

What are the Most Important Problems in Functioning Among Patients with Shoulder Pain? An Analysis of the Patient-Specific Functional Scale

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Abstract

Background Shoulder pain is a common and often persistent health condition with substantial impact on daily functioning. The primary aim of the present study was to identify important functional problems among patients with shoulder pain, using the Patient-Specific Functional Scale (PSFS). A secondary aim was to investigate differences between primary- and secondary care patients.

Methods The study had a cross-sectional design and included patients seeking care for shoulder pain in a primary- and a secondary outpatient clinic. Background variables, pain, physical activity level and the PSFS, were registered with a questionnaire package. Meaningful concepts from the PSFS responses were extracted and linked to the International Classification of Functioning, Disability and Health (ICF), according to the refined linking rules. Frequency for the ICF categories was estimated for primary- and secondary care, separately. Differences between primary and secondary care were investigated by calculating confidence intervals for the sample proportions, at ICF chapter level.

Results Of the total 177 patients, 84 were recruited from primary care and 93 from secondary care. The primary care sample reported functional problems linked to 226 ICF categories, while 337 in secondary care. Of the linked ICF categories 87.7% belonged to the Activities and Participation component of the ICF. Seventeen categories were identified in > 3% of the patients, of those the most frequent were: Recreation and leisure (d920), Lifting and carrying objects (d430), Doing housework (d640), Hand and arm use (d445) and Remunerative employment (d850). Categories included in the ICF chapters Self-care (d5) and Domestic life (d6) were significantly more frequent in the secondary care sample, while there was a trend that b7 Neuromusculoskeletal and movement-related functions were more frequent in primary care.

Conclusion The present findings indicate that patients with shoulder pain report a wide range of functional problems, from basic functions related to mobility to more complex functions related to work and leisure activities. This study also discovered differences in the report of functional problems between primary and secondary care patients. The large variation in the experiences between patients supports the use of an individualised measure to support assessment of functioning among shoulder patients.

Trial registration Not applicable

Background

Shoulder pain is a common, disabling and costly disorder with prevalence estimates ranging 7–26% in the general population [1–6]. Many cases of shoulder pain are long-lasting, among patients seeking the general practitioner for a new episode of shoulder pain, symptoms remained after 12 months in 41% of the cases [7]. While the majority of shoulder pain research has been conducted within secondary care settings, few studies have compared data between clinical settings [8].

Shoulder pain is an umbrella term and previous findings show that disability varies largely between patients from those experiencing mostly pain and movement-deficits to those with sleeping and

emotional problems and different types of activity limitations [2, 8]. This is supported by a systematic review on qualitative studies, which found that shoulder pain patients suffer from disruptive experiences such as pain, physical function/activity limitations, participation restriction, sleeping problems, lack of energy and drive and pathophysiological manifestations [4]. Although these studies provide an overview of the disorder at the population- and individual level they do not show which functional problems are most urgent daily for patients with shoulder pain disorders.

The Patient-Specific Functional scale (PSFS) is a measurement instrument in which the patient is asked to identify functional problems she/he either has problem performing, or is unable to do because of a disorder [9]. The psychometric properties of the PSFS have been proven for a number of disorders, including shoulder pain [10, 11]. Due to the patient centred nature of the PSFS, it can be a valuable tool in clinical goal setting and in evaluation of treatment interventions. Although shoulder-specific questionnaires of pain and function are most often used as the primary outcome in clinical trials of shoulder pain, their ability to capture the patient experience of functioning has been questioned [12, 13].

The International Classification of Functioning, Disability and Health (ICF) is the WHO biopsychosocial framework for health and disability (WHO, 2001). Since it was approved in 2001, it has been used as a tool to classify and compare health information. A set of ten linking rules were published in 2002, updated in 2005 and further refined in 2016 in order to extract and translate content from measurement instruments into ICF categories [14–16]. The ICF linking rules have been used to extract and classify responses from a number of sources, including PSFS responses in patients with low back pain and in a mixed population with musculoskeletal disorders [17, 18].

The primary aim of the present study was to identify important functional problems among patients with shoulder pain, using the PSFS. A secondary aim was to investigate differences in the reported problems between primary- and secondary care patients.

Methods

Design and setting

This cross-sectional study was based on the baseline data from two outpatient clinics, whereas one was in primary care at Oslo Metropolitan University of Applied Sciences and the other in secondary care at Ålesund hospital, a small city at the western coast of Norway.

