Responsiveness of a Danish version of the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire

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ABSTRACT

INTRODUCTION: This prospective cohort study in consecutive shoulder patients sought to determine the minimal, clinically important difference of the Danish version of the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire and to evaluate patient responsiveness to it. The study was undertaken at the Outpatient Clinic of the Department of Orthopaedic Surgery, Viborg Regional Hospital, Denmark.

MATERIAL AND METHODS: During clinical examination, patients completed a baseline questionnaire including the DASH questionnaire, the EuroQol-5D index and the EuroQol-VAS. A follow-up questionnaire concerning the patient's global impression of change was posted to the patients eight to nine weeks after the initial assessment. Responsiveness was analysed by correlation analysis and receiver-operating characteristic curve statistics. Using the optimal cut-off point of the receiver-operating characteristic curve, the minimal, clinically important difference was determined.

RESULTS: A total of 81 patients with a variety of shoulder diagnoses were included. Only the DASH questionnaire demonstrated significant differences in change scores (p = 0.001). The area under the curve was 0.76 (95% confidence interval, 0.62-0.90), and a minimal clinically important difference of 12 points was found.

CONCLUSION: The DASH questionnaire provides a response outcome measure in Danish-speaking orthopaedic shoulder patients.

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TRIAL REGISTRATION: not relevant.

Patient-reported outcome measures are considered important in the assessment of shoulder pain and disability. However, any evaluation of a questionnaire should be conducted within the population and setting in which it will be utilised [1]. The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire has recently been translated into Danish and was to found to be reliable in orthopaedic patients with a variety of upper extremity disorders [2]. Important aspects of the questionnaire's psychometric properties include its responsiveness and minimal clinically important difference (MCID) [1]. Responsiveness is defined as the ability of an instrument to accurately detect a clinically meaningful change [3]. A MCID exists for all instruments and is defined as the smallest change in a score that a patient would perceive as beneficial or detrimental and that could justify a change in management. The MCID of the Danish version of the DASH questionnaire in shoulder patients and the questionnaire's responsiveness have yet to be investigated.

Thus, the aim of the present study was to evaluate the responsiveness and the MCID of the Danish version of the DASH questionnaire in orthopaedic shoulder patients.

MATERIAL AND METHODS

Eligible patients for this study were consecutive shoulder patients referred to the Department of Orthopaedic Surgery, Viborg Regional Hospital, Denmark, in October 2012 and November 2012.

The patients were invited to participate in the study in connection with their shoulder examination. All patients signed an informed consent form. On the day of the clinical examination, the patients completed a baseline questionnaire including questions regarding demographics, history of shoulder problems and the DASH questionnaire, EuroQol five dimensions questionnaire (EQ-5D index) and EuroQol Visual Analogue Scales (EQ-VAS). The clinical diagnoses were obtained from medical records based on preliminary medical examination.

A follow-up questionnaire was posted to the patients 8-9 weeks after their initial assessment, which included a transition question regarding the patient's perceived global impression of change.

The DASH questionnaire is a self-administered questionnaire and is region-specific to upper extremity disorders. The questionnaire consists of 30 items, including six items on symptoms and 24 on function. The questionnaire score can range from 0 to 100, where 0 = no disability and 100 = most severe disability. If there is no response for more than three items, no DASH score is calculated [4].

The EQ-5D index and the EQ-VAS are components of a generic measure of health-related quality of life [5]. The EQ-5D index measures five dimensions of health; for each health state, utility scores were assigned using Danish time trade-off values to transform the EQ-5D in-

TABLE 1

Patient characteristics
(N = 81).

Age, yrs, mean, (± SD)	55 (± 15.2)
Gender, female, n (%)	45 (55.6)
Working, n (%)	37 (45.7)
Dominant side shoulder pain, n (%)	71 (88.8)
Diagnoses[a], n (%)	
Rotator cuff/impingement	25 (30.9)
Adhesive capsulitis	7 (8.6)
Humeroscapular instability	9 (11.1)
Humeroscapular arthrosis	12 (14.8)
Humeral fracture	5 (6.2)
Other shoulder disorder	11 (13.6)
Shoulder disorder without specification	12 (14.8)

SD = standard deviation.
a) In cases of more than one diagnosis, only the predominant diagnosis is reported.

TABLE 2

Scores and AUC for the DASH questionnaire, EQ-5D index and EQ-5D VAS.

