, however, indicate that the condition may also have an impact on mental function and general health (7–12). Moreover, physical and social factors in the work environment have been found to influence functioning (13–16). Although previous research provides a valuable contribution to the understanding of the impact of shoulder pain on functioning, it has often been limited to defined patients groups, rehabilitation settings or specific aspects of functioning. A number of different classifications are in use, and no multidisciplinary clinical practice guidelines exist (17–19).

As a result of the approval of the International Classification of Functioning, Disability and Health (ICF) in 2001, a system of concepts and a classification of functioning became available (20). The ICF provides a hierarchical classification system based on components, chapters and categories. The *body functions and structures* component is ordered according to body regions or systems, and the *activities and participation* component covers the complete range of domains, denoting aspects of functioning from both an individual and a societal perspective (20). The *environmental factors* component is systematically arranged in sequence from the individual's most immediate environment to the general environment and may affect all functional components (20). *Personal factors* are not classified in the ICF because of their wide social and cultural variance (20). The ICF describes situations with regard to human functioning, and serves as a framework to organize information (20).

The ICF classification is comprehensive, as it comprises more than 1,400 categories. To increase its applicability in clinical assessments and research, ICF Core Sets have been developed. The Core Sets contain a selection of categories that describe the typical spectrum of problems in functioning of patients with specific conditions (21). The development processes were based on literature reviews, expert surveys and quantitative

and qualitative clinical studies of patients (21). Currently, ICF Core Sets for a number of chronic conditions and settings are available, e.g. low back pain and vocational rehabilitation (22, 23). As part of the development process, patients' problems in functioning were investigated in cross-sectional studies (24, 25). Until now, shoulder pain has rarely been investigated within the bio-psycho-social perspective, and to our knowledge, there are no condition-specific ICF categories for shoulder pain.

The aim of this study was to identify the ICF categories that best describe problems related to functioning and interactions with the environment due to shoulder pain from the patient's perspective.

## METHODS

### Study design

This study had a cross-sectional design and included outpatients with shoulder pain at the Department of Physical Medicine and Rehabilitation at Oslo University Hospital from November 2009 through February 2011. The study was approved by the Norwegian Regional Ethical Committee (number 2009/820a) and was conducted according to the Declaration of Helsinki.

### Subjects

Patients aged 18 years and older, diagnosed with shoulder pain and symptoms lasting longer than 3 months, were eligible for the study. The exclusion criteria were shoulder joint replacement, surgery in the affected shoulder within the last 6 months, diagnosed rheumatic disease affecting the shoulder, generalized pain conditions, and insufficient Norwegian language skills.

### Measures

Data were collected with two sets of case record forms, one for health professionals and another for patients. The case record form for health professionals included registrations of the patients' characteristics and the nature of the patients' work with regard to repetitive movements of the arm, use of the arm at or above shoulder level, and lifting 10 kg or more at work.

An extended ICF Checklist was derived for the patients from the ICF classification. The categories in the ICF classification use an alphanumeric coding system, in which the first letter refers to the component, followed by a numeric code that starts with the chapter number (e.g. d4 mobility), followed by the second-level category (e.g. d445 hand and arm use), the third-level category (e.g. d4452 reaching) and the fourth-level category, when appropriate.

The ICF Checklist in the current study was an extended version of the generic ICF Checklist Version 2.1a (26). The content of the condition-specific scales and clinical tests were extracted and linked to ICF categories by a researcher (Y.R.) to ensure that all relevant functions were covered (27, 28). Twenty-three additional second-level categories from these measures were added to the generic checklist. The final Extended ICF Checklist contained a total of 146 second-level ICF categories. Of these, 52 were from the *body functions and structures* component, 57 were from the *activities and participation* component and 37 were from the *environmental factors* component. The patients' problems in each category were rated on an ordinal scale, with scores ranging from 0 to 4 (20). For the *body functions* components, the scores included *no impairment*, *mild impairment*, *moderate impairment*, *severe impairment* and *complete impairment*. For the *body structures* component, only the presence of impairment was rated, as either *impairment* or *no impairment*, in this study. In the *activities and participation* component, the categories were denominated *no difficulty*, *mild difficulty*, *moderate difficulty*, *severe difficulty* and *complete difficulty* and were rated according to reported performance. The *environmental factors* component included both *barriers* and *facilitators* of function, each categorized as *mild*, *moder-*

*ate*, *severe* or *complete*. Additional options on the ICF qualifiers scale were 8 (*not specified*), 9 (*not applicable*) and C (*comorbidity*). The *not specified* option was avoided, and *not applicable* was registered only for mutually exclusive categories in the *major life areas* (d8-chapter). Comorbidity was registered on a separate form.