Participants

Patients referred for the management of shoulder pain were recruited from March 2015 to December 2017. Patients were eligible for inclusion if the shoulder pain was their main health problem (primary care) or received a diagnosis related to the shoulder (secondary care), were aged 18 years or older and adequately understood the Norwegian language. For the secondary care sample, the exclusion criteria were systematic disease or generalized pain, cardiac disease, symptoms of cervical spine disease or

surgery in the affected shoulder in the last 6 months. All participants signed informed consent. Ethical approval for the present study was obtained from the Norwegian Regional Committees for Medical and Health Research Ethics (Ref.2017/439) and the Norwegian Centre for Research Data (Ref 2018/1191).

Measurements

The included patients filled in a questionnaire package consisting of the following background variables: Age, gender, educational level and working situation (employment status and sick leave). The pain duration and pain during the last week was registered by a 11-point numerical scale. Self-reported physical exercise-level was registered as the number of times the patient had exercised during the last week. The important functional problems were collected with the Patient-Specific Functional Scale (PSFS), Norwegian language version [19]. In the present version of the PSFS the patient was requested to identify up to three activities they had problems performing, because of their shoulder problem. The severity of the problem was scored on a 11-point numerical scale, where 0 was unable to perform activity and 10 was able to perform at pre-injury level.

ICF content linking

The content of the PSFS items was analysed, using the refined linking rules of the International Classification of Functioning, Disability and Health (ICF) [14–16, 20]. The ICF is based on an integrative model of health that classifies functioning within the components of Body Functions (b), Body Structures (s), Activities & Participation (d), and Environmental factors (e) and Personal Factors (not classified). The ICF classifications (b, s, d, e) provides categories of functioning and environmental factors that are arranged hierarchically, using an alphanumeric coding system.

The content of the PSFS items was linked to the ICF according to the 10 refined linking rules [16]. Linking rules #1–3 specify how to get familiar with the ICF, identifying the purpose of an instrument and concepts to be linked to the ICF. First, the actual meaning (main and additional concepts) of the information to be linked was identified (rule #2 and 3) [16]. When identifying the concepts, both the item text and the text that set premises for the interpretation of the item content was taken into consideration. For most PSFS items it was straightforward to identify main and additional concepts. The next step was to document the perspectives from which the information was collected (linking rule # 4). The most common perspectives included in measurement instruments are the descriptive, appraisal and the needs or dependency perspectives [16]. The descriptive perspective refers to a person's function of the body, the ability to perform a task in a standardized environment (capacity), or actual performance of certain task or activities in the natural environment. Linking rule #5, concerns the categorisation of the response option in a measure. Finally, all main and additional concepts identified during step #2 and 3 were linked to the most precise ICF category (linking rules #6–10). Concerning concepts not sufficiently specified to be linked, the not definable option (nd), was used. Likewise, if a concept was not covered by any of the ICF classifications, the option not covered (nc), was used.

All responses were independently linked by two researchers (TR and ATT). In case of disagreement a third researcher who was an expert in the ICF (YR), was consulted. Before the linking, the two researchers went

through training, which included studying online resources provided by the ICF Research Group and linking of shoulder questionnaires that had already been reported [13]. After these rather comprehensive trials, the researchers linked the meaningful concepts included in the present study. The agreement of the linking of concepts at 2nd ICF category level, was calculated with the Cohen's Kappa coefficient. The 95% confidence intervals (95% CI) for the Kappa coefficient were calculated using the standard error of the kappa: $k \pm 1.96 \times SE_k$ [21]. The calculated Kappa coefficient of the linking of main and additional concepts was 0.98, 95% CI [0.97, 0.99], considered as excellent [22].

The ICF frequency of the linked categories was transformed to relative numbers, based on the number of incidents (linked ICF categories) in each sample. The content in the PSFS items was analysed regardless of the severity of the problem.

Statistical analyses

The background variables were analysed with descriptive statistics. Differences in the reported problems between primary- and secondary care patients were investigated by comparing incidences at ICF chapter level. The relative frequency for each ICF chapter was calculated by summing the frequencies of categories belonging to the chapter. The confidence intervals (95% CI) for the point estimates were calculated using the equation

$$\hat{\rho} \pm 1.96 * \sqrt{\frac{\hat{\rho} * (1 - \hat{\rho})}{n}}$$

where $\hat{\rho}$ was the sample proportion and n the total number of incidents (categories) in the sample:

Similarly, the confidence intervals (95% CI) for the difference between the primary ($\widehat{\rho}_P$) and secondary care ($\widehat{\rho}_S$) samples were calculated using the equation

$$\widehat{\rho}_P - \widehat{\rho}_S \pm 2 * \sqrt{\frac{\widehat{\rho}_P * (1 - \widehat{\rho}_P)}{n_1} + \frac{\widehat{\rho}_S * (1 - \widehat{\rho}_S)}{n_2}}$$

The difference estimates in which the confidence interval did not include zero, were considered as significant. The ICF chapters including categories with overall frequency > 1%, were included in the analysis.

