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Introduction

In shoulder surgery scoring instruments are well-established to evaluate functional outcome and patient satisfaction. A distinction is made between self-assessment questionnaires allowing for long-term follow-up examination of large patient collectives despite of long distances to the clinic without requiring face-to-face contact and physician-based scoring systems mostly used in the clinical setting. In general Patient-Reported Outcome (PRO) questionnaires showed to be more suitable for outcome research due to their superior validity in comparison to clinician assessed parameters [1]. Furthermore self-assessment eliminates selection or examiner observation bias of physicians rating the patients they treated before much better than other physicians or patients themselves [2]. Since subjective patient-satisfaction is not necessarily directly linked to physician-based objective examination [3], numerous scoring tools have been developed in the recent years. As most studies use different scoring systems, comparison of treatment results with literature, with the aim to improve therapeutic strategies, is limited. Consequently, the risk

of maintaining inadequate treatment concepts is increased leading to reduced treatment quality and decreased patient satisfaction. Recently a new PRO shoulder questionnaire, the Munich Shoulder Questionnaire, was developed to calculate already well-established shoulder scores out of one single questionnaire [4] to compare the results of different therapeutic approaches with the objective on selecting the most effective treatment strategies and quitting obsolete therapy regimes.

The Munich Shoulder Questionnaire (MSQ) [4]

The MSQ is a universally applicable patient reported outcome (PRO) questionnaire which has been developed for an effective follow-up of shoulder patients. Analysing the items of already existing and well established shoulder scores (Shoulder Pain and Disability Index (SPADI), Disability of the Arm, Shoulder and Hand (DASH) and the Constant Score) for congruency in measurement and subsequent condensing of numerous items into one single question led to a 30 items containing tool. Typical shoulder movements are depicted as photographs to assess the range of motion. The MSQ has been demonstrated as a valid questionnaire allowing for reliable calculation of the SPADI, the DASH and the Constant Score and is currently in use in outcome research [5]. The Munich Shoulder Questionnaire

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is available at <http://www.chirurgische-klinik.de/download/inhalt/fachgebiete/unfallchirurgie/MSQENG.pdf>

The Shoulder Pain and Disability Index (SPADI) [6]

Roach et al. [6] developed a self-administered questionnaire consisting of 13 equally weighted items divided in two subscales to measure pain (see Table 21.1) and disability (Table 21.2) in shoulder diseases. The 5 items for pain and the 8 items for disability are visualized as visual analog scales ranging from 0 to 10 (0=no pain/no difficulty; 10=worst pain imaginable/so difficult required help).

The Disability of the Arm, Shoulder and Hand (DASH) [7]

The DASH is a 30-item self-administrated measurement tool to assess physical function and symptoms in patients with musculoskeletal

disorders of the upper extremity. It was developed by the American Academy of Orthopedic Surgeons (AAOS), the Council of Musculoskeletal Specialty Societies (COMSS) and the Institute for Work and Health (Toronto, Ontario) to be used by physicians in daily practice and as a research tool. Two optional modules for work and sports or performing arts provide an amendment to measure symptoms and function in athletes, artists and other workers whose jobs require a high degree of physical performance. The DASH has been translated in numerous languages and is available under <http://dash.iwh.on.ca> free of charge.

The Constant Score [8]

The Constant Score was developed as a physician-based measurement tool to provide an overall clinical functional assessment [8]. It is a 100 point scaling system divided into four subscales: pain (15 points; Table 21.3), activities of daily living (20 points; Table 21.4), strength measurement (25 points) and range of motion (40 points; Table 21.5a, b). Shoulder strength is measured as abduction power at 90° with the wrist as point of loading [9].

Table 21.1 Pain subscale of the SPADI

How severe is your pain?
At its worst?
When lying on the envolved side?
Reaching for something on a high shelf?
Touching the back of your neck?
Pushing with the involved arm?

Reprinted with permission from Roach et al. [6]

Table 21.2 Disability subscale of the SPADI

How much difficulty do you have?
Washing your hair?
Washing your back?
Putting on an undershirt or jumper?
Putting on a shirt that buttons down the front?
Putting on your pants?
Placing an object on a high shelf?
Carrying a heavy object of 10 lb?
Removing something from your back pocket?