	Baseline, mean (SD)	Follow-up, mean (SD)	Change, mean (SD)	p-value[a]	AUC, mean (95% CI)
DASH (N = 59)	35.8 (19.7)	30.2 (20.5)	5.6 (12.4)	0.00	0.76 (0.62-0.90)
Improved (n = 15)	29.0 (15.7)	15.0 (13.5)	13.9 (10.2)		
Unchanged (n = 41)	38.1 (21.9)	34.5 (20.1)	3.6 (11.4)		
EQ-5D index (N = 59)	0.7 (0.2)	0.7 (0.2)	0.1 (0.2)	0.09	0.53 (0.38-0.69)
Improved (n = 15)	0.8 (0.1)	0.8 (0.1)	0.1 (0.1)		
Unchanged (n = 41)	0.8 (0.2)	0.7 (0.2)	0.1 (0.2)		
EQ-5D VAS (N = 59)	62.6 (26.3)	66.3 (22.1)	−3.6 (18.1)	0.13	0.63 (0.46-0.80)
Improved (n = 15)	73.1 (20.6)	82.9 (12.6)	9.8 (21.0)		
Unchanged (n = 41)	60.4 (27.1)	62.2 (21.2)	1.8 (17.6)		

AUC = area under the curve; CI = confidence interval; DASH = the Disabilities of the Arm, Shoulder and Hand questionnaire; EQ-5D index = EuroQol 5 dimensions questionnaire; EQ-5D VAS = EuroQol visual analogue scales; SD = standard deviation.
a) Analysed by paired t-test.

dex scores into health utility scores. The Danish utility scores range from -0.6 to 1.0, with higher values representing better health states. The EQ-VAS is a visual analogue scale ranging from 0 to 100, where 0 = worst and 100 = best imaginable state of health. Each patient's global impression of change was measured using a seven-point Likert scale ranging from one (much improved) to seven (much worse). The question was worded as follows: Compared with eight weeks ago, how would you describe your current shoulder condition? We expected that the DASH questionnaire would demonstrate superior responsiveness to generic measures in shoulder patients. All data were double-entered using EpiData 3.1 and statistical analysis was performed using STATA11.

Descriptive statistics were calculated for all variables. The distribution of baseline and follow-up scores were inspected for possible floor and ceiling effects,

which were considered to be present if more than 15% of the patients had either the highest or the lowest score [1].

Responsiveness was assessed using two different strategies: correlation analysis and receiver operating characteristic (ROC) curve statistics [6]. The Spearman rank correlation coefficient was used to assess how well the scores changed from baseline to follow-up for the DASH questionnaire, EQ-5D scores and EQ-VAS, as correlated with the patient's global impression of change. Correlation coefficients in the 0.00-0.25 range indicated little or no relationship; 0.26-0.50 indicated a fair relationship; 0.51-0.75 indicated a moderate to good relationship; and values greater than 0.75 were considered good to excellent [7]. ROC curve analyses of the change scores were used to assess sensitivity and specificity to correctly classify patients as improved (completely recovered and much better) or unchanged (somewhat better, unchanged or slightly worse), and these results were then compared with the patient's global impression of change. The areas under the ROC curves (ROC_{AUC}) were estimated with 95% confidence intervals (CIs). An area under the curve (AUC) of a least 0.70 is considered to be adequate [1]. For each questionnaire, the MCID was determined according to the optimal cut-off point of the ROC curve.

Trial registration: not relevant.

RESULTS
In total, 81 patients completed the baseline questionnaires. The baseline characteristics of the included patients are presented in **Table 1**.

The study sample contained a variety of diagnoses of which the majority was rotator cuff/impingement syndrome. At baseline, 24 patients had one or two missing items in the DASH questionnaire and no patients had missing items in the EQ-5D index or the EQ-VAS.

A total of 65 patients (77%) returned the follow-up questionnaire. The average time between the completion of the questionnaires was 70 days (standard deviation (SD) 8.3). Scores for patients with more than three missing items in the DASH questionnaire and with missing items in the EQ-5D index and the EQ-VAS were not calculated. As such, there were 59 patients with complete data for the final analysis. The included patients did not significantly differ from patients who were not included with respect to baseline characteristics or scores.

No floor or ceiling effect was observed for baseline or follow-up scores for any of the included scales. The scores from baseline to follow-up are presented in **Table 2**.