Results

Of the total 177 patients, 84 were recruited from primary care and 93 from secondary care. The baseline characteristics of the patients are presented in Table 1. The samples were rather similar with respect to age and gender, but the secondary care patients in average had longer pain duration, more patients on sick-leave and higher level of disability (lower PSFS score).

Table 1

Background variables of the patients with respect to clinical setting. Values are numbers (percentages) unless stated otherwise

	Primary care n = 84	Secondary care n = 93
Mean (SD) Age (years).	43.0 (15.2)	45.3 (10.2)
Gender,		
Male	25 (31.1)	25 (26.9)
Female	59 (69.9)	68 (73.1)
Education level,		
Obligatory school	3 (3.6)	5 (5.4)
High School	24 (28.6)	40 (43.0)
University < 4 years	24 (28.6)	26 (28.0)
University > 4 years	31 (36.9)	20 (21.5)
Missing	2 (2.4)	2 (2.2)
Work situation,		
Full-time	40 (47.6)	49 (52.7)
Part-time	8 (9.5)	31 (33.3)
Student	24 (28.6)	3 (3.2)
Other	12 (14.3)	8 (8.6)
Missing	0	2 (2.2)
On sick leave	8 (9.5)	37 (39.8)
Pain duration		
1–3 months	23 (27.4)	1 (1.1)
4–12 months	23 (27.4)	21 (22.6)
More than 12 months	38 (45.2)	70 (75.3)
Missing	0	1 (1.1)
Mean (SD) Pain last week (NPRS),	4.4 (2.15)	5.2 (1.86)
Physical exercise level		
< Once a week	6 (7.2)	8 (8.6)

	Primary care n = 84	Secondary care n = 93
Once a week	8 (9.5)	11 (11.8)
2–3 times a week	53 (63.1)	48 (51.6)
Almost every day	17 (20.2)	17 (18.3)
Missing	0	9 (9.7)
Mean (SD) Patient-Specific Functional Scale*	4.78 (2.21)	3.44 (1.75)
* PSFS original scale, 0 (unable to perform activity) – 10 (able to perform at pre-injury level). An average score for each patient was obtained by summing the ratings of the nominated activities and dividing by the number of defined activities (up to 3)		

Frequent functional problems

The framing of the items in the PSFS (linking rule #4) reflects a descriptive-performance perspective and the response scale (linking rule #5) reflects intensity. A total of 563 meaningful concepts (226 from primary care and 337 from secondary care), were extracted and linked to the ICF (linking rules #6–10). Of the linked ICF categories 87.7% belonged to Activities and Participation, 9.9% to Body Functions, 2% to ‘Environmental Factors’ and 0.4% were not definable.

The 17 ICF categories identified in at least 2% of the patients in one of the samples, are shown in Fig. 1. The most frequent categories were: Recreation and leisure (d920), Lifting and carrying objects (d430), Doing housework (d640), Remunerative employment (d850) and Hand and arm use (d445).

Between sample differences

The ICF chapters with the highest proportions of categories, in descending order, were: Mobility (d4), Community, social and civic life (d9), Domestic life (d6) and Major life areas (d8). The sample proportions and the differences between samples, are displayed in Table 2. Functional problems linked to Self-care (d5) and Domestic life (d6), were significantly more frequent in secondary care. In contrast, Neuromusculoskeletal and movement-related functions (b7) was more frequent in primary care (Confidence Interval close to Zero), For the rest of the ICF chapters, no significant sample differences were discovered.

Table 2

Comparison of incidences between primary- and secondary care samples at ICF chapter level with relative numbers and confidence intervals