The case record form for patients contained both the Shoulder Pain and Disability Index (SPADI) and the Self-Administered Comorbidity Questionnaire (SCQ). The SPADI is a patient-reported condition-specific instrument comprising 13 items in the pain and disability domains (29, 30). Ratings are registered on an 11-point ordinal scale, from no pain/no difficulty (0) to worst pain imaginable/so difficult it required help (10). A summed score ranging from 0 to 100 (best to worst) is estimated by averaging the pain and disability sub-scores. The SCQ is a patient-rated instrument with a list of common health problems to which an additional question on neck pain was added (31). The respondent was asked to mark whether the health problem was present, whether treatment had been received and whether the problem limited activities.

### Procedure

The outpatient clinic of the Department of Physical Medicine and Rehabilitation at Oslo University Hospital receives patients with musculoskeletal conditions who are referred from general practitioners. The patients undergo an assessment by a physician specializing in physical medicine. Based on standardized criteria, a diagnosis according to the International Classification of Diseases (ICD-10) is made and further interventions are recommended (32, 33).

The inclusion of the patients shown in Fig. 1 was based on the contributions of 7 physicians at the clinic. The clinic receives approximately 750 patients with shoulder pain annually (personal communication NGJ). Patients with an appointment on specific weekdays when the researcher (YR) would be present received a letter informing them about the study, and notifying them that they would be asked to participate after the consultation if they met the inclusion criteria. Overall, 375 patients received information about the study, and 165 (44%) patients were included. The distribution of gender and diagnoses of the included patients were in accordance with the general cohort of patients with shoulder pain at the clinic.

The included patients participated in a structured interview using the case record form for health professionals and completed the case record form for patients. The interviews were administered by a physiotherapist and researcher (YR) who has experience with the ICF and with shoulder rehabilitation in clinical and educational settings. The ratings of the severity of functional problems in the Extended ICF Checklist were determined through discussion with the patient. When categories were not self-explanatory, examples from the *inclusions* of the ICF were provided. For example, the second-level category of *emotional functions* (b152) was exemplified by *joy*, *sorrow*, *tension*, *fear*, *anger*, etc. The ratings of structural impairment were based on the standardized diagnostic criteria (32, 33). The mean duration was approximately 40 min for the interviews and 20 min for the questionnaires.

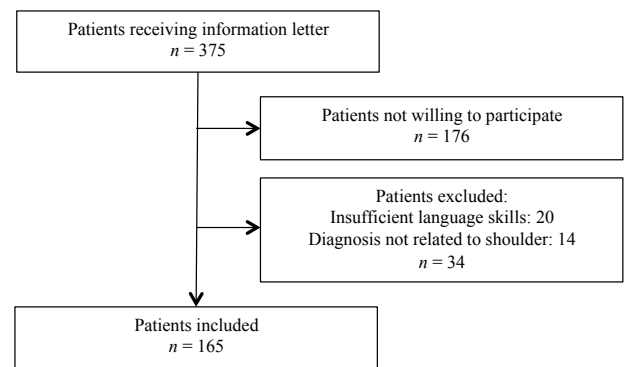


Fig. 1. Inclusion procedure.

Table I. Characteristics of the patient population (n = 165)

Characteristics	
Gender, male, %	46
Age, years, mean (SD) [range]	46.5 (12.5) [19–86]
Education, %	
≤12 years in school	56
University/college	44
Employment status, %	
Remuneratively employed	76.3
Student in higher education	16.5
Other	7.2
Duration of pain, %	
3–6 months	15
6–12 months	26
> 12 months	59
Main ICD-10 diagnoses of the shoulder, %	
m75.4 Impingement syndrome <sup>a</sup>	42.9
m79.1 Myalgia	18.0
m75.0 Adhesive capsulitis	13.7
m24.3 Instability	5.5
m75.1 Rotator cuff syndrome <sup>b</sup>	5.0
m19.8 Acromioclavicular-joint rupture or arthrosis	3.8
Other diagnoses	11.1
Comorbidity <sup>c</sup> , %	
Neck pain	66
Back pain	35
Osteoarthritis (other than in shoulder)	14
Depression	12
Rheumatoid arthritis	4
Other medical conditions	37
SPADI total score, mean (SD)	47.4 (21.1)

<sup>a</sup>Inclusive bursitis and partial thickness tears.

<sup>b</sup>Only full thickness tears.

<sup>c</sup>More than one comorbidity was registered in some participants.

SD: standard deviation; SPADI: Shoulder Pain and Disability Index; ICD-10: International Classification of Diseases – version 10.

### Statistical analysis

Descriptive statistics are used to characterize the study population. Gender, educational level, employment status, primary ICD-10 diagnosis of the shoulder, comorbidity and the nature of the work were estimated as relative frequencies (%). Age and the SPADI total summary score were estimated with the mean and the standard deviation (SD).

The relative frequencies (%) of ICF categories that registered as *impairment, limitation, restriction, barrier or facilitator* for at least 5% of the participants were reported for each ICF component separately.