The correlations between the patients' global im-

pression of change scores and the DASH questionnaire, the EQ-5D score and the EQ-VAS were -0.520 (p = 0.001), -0.279, (p = 0.032) and -0.140, (p = 0.308), respectively. Based on the global impression of change result, a total of 15 (25%) patients were grouped as "improved", 41 patients (70%) as "unchanged" and three patients (5%) as "worse". Due to the small number of patients in the latter category, a ''worse'' subgroup was not included in the ROC curve analysis. The AUC for the DASH questionnaire was found to be 0.76 (Table 2 and **Figure 1**), which yielded an MCID of 11.7 points.

DISCUSSION

The aim of the present study was to evaluate the responsiveness and the MCID of the Danish version of the DASH questionnaire in orthopaedic shoulder patients. The questionnaire surpassed the threshold of the AUC (i.e., > 0.70) previously proposed as a quality criteria for adequate responsiveness in health status questionnaires [1]. Moreover, as expected, we found the questionnaire to be more sensitive to change and more strongly correlated with the patient's perceived global impression of change than the generic health-related scales. The results of the present study are in accordance with previous studies [8-10]. In patients with total shoulder arthroplasty [10], shoulder impingement [8] and a variety of upper extremity diagnoses [9], the AUCs were found to be 0.71 (0.60-0.82), 0.79 (0.69-0.89) and 0.67, respectively. Similar to our findings, no floor or ceiling effect was reported in these previous studies. The MCID found in the present study resembles the findings by others (11.7 versus 10.2) [11]. The MCIDs for outcome measures may vary depending on the population, setting and given intervention, which may explain the slightly higher MCID value observed in our study [12].

The present study had some limitations. For example, the response rate of the follow-up questionnaire was moderate (77%). However, the included patients did not differ from the patients not included, and we therefore do not believe that this affected our results. In addition, the follow-up time in the present study was 8-9 weeks, and we did not obtain information regarding treatments received during those weeks; also, for some patients, 8-9 weeks is insufficient time for recovery. This may have resulted in the small change score of 5.6 compared with the 13 points found by Smith JS et al [11]. Finally, our results may only be generalised to shoulder patients in secondary care as the patients in primary care are often less affected by their shoulder problems.

In the present study, responsiveness and the MCID were analysed using the patient´s global impression of change as an anchor. Anchor-based methods have been criticised because of the need to recall baseline health status [8]. However, the reliability of the seven-point

Receiver operating characteristic (ROC) curve for the Disabilities of the Arm, Shoulder and Hand questionnaire.

Area under ROC curve = 0.7612
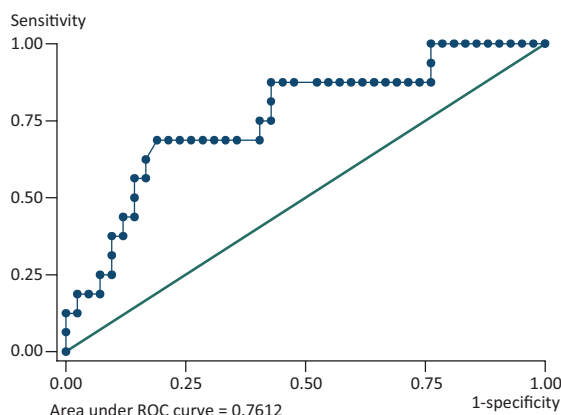
Likert scale has been shown to be excellent [13]. A range of statistical indicators of responsiveness was also employed. In the present study, two different methods were used to provide as much clarity as possible on the performance of the DASH questionnaire and both methods found the DASH questionnaire to be responsive to change.

CONCLUSION

The DASH questionnaire was shown to be a responsive outcome measure in Danish-speaking orthopaedic patients with a variety of shoulder diagnoses. Further work

The Disabilities of the Arm, Shoulder and Hand questionnaire may be used for measurement of functional ability and pain in shoulder patients.

should be performed to compare the psychometric properties of the DASH questionnaire to questionnaires specific to the shoulder, e.g. the Shoulder, Pain and Disability Index.

Clinical messages

– The DASH questionnaire was found to be a responsive measurement in Danish-speaking orthopaedic shoulder patients.
– The smallest change in score that patients would define as clinically important improvement was estimated to be 12 points.

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