	$\hat{p}_{Primary}$	$\hat{p}_{Secondary}$	$\hat{p}_P - \hat{p}_S$
ICF chapters	Percent [95% CI]	Percent [95% CI]	Percent [95% CI]
b1 Mental functions	2.2 [0.3, 4.1]	2.1 [0.6, 3.6]	0.1 [-2.4, 2.6]
b2 Sensory functions and pain	4.0 [1.4, 6.6]	1.5 [0.2, 2.8]	2.5 [-0.4, 5.4]
b7 Neuromusculoskeletal and mov.	8.4 [4.8, 12.0]	3.9 [1.8, 6.0]	4.5 [0.3, 8.7]
d1 Learning and applying knowledge	2.7 [0.6, 4.8]	0.6 [0.8, 1.4]	2.1 [-0.2, 4.4]
d4 Mobility	37.5 [31.2, 43.8]	34.0 [28.9, 39.1]	3.5 [-4.6, 11.6]
d5 Self-care	3.0 [0.8, 5.2]	8.1 [5.2, 11.0]	-5.1 [-8.1, -2.1]
d6 Domestic life	3.5 [1.1, 5.9]	20.2 [15.9, 24.5]	-16.7 [-21.1, -11.3]
d7 Interpersonal interactions and rel.	0.4 [-0.4, 1.2]	2.1 [0.6, 3.6]	-1.7 [-4.7, 1.3]
d8 Major life areas	9.2 [5.4, 13.0]	8.9 [5.9, 11.9]	0.3 [-4.5, 5.1]
d9 Community, social and civic life	24.3 [18.7, 29.9]	17.8 [13.8, 21.9]	6.5 [-0.4, 13.4]
e1 Products and technology	3.6 [1.2, 6.0]	0.9 [-0.1, 1.9]	2.7 [-1.7, 3.5]
Other chapters or non-definable	0.8 [-2.7, 4.3]	0.3 [-0.3, 0.9]	0.5 [-0.8, 1.8]
	100%	100%	

Discussion

This study showed a range of important functional problems reported by patients with shoulder pain, and that there were significant differences between primary- and secondary care patients with respect to types of functional problems reported. In the secondary care problems related to self-care and domestic life were more common, whereas in the primary care problems related to neuromuscular and movement-related body functions dominated.

Almost 90% of the linked problems from the Patient-Specific Functional Scale (PSFS) belonged to the Activities and Participation component of the International Classification of Functioning, Disability and Health (ICF). This finding was similar to two other studies, of which one collected data from a hospital outpatient clinic and the other from several physiotherapy school clinics [17, 18]. The explanation for the

high frequency of activity and participation related problems probably is the little guiding provided in the PSFS in terms of functional problems in a body perspective, such as pain and sleeping. This is supported by the findings in another study which registered functional problems on a broader basis, using an extended ICF-based checklist [8]. In this study problems were more evenly distributed between these ICF components.

It is worth noting that several of the high-ranked categories in the present study (Fig. 1) are not included in commonly used shoulder-specific questionnaires, such as the Shoulder Pain and Disability Index (SPADI) and the Oxford Shoulder Score (OSS) [23]. This is particularly the case for functional problems reflecting housework, employment and leisure activities. This lack of consistency supports the conclusions of a previous study from our group, which questioned the content validity of shoulder-specific questionnaires of pain and functioning [23]. In our view the large variation in the patient experience of shoulder pain and functioning, supports the use of an individualised measurement instrument, such as the PSFS, instead of, or in addition to standardised questionnaires, depending upon the purpose of the assessment.

A main finding of our study was the significant differences between patients in primary and secondary care (Table 2). There are, however, several reasons for careful interpretation of these results. First, the higher number of problems reported by each patient in the secondary care population may explain some of the differences. Second, the confidence intervals for all sample proportions were rather wide, and the significant difference for one chapter (b7), was close to touching zero. We think the width of the confidence intervals were due to the relative low number of incidents in both populations. Given these limitations, still we think the results are highly interesting, as they show that self-care and domestic life related problems are significantly more common among secondary care patients, and that there was a trend that muscle- and movement-related body function problems were more common in primary care. In It is also worth mentioning that the largest differences were discovered in domestic life, which accounted for 20.2% of the problems in secondary care, while only 3.5% in primary care. Surprisingly, no significant differences were found within the high frequent work and leisure activities, although the latter were close to being more frequently reported in the primary care sample. This finding underlines the importance of including these types of activities in assessments of functioning, independent of clinical setting.

A strength of this study was the high agreement between researchers in the linking process, which support a structured preparation plan, before the linking. We also think the clinical expertise of the researchers provided an important context in the linking process. This study also had some limitations. First, the study included a heterogeneous group of patients with different shoulder diagnoses. There is evidence indicating that painful and stiff shoulders, consistent with an adhesive capsulitis diagnosis, might have a disability profile that differs from rotator cuff-related disorders [24]. Because the participants in the primary care sample were included based on self-reported shoulder pain, the diagnostic distribution is not known. Second, the primary care sample was collected in urban Oslo, while the secondary care sample in a small city at the western coast of Norway. Nevertheless, a previous study

found that self-reported musculoskeletal complaints in a local community was representative for the general Norwegian population [25].