IBM SPSS Statistics, version 19 was used for the statistical analysis (IBM Corporation, Armonk, NY, USA).

## RESULTS

The characteristics of the included patients and their comorbidities are shown in Table I. There was a slight overrepresentation of women (54%). The diagnosis impingement syndrome (m75.4) was the most frequent, accounting for 43% of the cases. Additional neck pain was reported by almost two-thirds of the patients and low back pain was reported by more than one-third of the patients.

With regard to employment status, 92.8% of the participants were either employed or students, 35.2% of whom were on sick leave. The remainder of the participants (7.2%) were retired, unemployed, received disability pension or were homemakers. The nature of the work varied; 82% reported repetitive movements of the arm, 29% reported frequent use of the arm at or above shoulder level, and 27% reported frequent lifting of 10 kg or more at work.

The 19 second-level ICF categories that were identified as a problem in the *body functions and structures* component are shown in descending order in Table II. The most frequent problems were related to the *sensation of pain* (b280), *mobility of joint functions* (b710), *sleep* (b134), *muscle endurance functions* (b740) and *energy and drive functions* (b130).

Table II. International Classification of Functioning, Disability and Health (ICF) categories of the body functions and structures component with relative frequencies (%), rated as impaired in at least 5% of participants

Body functions and structures categories	0	1	2	3	4	Sum 1–4
b280 Sensation of pain	1.2	13.9	34.5	43.6	6.7	98.8
s720 Structure of shoulder region	4.2	–	–	–	–	95.8
b710 Mobility of joint functions	9.1	18.2	20.6	45.5	6.7	90.9
b134 Sleep functions	21.2	20.6	23.0	30.9	4.2	78.8
b740 Muscle endurance functions	26.1	15.8	23.0	32.1	3.0	73.9
b130 Energy and drive functions	29.7	22.4	27.9	18.8	1.2	70.3
b730 Muscle power functions	30.9	13.3	24.2	29.7	1.8	69.1
b720 Mobility of bones function	32.1	24.8	21.8	21.2	0	67.9
b840 Sensation related to the skin	36.4	24.2	20.6	18.2	0.6	63.6
b735 Muscle tone functions	40.6	18.2	21.8	18.8	0.6	59.4
b126 Temperament and personality functions	48.5	26.1	20.6	4.8	0	51.5
b152 Emotional functions	53.9	24.2	14.5	7.3	0	46.1
s730 Structure of upper extremity	56.6	–	–	–	–	43.6
b715 Stability of joint functions	70.3	13.9	6.7	9.1	0	29.7
s710 Structure of head and neck region	82.4	–	–	–	–	17.6
b140 Attention functions	89.7	4.8	4.2	1.2	0	10.3
b144 Memory functions	90.3	7.9	1.2	0.6	0	9.7
b770 Gait pattern functions	92.7	4.8	1.8	0.6	0	7.3
b164 Higher level cognitive functions	93.9	4.8	1.2	0	0	6.1

Table III. International Classification of Functioning, Disability and Health (ICF) categories of the activities and participation component with relative frequencies (%), rated as a limited or restricted in at least 5% of participants

Activities and participation categories	0	1	2	3	4	Sum 1–4
d430 Lifting and carrying objects	15.2	26.7	26.1	28.5	3.6	84.8
d850 Remunerative employment	21.2	20.0	18.2	21.2	19.4	78.8
d920 Recreation and leisure	23.6	18.2	27.3	25.5	5.5	76.4
d410 Changing basic body position	24.8	20.6	24.8	26.7	3.0	75.2
d510 Washing oneself	30.9	25.5	29.7	13.3	0.6	69.1
d540 Dressing	33.3	26.7	27.3	12.1	0.6	66.7
d415 Maintaining a body position	37.0	16.4	22.4	23.6	0.6	63.0
d640 Doing housework	40.0	23.0	23.0	12.7	1.2	60.0
d620 Acquisition of goods and services	48.5	26.7	18.8	6.1	0	51.5
d475 Driving	62.4	15.8	12.1	8.5	1.2	37.6
d445 Hand and arm use	66.1	17.6	13.3	2.4	0.6	33.9
d520 Caring for body parts	70.3	16.4	9.1	4.2	0	29.7
d630 Preparing meals	72.7	14.5	10.3	1.8	0.6	27.3
d465 Moving around using equipment	73.9	15.8	6.7	3.0	0.6	26.1
d440 Fine hand use	76.4	10.3	7.3	6.1	0	23.6
d770 Intimate relationships	81.2	10.9	6.1	1.8	0	18.8
d530 Toileting	81.8	7.9	8.5	1.8	0	18.2
d660 Assisting others	84.2	10.9	3.6	1.2	0	15.8
d550 Eating	86.1	11.5	2.4	0	0	13.9
d760 Family relationships	86.1	8.5	4.8	0.6	0	13.9
d455 Moving around	86.7	7.9	3.0	1.8	0.6	13.3
d750 Informal social relationships	86.7	9.1	1.8	2.4	0	13.3
d740 Formal relationships	89.7	7.3	2.4	0.6	0	10.3
d230 Carrying out daily routine	90.9	2.4	4.2	2.4	0	9.1
d170 Writing	91.5	2.4	2.4	3.6	0	8.5
d650 Caring for household objects	92.1	5.5	2.4	0	0	7.9
d710 Basic interpersonal interactions	92.1	5.5	1.8	0.6	0	7.9
d720 Complex interpersonal interactions	92.1	4.8	1.8	1.2	0	7.9
d420 Transferring oneself	93.3	4.8	1.2	0.6	0	6.7
d210 Undertaking a single task	93.9	1.8	3.0	1.2	0	6.1
d730 Relating with strangers	93.9	4.8	0.6	0.6	0	6.1
d220 Undertaking multiple tasks	94.5	1.8	2.4	1.2	0	5.5
d470 Using transportation	94.5	2.4	3.0	0	0	5.5