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Table 21.3 Pain subscale of the Constant Score

Pain	None	15
	Mild	10
	Moderate	5
	Severe	0

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Table 21.4 Activities of daily living subscale of the Constant Score

Activities of daily living	Full work	4
	Full recreation/sport	4
	Unaffected sleep	2
Positioning	Up to waist	2
	Up to xiphoid	4
	Up to neck	6
	Up to top of head	8
	Above head	10

Reprinted with permission from Constant and Murley [8]

The Relative Constant Score (Age- and Sex-Related) according to Gerber et al. [10]

The strength subscale of the Constant Score constitutes a potential source of error due to gender-related differences in absolute lean body mass resulting in an average lower muscular force in women compared to men [11]. Brinker et al. [12] reported a relevant bias of both age and gender on the total Constant Score in favour of young men. Therefore Yian et al. [10] developed

Table 21.5 Range of motion subscale of the Constant Score

(a) Flexion/abduction		
Flexion	0–30°	0
	31–60°	2
	61–90°	4
	91–120°	6
	121–150°	8
	151–180°	10
Abduction	0–30°	0
	31–60°	2
	61–90°	4
	91–120°	6
	121–150°	8
	151–180°	10
(b) External/internal rotation		
External	Hand behind head with elbow held forward	2
	Hand behind head with elbow held back	2
	Hand on top of head with elbow held forward	2
	Hand on top of head with elbow held back	2
	Full elevation from on top of head	2
Internal rotation	Dorsum of hand to lateral thigh	0
	Dorsum of hand to buttock	2
	Dorsum of hand to lumbosacral junction	4
	Dorsum of hand to waist (3rd lumbar vertebra)	6
	Dorsum of hand to 12th dorsal vertebra	8
	Dorsum of hand to interscapular region	10

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normative age- and sex-specific Constant Scores and strength values in a large population sample (Table 21.6).

The American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form [13]

This shoulder score was developed by the Research Committee of the American Shoulder and Elbow Surgeons (ASES) as a standardized method of assessing musculoskeletal function to facilitate the communication between investigators [13]. It constitutes a baseline measurement tool applicable to all shoulder patients regardless of diagnosis. The form consists of demographic information (Fig. 21.1), a patient self-evaluation section and a physician assessment section. The patient self-evaluation form is divided into three subscales (Fig. 21.2a–c): pain, instability and activities of daily living. The physician assessment portion of the form consists of a range of motion (Fig. 21.3a), a clinical signs (Fig. 21.3b), a strength (Fig. 21.3c) and an instability section (Fig. 21.3d).

Summary

In general scoring instruments are widely used to assess the preoperative and postoperative status of patients with shoulder diseases. Besides already existing physician-based scores

Table 21.6 Normative age- and sex-specific Constant Score

Age (years)	Constant score	
	Male	Female
21–30	94	86
31–40	94	86
41–50	93	85
51–60	91	83
61–70	90	82
71–80	86	81

Reprinted with permission from Yian et al. [10]

Shoulder assessment form Americam shoulder and elbow surgeons		
Name:		Date
Age:	Hand dominance: R L Ambi	Sex: M F
Diagnosis:		Initial Assess? Y N
Procedure/Date:		Follow-up: M; Y

Fig. 21.1 Demographic information of the ASES standardized shoulder assessment form (Reprinted with permission from Richards et al. [13])

numerous self-evaluation questionnaires have been developed to eliminate observer bias of physicians rating the patients they treated before. The Munich Shoulder Questionnaire, a patient-reported measurement tool, was especially developed for an effective self-evaluation of shoulder patients and allows for a quantitative

assessment of the Constant, Shoulder Pain and Disability Index (SPADI) and Disabilities of the Arm, Shoulder and Hand (DASH) score. It presents a universally applicable baseline measurement tool to select the most effective treatment strategy and to facilitate communication of investigators.