Conclusion

The present findings indicate that patients with shoulder pain reported a wide range of functional problems, from basic functions related to mobility to more complex functions related to work and leisure activities. This study also discovered differences in the report of functional problems between primary and secondary care patients. Important functional problems from the perspective of patients with shoulder pain extended across a range of functional dimensions. These large variations support the use of an individualised measure to supplement other standardised instruments in the assessment of functioning among shoulder patients.

List Of Abbreviations

PSFS Patient-Specific Functional Scale

ICF International Classification of Functioning, Disability and Health

Declarations

Ethics approval and consent to participate

All participants signed informed consent. Ethical approval for the present study was obtained from the Norwegian Regional Committees for Medical and Health Research Ethics (Ref.2017/439) and the Norwegian Centre for Research Data (Ref 2018/1191).

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

YR was responsible for the analyses of the data and in writing of the manuscript. TR participated in the analyses of the data and in writing the manuscript. ATT participated in the collection of data, analyses and in writing the manuscript. TBS and MJ participated in the collection of data and in writing the manuscript. MG participated in the collection of data, analyses and was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

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Not applicable

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Figures

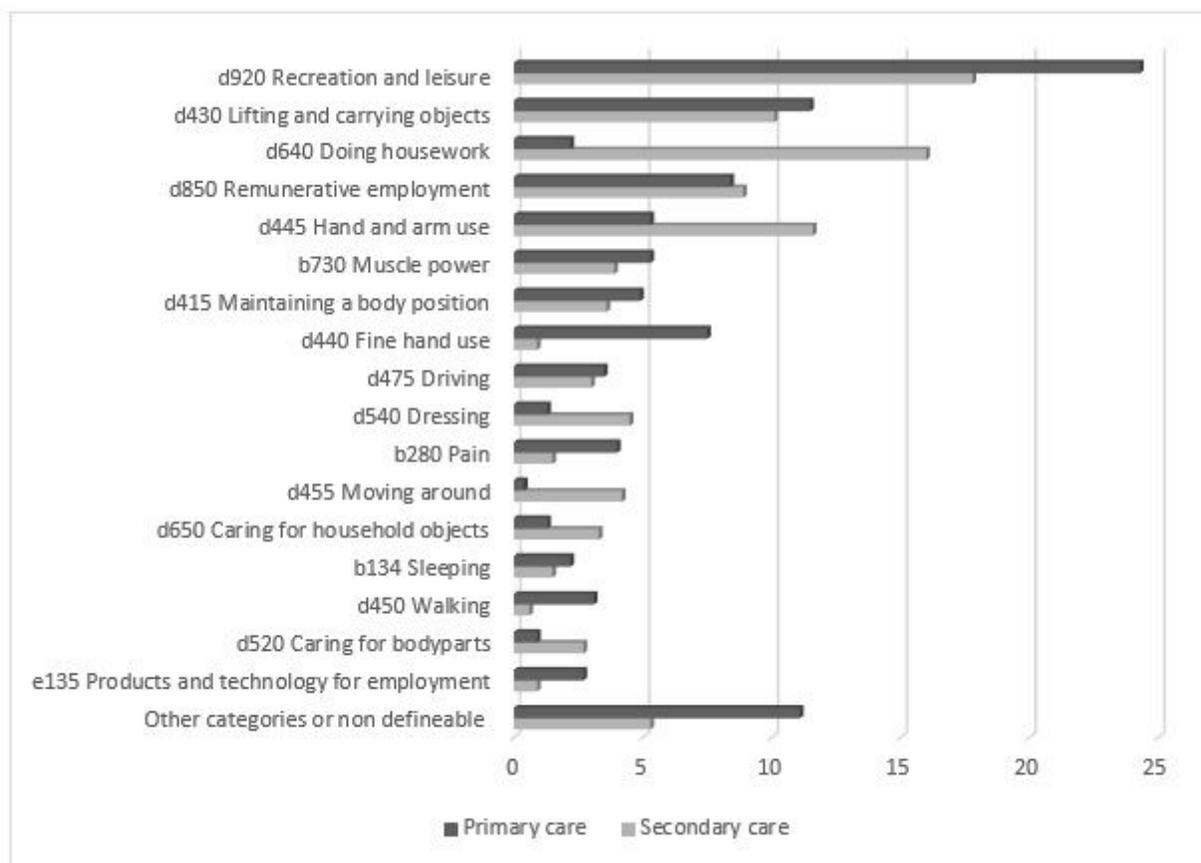


Figure 1

Relative distribution of frequent ICF categories (>2%), presented separately for the primary- and secondary care samples