The higher education (d830) category was limited or restricted in 6 out of 10 of the patients registered as students.

With respect to problems in the *activities and participation* 33 second-level ICF categories that were identified as a problem are shown in descending order in Table III. The most frequent problems were related to *lifting and carrying objects* (d430), *remunerative employment* (d850), *recreation and leisure* (d920) and *changing basic body positions* (d410). Of the 10 patients who were students, 6 reported difficulties in the *higher education category* (d830) (not shown in Table III).

The 8 second-level ICF categories of the *environmental factors* component identified as a barrier or facilitator are shown in descending order in Table IV. No categories exceeded a frequency of 20%. *Immediate family and friends* (e310 and e320) were the most frequently reported facilitators, while *social security services, systems and policies* (e570) was the most frequently reported barrier.

The distribution of categories according to ICF chapter-level in Fig. 2 shows that the highest number of categories were

Table IV. International Classification of Functioning, Disability and Health (ICF) categories of the environmental factors component with relative frequencies (%), rated as a barrier or facilitator in at least 5% of participants

Environmental factors categories	Barrier					Sum (1–4)	Facilitator				Sum (1–4)
	0	-1	-2	-3	-4		1	2	3	4	
e310 Immediate family	80.6	0.6	0.6	0	0	1.2	6.7	10.3	1.2	0	18.2
e320 Friends	86.0	0	0	0	0	0	6.1	7.3	0.6	0	14.0
e570 Social security services, systems and policies	86.2	1.8	4.2	4.2	0	10.2	1.8	1.2	0.6	0	3.6
e125 Products and technology for communication	85.5	1.2	6.7	0.6	0	8.5	0.6	4.8	0.6	0	6.0
e325 Acquaintances, peers, colleagues, neighbours and community members	86.8	0.6	4.2	0.6	0	5.4	4.2	3.6	0	0	7.8
e330 People in positions of authority	88.6	0.6	3.0	1.2	0	4.8	3.6	3.0	0	0	6.6
e355 Health professionals	91.6	1.2	1.8	0	0	3.0	2.4	3.0	0	0	5.4
e450 Individual attitudes of health professionals	91.0	1.2	3.0	1.2	0	5.4	1.2	2.4	0	0	3.6