a

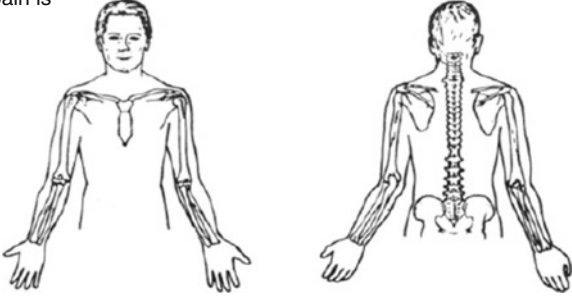
Patient self-evaluation		
Are you having pain in your shoulder? (circle correct answer)	Yes	No
Mark where your pain is		
		
Do you have pain in your shoulder at night?	Yes	No
Do you take pain medication (aspirin, Advil, Tylenol etc.)?	Yes	No
Do you take narcotic pain medication (codeine or stronger)?	Yes	No
How many pills do you take each day (average)?	pills	
How bad is your pain today (mark line)?		
0 _____ 10 No pain at all Pain as bad as it can be		
b		
Does your shoulder feel unstable (as if it is going to dislocate?)	Yes	No
How unstable is your shoulder (mark line)?		
0 _____ 10 Very stable Very unstable		
c		
Circle the number in the box that indicates your ability to do the following activities: 0= Unable to do; 1 = Very difficult to do; 2 = Somewhat difficult; 3 = Not difficult		
Activity	Right arm	Left arm
1. Put on a coat	0 1 2 3	0 1 2 3
2. Sleep on your painful or affected side	0 1 2 3	0 1 2 3
3. Wash back/do up bra in back	0 1 2 3	0 1 2 3
4. Manage toileting	0 1 2 3	0 1 2 3
5. Comb hair	0 1 2 3	0 1 2 3
6. Reach a high shelf	0 1 2 3	0 1 2 3
7. Lift 10 lbs. above shoulder	0 1 2 3	0 1 2 3
8. Throw a ball overhand	0 1 2 3	0 1 2 3
9. Do usual work - List	0 1 2 3	0 1 2 3
10. Do usual sport - List	0 1 2 3	0 1 2 3

Fig. 21.2 (a) Self-evaluation: pain section of the ASES standardized shoulder assessment form (Reprinted with permission from [13]). (b) Self-evaluation: Instability section of the ASES standardized shoulder assessment form

(Reprinted with permission from Richards et al. [13]). (c) Self-evaluation: Activities of daily living section of the ASES standardized shoulder assessment form (Reprinted with permission from Richards et al. [13])

Physician assessment				
Range of motion Total shoulder motion Goniometer preferred	Right		Left	
	Active	Passive	Active	Passive
Forward elevation (Maximum arm-trunk angle)				
External rotation (Arm comfortably at side)				
External rotation (Arm at 90° abduction)				
Internal rotation (Highest posterior anatomy reached with thumb)				
Cross-body adduction (Antecubital fossa to opposite acromion)				

Signs								
0 = none; 1 = mild; 2 = moderate; 3 = severe								
Sign	Right		Left					
Supraspinatus/greater tuberosity tenderness	0	1	2	3	0	1	2	3
AC joint tenderness	0	1	2	3	0	1	2	3
Biceps tendon tenderness (or rupture)	0	1	2	3	0	1	2	3
Other tenderness - List:					0	1	2	3
Impingement I (Passive forward elevation in slight internal rotation)	Y	N			Y	N		
Impingement II (Passive internal rotation with 90° flexion)	Y	N			Y	N		
Impingement III (90° active abduction - classic painful arc)	Y	N			Y	N		
Subacromial crepitus	Y	N			Y	N		
Scars - location:	Y	N			Y	N		
Atrophy - location:	Y	N			Y	N		
Deformity : describe	Y	N			Y	N		

Strength (record MRC grade)												
0 = no contraction; 1 = flicker; 2 = movement with gravity eliminated 3 = movement against gravity; 4 = movement against some resistance; 5 = normal power.												
	Right		Left									
Testing affected by pain?	Y	N	Y	N								
Forward elevation	0	1	2	3	4	5	0	1	2	3	4	5
Abduction	0	1	2	3	4	5	0	1	2	3	4	5
External rotation (Arm comfortably at side)	0	1	2	3	4	5	0	1	2	3	4	5
Internal rotation (Arm comfortably at side)	0	1	2	3	4	5	0	1	2	3	4	5

Fig. 21.3 (a) Physician assessment: range of motion section of the ASES standardized shoulder assessment form (Reprinted with permission from Richards et al. [13]). (b) Physician assessment: Clinical signs section of the ASES standardized shoulder assessment form (Reprinted with permission from Richards et al. [13]). (c) Physician

assessment: Strength section of the ASES standardized shoulder assessment form (Reprinted with permission from Richards et al. [13]). (d) Physician assessment: Instability section of the ASES standardized shoulder assessment form (Reprinted with permission from Richards et al. [13]).

d

Instability		
0 = none; 1 = mild (0 - 1 cm translation) 2 = moderate (1 - 2 cm translation or translates to glenoid rim) 3 = severe (> 2 cm translation or over rim of glenoid)		
Anterior translation	0 1 2 3	0 1 2 3
Posterior translation	0 1 2 3	0 1 2 3
Inferior translation (sulcus sign)	0 1 2 3	0 1 2 3
Anterior apprehension	0 1 2 3	0 1 2 3
Reproduces symptoms?	Y N	Y N
Voluntary instability?	Y N	Y N
Relocation test positive?	Y N	Y N
Generalized ligamentous laxity?	Y N	
Other physical findings:		
Examiner's name:		
		Date

Fig. 21.3 (continued)

References

1. Kosinski M, Zhao SZ, Dedhiya S, Osterhaus JT, Ware Jr JE. Determining minimally important changes in generic and disease-specific health-related quality of life questionnaires in clinical trials of rheumatoid arthritis. *Arthritis Rheum.* 2000;43(7):1478–87.
2. Boehm D, Wollmerstedt N, Doesch M, Handwerker M, Mehling E, Gohlke F. Development of a questionnaire based on the Constant-Murley-Score for self-evaluation of shoulder function by patients. *Unfallchirurg.* 2004;107(5):397–402.
3. Hollinshead RM, Mohtadi NG, Vande Guchte RA, Wadey VM. Two 6-year follow-up studies of large and massive rotator cuff tears: comparison of outcome measures. *J Shoulder Elbow Surg.* 2000;9(5):373–81.
4. Schmidutz F, Beirer M, Braunstein V, Bogner V, Wiedemann E, Biberthaler P. The Munich Shoulder Questionnaire (MSQ): development and validation of an effective patient-reported tool for outcome measurement and patient safety in shoulder surgery. *Patient Saf Surg.* 2012;6(1):9.
5. Biberthaler P, Beirer M, Kirchhoff S, Braunstein V, Wiedemann E, Kirchhoff C. Significant benefit for older patients after arthroscopic subacromial decompression: a long-term follow-up study. *Int Orthop.* 2013;37(3):457–62.
6. Roach KE, Budiman-Mak E, Songsiridej N, Lertratanakul Y. Development of a shoulder

pain and disability index. *Arthritis Care Res.* 1991;4(4):143–9.

7. Hudak PL, Amadio PC, Bombardier C. Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand) [corrected]. The Upper Extremity Collaborative Group (UECG). *Am J Ind Med.* 1996;29(6):602–8.
8. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res.* 1987;214:160–4.
9. Constant CR, Gerber C, Emery RJ, Sojbjerg JO, Gohlke F, Boileau P. A review of the Constant score: modifications and guidelines for its use. *J Shoulder Elbow Surg.* 2008;17(2):355–61.
10. Yian EH, Ramappa AJ, Arneberg O, Gerber C. The Constant score in normal shoulders. *J Shoulder Elbow Surg.* 2005;14(2):128–33.
11. Katch MK. Measuring and improving muscular strength. In: *Exercise physiology energy, nutrition, and human performance.* Philadelphia: Lippincott Williams and Wilkins; 1991.
12. Brinker MR, Cuomo JS, Popham GJ, O'Connor DP, Barrack RL. An examination of bias in shoulder scoring instruments among healthy collegiate and recreational athletes. *J Shoulder Elbow Surg.* 2002;11(5):463–9.
13. Richards RR, An KN, Bigliani LU, Friedman RJ, Gartsman GM, Gristina AG, Iannotti JP, Mow VC, Sidles JA, Zuckerman JD. A standardized method for the assessment of shoulder function. *J Shoulder Elbow Surg.* 1994;3(6):347–52.