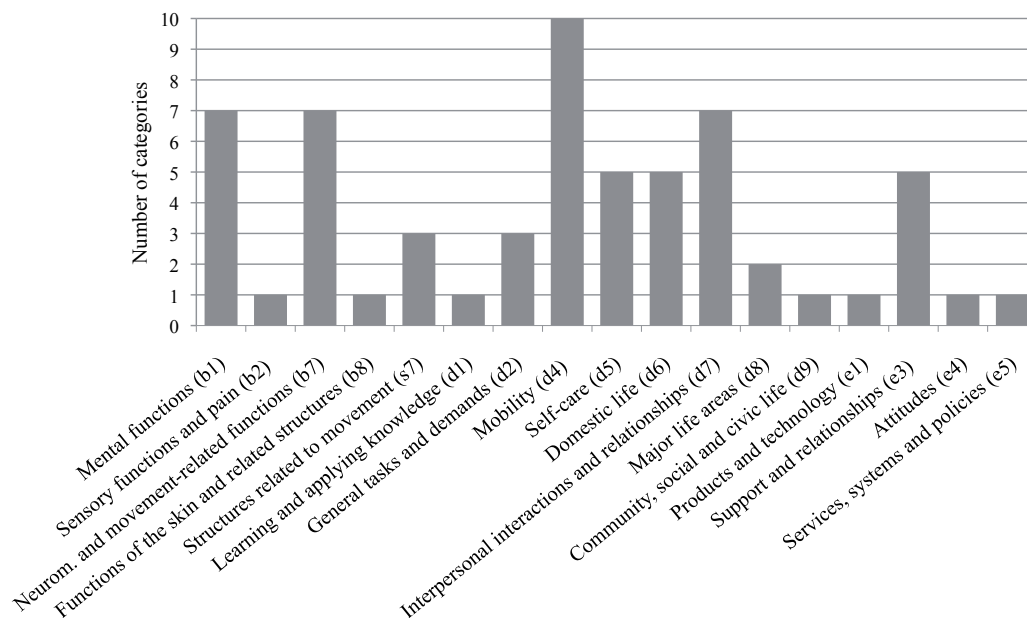


Fig. 2. Overview of International Classification of Functioning, Disability and Health (ICF) chapters containing one or more second-level categories identified as a frequent problem, barrier or facilitator ( $n=61$ ).

identified in the chapters of *mobility* (d4), with 10 categories, followed by the *neuromusculoskeletal and movement-related functions* (b7), *mental functions* (b1) and *interpersonal interactions and relationships* (d7) chapters, with seven categories each, and *self-care* (d5), *domestic life* (d6) and *support and relationships* (e3), comprising 5 categories each.

## DISCUSSION

The primary result of this study was the identification of a set of 61 second-level ICF categories reflecting common problems in functioning and environmental factors in chronic shoulder pain from the patients' perspective.

The characteristics of the patients show that patients in the current study had a distribution of gender, age and diagnoses that paralleled a sample of patients in a general practice reported by van der Windt and colleagues (4). The mean SPADI-total score did not deviate substantially from the scores reported by Beaton and colleagues in a hospital-treated sample of patients with shoulder-related diagnoses, or from a study by Ostor and colleagues on patients in primary care (34, 35).

Problems in functioning that related to a total of 19 categories in the *body functions and structures* component are shown in Table II. The *sensation of pain* (b280) was a problem for almost all of the patients, and more than half of the patients rated their pain as *severe or complete*. The frequency estimate and severity ratings show that pain itself is a major issue in the understanding of shoulder pain. Pain has also been found to be an almost equally prevalent problem in other musculoskeletal disorders, such as low back pain (24).

Furthermore, 7 categories related to problems of *neuromusculoskeletal and movement-related functions* (b7) were identified. Of these, the most frequently reported problems were in the

*mobility of joint functions* (b710), *muscle endurance functions* (b740), *muscle power functions* (b730) and *mobility of bone functions* (b720). Most of these categories reflect functions that are considered key elements in the clinical examination of shoulder pain (6, 36). The findings of the current study thus show that patients have perceptions of aspects of functioning that traditionally have been assessed by clinicians. However, one of the frequent functions, muscle endurance, has received less attention in the clinical literature. Brox and colleagues (37) found that isometric muscle endurance was associated with both emotional distress and increased pain in a group of patients with rotator cuff tendinosis, and they recommended muscle endurance testing as a psychophysiological measure in assessments. The findings indicate that patients have perceptions of aspects of functioning that are often assessed by clinicians, and future research should investigate the benefits of the improved participation of patients in the examinations.

Three categories were identified within the *body structures* component, of which the *structure of shoulder region* (s720) was the most frequently reported. The registrations were made according to the evidence-based diagnostic criteria of symptom localization and imaging used in the department (32, 33). Almost two-thirds of the patients reported additional neck pain, and more than one-third reported additional low back pain. Others have shown that additional pain or symptom sites may be predictive for patients' disability. Cunningham and colleagues (38) suggested that persons with multiple pain sites were more likely to report disability, while Kamalari and colleagues (39) found an almost linear relationship between the number of pain sites and overall health, sleep quality, and psychological health. Whether pain in the neck should be considered a comorbidity is, however, a matter of definition, which has been handled differently in different studies. How-

ever, we believe that only a few patients in the current study may be characterized as having multiple pain sites because generalized pain was an exclusion criterion.

In the area of *mental functions* (b1-chapter), problems related to 7 categories were identified. More than half of the participants had problems with *sleep* (b134), *energy and drive functions* (b130) and *temperament and personality functions* (b126). However, only 12% of the patients in the current study reported depression on the comorbidity form. Psychological factors have been found to be important in understanding the development or maintenance of shoulder pain (7, 11, 12). Van der Windt and colleagues (40) found that these factors were more strongly associated with persistent pain and disability in patients with low back pain than in those with shoulder pain, and they suggested that the influence of psychological factors on outcome varies across patients with different types of pain. By contrast, difficulties with mental function in the current study were found with somewhat higher frequencies than for the patients with low back pain in the cross-sectional study by Ewert and colleagues (24). Until now, how problems in mental functioning should influence clinical decision-making has been little discussed.

With regard to problems in *activities and participation*, a total of 33 categories were identified. Related to *mobility* (d4-chapter), problems in *lifting and carrying objects* (d430) and *changing or maintaining a body position* (d410 and d415) were the most commonly reported. When comparing the d4 mobility chapter findings with the other musculoskeletal cross-sectional studies, lifting and carrying appeared to be a functional problem that was very frequent in all conditions (24). Unlike shoulder pain, problems walking were also frequent among the other musculoskeletal conditions.

Activities of daily living were also affected. With respect to the *self-care* (d5) and *domestic life* (d6), problems in *washing oneself* (d510), *dressing* (d540), *doing housework* (d640) and *acquisition of goods and services* (d620) were the most frequent. Functioning according to self-care and domestic life has been considered important and are thus often implemented in the items of condition-specific scales (8, 10, 41). By contrast, for low back pain, no frequent functions related to self-care, and only 1 related to domestic life, were identified in the cross-sectional study (24). Nevertheless, the self-care and domestic life functions were added during the development of the ICF Core Set for low back pain, and these functions are also present in the other musculoskeletal Core Sets (22, 42).

Although problems in social participation were reported by less than 20% of the patients, 7 functions of *interpersonal interactions and relationships* (d7-chapter) were identified. These primarily concerned *intimate relationships* (d770), *family relationships* (d760) and *informal social relationships* (d750), and indicate that for some patients their shoulder pain has consequences for their social life. In an overview of psychosocial and behavioural factors in shoulder and neck pain, Linton (11) suggested that a better understanding of these factors might enhance the treatment and prevention of the condition. An almost equal number of low frequent functional problems in

the *interpersonal interactions and relationships* (d7-chapter) were found among the other musculoskeletal conditions (24), and problems in intimate relationships (d770) were found to represent a common problem in all musculoskeletal ICF Core Sets (42).

A large majority of the working patients reported problems with *remunerative employment* (d850), and 6 of 10 of the students reported problems with *higher education* (d830). These findings are in line with previous findings of a negative relationship between shoulder pain and work (2, 3). Moreover, the high frequency of problems in remunerative employment was parallel to the other cross-sectional study on musculoskeletal conditions (24). In a recent cross-sectional study on patients in vocational rehabilitation, 40 activities and participation functions were identified as a problem, a substantially higher number than in the other studies (25). The finding from vocational rehabilitation shows that problems related to work performance are complex, and thus need to be classified by a range of ICF categories of the component.

Problems in *recreation and leisure* (d920) were reported by more than two-thirds of the patients. This category covers sports, playing, and engaging in handicrafts, hobbies and gatherings with others. However, we did not register whether the problems were related to sports or other recreational activities. Participation in sports is known to be affected in patients with shoulder pain (43). Problems in recreation and leisure were also reported by patients with low back pain and also found in all 5 condition-specific ICF Core Sets for musculoskeletal conditions (24, 42).

Eight *environmental factors* were identified as facilitators or barriers to functioning in the current study. Five of the 8 categories were in *support and relationships* (e3-chapter) and were primarily reported as facilitators. The findings of relevant *environmental factors* in the current study indicate that social factors may positively contribute to functioning for patients with shoulder pain. Although environmental factors have generally received little attention in shoulder pain research, there is some evidence to support the current findings (14–16). The cross-sectional study on musculoskeletal conditions also found few and low frequency categories according to the component (24). However, a number of categories of environmental factors were identified in other elements of the ICF Core Set development process for these conditions, indicating that structured interviews with limited time frames may not be the most adequate method to identify these factors (22, 24, 42).

The ICF chapters registered with the highest number of functional problems are shown in Fig. 2. The finding illustrates the complexity of the disability associated with chronic shoulder pain, and underscores the need to address a number of different functional domains in clinical decision-making (41).

The strength of this study is that it provides, for the first time, a comprehensive overview of functioning in shoulder pain within the ICF framework. However, this study has some limitations that should be considered. First, some condition-specific categories of interest may have been missed due to the development procedure of the Extended Checklist. For

example, the *handling stress and other psychological demands* (d240) category occurred frequently in the vocational rehabilitation study, but it was not found in the measures used to extend the checklist in the current study (25). Secondly, few elderly patients and patients with rheumatic disorders were included in the current study, even though shoulder pain may be common in such patients (44, 45). The results may thus not be generalized to these patient groups. Thirdly, this study was conducted with a cohort referred to a university hospital. Therefore, the patients may not be representative of the general population of shoulder pain patients seen by general practitioners.

In conclusion, this study provides the first comprehensive overview of disability in shoulder pain from the perspective of patients, using the ICF as a reference. A set of 61 second-level ICF categories from the components of body functions and structures, activity and participation and environmental factors were identified. The categories reflect functional problems and relevant environmental factors in middle-aged patients with chronic shoulder pain. The findings may have implications for clinical decision-making and promote multidisciplinary communication. Future work should investigate whether the patient's perspective is sufficiently addressed in the current practice of shoulder pain rehabilitation.

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#### REFERENCES

- Luime JJ, Koes BW, Hendriksen IJ, Burdorf A, Verhagen AP, Miedema HS, et al. Prevalence and incidence of shoulder pain in the general population; a systematic review. *Scand J Rheumatol* 2004; 33: 73–81.
- Mehlum IS, Kjuus H, Veiersted KB, Wergeland E. Self-reported work-related health problems from the Oslo Health Study. *Occup Med (Oxf)* 2006; 56: 371–379.
- Nygren A, Berglund A, von Koch M. Neck-and-shoulder pain, an increasing problem. Strategies for using insurance material to follow trends. *Scand J Rehabil Med Suppl* 1995; 32: 107–112.
- van der Windt DA, Koes BW, Boeke AJ, Deville W, De Jong BA, Bouter LM. Shoulder disorders in general practice: prognostic indicators of outcome. *Br J Gen Pract* 1996; 46: 519–523.
- Allander E. Prevalence, incidence, and remission rates of some common rheumatic diseases or syndromes. *Scand J Rheumatol* 1974; 3: 145–153.
- Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop* 1987: 160–164.
- Badcock LJ, Lewis M, Hay EM, McCarney R, Croft PR. Chronic shoulder pain in the community: a syndrome of disability or distress? *Ann Rheum Dis* 2002; 61: 128–131.
- Beaton DE, Richards RR. Measuring function of the shoulder. A cross-sectional comparison of five questionnaires. *J Bone Joint Surg Am* 1996; 78: 882–890.
- Gartsman GM, Brinker MR, Khan M, Karahan M. Self-assessment of general health status in patients with five common shoulder conditions. *J Shoulder Elbow Surg* 1998; 7: 228–237.
- Largacha M, Parsons IMt, Campbell B, Titelman RM, Smith KL, Matsen F 3rd. Deficits in shoulder function and general health associated with sixteen common shoulder diagnoses: a study of 2674 patients. *J Shoulder Elbow Surg* 2006; 15: 30–39.
- Linton SJ. An overview of psychosocial and behavioral factors in neck-and-shoulder pain. *Scand J Rehabil Med* 1995; 32: 67–77.
- Ring D, Kadzielski J, Fabian L, Zurakowski D, Malhotra LR, Jupiter JB. Self-reported upper extremity health status correlates with depression. *J Bone Joint Surg Amer* 2006; 88: 1983–1988.
- Larsson B, Søgaard K, Rosendal L. Work related neck-shoulder pain: a review on magnitude, risk factors, biochemical characteristics, clinical picture and preventive interventions. *Baillieres Best Pract Res Clin Rheumatol* 2007; 21: 447–463.
- Pope DP, Croft PR, Pritchard CM, Silman AJ, Macfarlane GJ. Occupational factors related to shoulder pain and disability. *Occupat Environ Med* 1997; 54: 316–321.
- van der Windt DA, Thomas E, Pope DP, de Winter AF, Macfarlane GJ, Bouter LM, et al. Occupational risk factors for shoulder pain: a systematic review. *Occupat Environ Med* 2000; 57: 433–442.
- Bongers PM, de Winter CR, Kompier MA, Hildebrandt VH. Psychosocial factors at work and musculoskeletal disease. *Scand J Work Environ Health* 1993; 19: 297–312.
- Van Eerd D, Beaton D, Bombardier C, Cole D, Hogg-Johnson S. Classifying the forest or the trees? *J Clin Epidemiol* 2003; 56: 940–942.
- Van Eerd D, Beaton D, Cole D, Lucas J, Hogg-Johnson S, Bombardier C. Classification systems for upper-limb musculoskeletal disorders in workers: a review of the literature. *J Clin Epidemiol* 2003; 56: 925–936.
- Brox JI. Regional musculoskeletal conditions: shoulder pain. *Baillieres Best Pract Res Clin Rheumatol* 2003; 17: 33–56.
- World Health Organization. *International Classification of Functioning, Disability and Health (ICF)*. Geneva: WHO; 2001.
- Cieza A, Ewert T, Ustün, n TB, Chatterji S, Kostanjsek N, et al. Development of ICF Core Sets for patients with chronic conditions. *J Rehabil Med* 2004; Suppl 44: 9–11.
- Cieza A, Stucki G, Weigl M, Disler P, Wilfried J, van der Linden S, et al. ICF Core Sets for low back pain. *J Rehabil Med* 2004; Suppl 44: 69–74.
- Finger ME, Escorpizo R, Glassel A, Gmunder HP, Luckenkemper M, Chan C, et al. ICF Core Set for vocational rehabilitation: results of an international consensus conference. *Disabil Rehabil* 2012; 34: 429–438.
- Ewert T, Fuessl M, Cieza A, Andersen C, Chatterji S, Kostanjsek N, et al. Identification of the most common patient problems in patients with chronic conditions using the ICF checklist. *J Rehabil Med* 2004; Suppl 44: 22–29.
- Finger ME, Glassel A, Erhart P, Gradinger F, Klipstein A, Rivier G, et al. Identification of relevant ICF categories in vocational rehabilitation: a cross sectional study evaluating the clinical perspective. *J Occupat Rehabil* 2011; 21: 156–166.
- World Health Organization. *ICF Checklist Version 2.1a* [Internet]. 2004 [cited 2012 Nov 10]. Available from: <http://www.who.int/classifications/icf/training/icfchecklist.pdf>.
- Cieza A, Brockow T, Ewert T, Amman E, Kollerits B, Chatterji S, et al. Linking health-status measurements to the international classification of functioning, disability and health. *J Rehabil Med* 2002; 34: 205–210.
- Cieza A, Geyh S, Chatterji S, Kostanjsek N, Ustun B, Stucki G. ICF linking rules: an update based on lessons learned. *J Rehabil Med* 2005; 37: 212–218.
- Roach KE, Budiman-Mak E, Songsiridej N, Lertratanakul Y. Development of a shoulder pain and disability index. *Arthritis Care Res* 1991; 4: 143–149.
- Williams JW Jr, Holleman DR Jr, Simel DL. Measuring shoulder function with the Shoulder Pain and Disability Index. *J Rheumatol* 1995; 22: 727–732.
- Sangha O, Stucki G, Liang MH, Fossel AH, Katz JN. The Self-Administered Comorbidity Questionnaire: a new method to assess comorbidity for clinical and health services research. *Arthritis*

- Rheumat 2003; 49: 156–163.
32. Juel NG, Brox JI, Thingnaes K, Bjornerheim R, Bryde P, Villerso K, et al. [Musculoskeletal pain in ultrasound operators]. *Tidsskr Nor Laegeforen* 2008; 128: 2701–2705 (in Norwegian).
  33. Walker-Bone KE, Palmer KT, Reading I, Cooper C. Criteria for assessing pain and nonarticular soft-tissue rheumatic disorders of the neck and upper limb. *Semin Arthrit Rheumat* 2003; 33: 168–184.
  34. Beaton D, Richards RR. Assessing the reliability and responsiveness of 5 shoulder questionnaires. *J Shoulder Elbow Surg* 1998; 7: 565–572.
  35. Ostor AJ, Richards CA, Prevost AT, Speed CA, Hazleman BL. Diagnosis and relation to general health of shoulder disorders presenting to primary care. *Rheumatol (Oxford)* 2005; 44: 800–805.
  36. Richards RR, An K-N, Bigliani LU, Friedman RJ, Gartsman GM, Gristina AG, et al. A standardized method for the assessment of shoulder function. *J Shoulder Elbow Surg* 1994; 3: 347–352.
  37. Brox JI, Brevik JI, Ljunggren AE, Staff PH. Influence of anthropometric and psychological variables pain and disability on isometric endurance of shoulder abduction in patients with rotator tendinosis of the shoulder. *Scand J Rehabil Med* 1996; 28: 193–200.
  38. Cunningham LS, Kelsey JL. Epidemiology of musculoskeletal impairments and associated disability. *Am J Public Health* 1984; 74: 574–579.
  39. Kamaleri Y, Natvig B, Ihlebaek CM, Bruusgaard D. Localized or widespread musculoskeletal pain: does it matter? *Pain* 2008; 138: 41–46.
  40. van der Windt DAWM, Kuijpers T, Jellema P, van der Heijden GJMG, Bouter LM. Do psychological factors predict outcome in both low-back pain and shoulder pain? *Ann Rheumat Dis* 2007; 66: 313–319.
  41. Michener LA. Patient- and clinician-rated outcome measures for clinical decision making in rehabilitation. *J Sport Rehabil* 2011; 20: 37–45.
  42. Schwarzkopf SR, Ewert T, Dreinh, x00F, fer KE, Cieza A, et al. Towards an ICF Core Set for chronic musculoskeletal conditions: commonalities across ICF Core Sets for osteoarthritis, rheumatoid arthritis, osteoporosis, low back pain and chronic widespread pain. *Clinical Rheumatol* 2008; 27: 1355–1361.
  43. Owens S, Itamura JM. Differential diagnosis of shoulder injuries in sports. *Orthop Clin North Am* 2001; 32: 393–398.
  44. Bjelle A. Epidemiology of shoulder problems. *Baillieres Clin Rheumatol* 1989; 3: 437–451.
  45. Petersson CJ. Painful shoulders in patients with rheumatoid arthritis. Prevalence, clinical and radiological features. *Scand J Rheumatol* 1986; 15: 275–279.