Guidelines for Useful Integration of Patient-Rated Outcome Measures into Clinical Practice

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COMMENTARY

Outcome measures gauge intervention effectiveness in an evidence-based, patient-centered practice. Patient-rated outcomes (PROs) are tools to measure the perceived effectiveness of a clinician's practice, while serving as instruments to improve clinician-patient communication and health-related quality of life (HRQoL).[1,2,3] While clinicians may recognize the importance of PRO usage in practice, adoption into practice can be perceived to be burdensome. In one study, only 26% of the sample of athletic trainers used PRO measures regularly in practice.[4] The assortment, variation, and abundance of available measures can be defeating to a clinician who is a novice at utilizing PROs. Clinicians may lack knowledge regarding PRO usage and interpretation, and may struggle with developing the habit of using the instruments in practice. Furthermore, they may lack an understanding of how to interpret PROs for their unique patient populations. The purpose of this paper is to introduce and discuss valid PROs that can be used easily across most athletic training patient populations, and to present a model to begin implementing the use of these PROs in practice.

PATIENT-CENTERED CARE

Outcome measures are an essential part of whole-person care, "comprehensive care that considers and addresses all aspects of disability, from the impairment of body structures and functions to activity limitations and participation restrictions."[4] Outcome measure collection is a crucial aspect of patient-centered care for several reasons. First, for individual patients, using outcome measures provides means for patient-clinician communication about HRQoL factors beyond primary complaint, such as social and economic well-being.[1] Clinicians may become aware of information about symptoms not discussed during the history, symptoms whose severity was downplayed, or symptoms which are difficult to discuss.[3] Secondly, outcome measure collection can be used to investigate the effectiveness and efficacy of clinical care by individual healthcare practitioners, clinics, programs, or hospitals, and particular treatments and interventions.[1] Finally, outcome measure collection improves quality,[1] evaluating and making changes in clinical care,[1] and determining the effects of translational research into practice.[5]

While athletic training clinicians are already adept at gathering clinician-oriented outcome measures such as range of motion and manual muscle testing, researchers and educators urge clinicians to begin collecting PRO measures.[4] Generic patient-rated outcome measures address a broad range of health concepts, focus on HRQoL, and cover a wide variety of health domains.[6] Patient-rated outcomes can also be specific measures, such as region-specific (ankle, shoulder), disease specific (migraines, asthma), or

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dimension-specific (pain, fear avoidance) instruments.[6] Patient-rated outcomes provide the patient perspective and a valuable indication of the effects of the patient's condition on HRQoL.[4] Benefits to PRO use include providing information central to patient-oriented evidence that matters (POEM), advancing the athletic training profession, and enabling evidence-based athletic training practice.[6] Patients' perceptions of improvement or perceived degree of change may exert an important influence on reports of satisfaction of care.[7] Clinicians may use data generated by PRO measures along with clinician-rated measures such as range of motion and strength tests as part of an overall clinical outcomes management plan to assess their clinical care and improve their athletic training practice.[2,6,8] These benefits support the immediate adoption of PROs into clinical use.

The general population of athletic trainers, however, has thus far failed to adopt PROs in practice. Valier et al. reported that 74% (n=311) of athletic trainers who completed a survey about PRO use in practice (n=421) indicated they did not use PRO measures.[4] This finding is similar to trends in other rehabilitation professions. Nicholas et al. reported that 52% of clinicians failed to record standardized outcome measures at discharge during a 12-month mandatory reporting period.[9] Barriers identified in the implementation and use of PROs include confusing to the patient, time-consuming for the clinician, and lack of clinician knowledge.[9] The large variety and different classifications of PROs is one reason why PRO use is burdensome to clinicians in routine practice.[6]

EVALUATING THE UTILITY OF A PATIENT-RATED OUTCOME MEASURE

Two elements of a PRO to consider before implementing a specific measure in practice are essential elements and clinical utility.[8] Essential elements involve psychometric measures of the soundness of the instrument and its development.[8] Psychometrics and clinimetrics are the methodologies used to develop and evaluate instruments such as PROs (Table 1).[10] These methodologies are evaluated for a PRO for a wide range of conditions, because the instrument may respond differently in varying populations with varying severity. Two important types of validity are content validity, the extent items in the instrument assess the same content, and construct validity, how well the instrument measures a theoretical construct.[9] Reliability is a measure of consistency under repetition of constant conditions.[11-13] Responsiveness is a measure of how well the instrument measures change over time.[12,13] Clinical utility involves the acceptability, feasibility, and appropriateness of using the PRO in clinical practice.[8] The clinician must determine if the instrument is useful, time- and cost-effective, and acceptable to both himself and the patient.[8] Clinicians use the minimal clinically important difference (MCID) to measure change. The MCID is a threshold value for change that a patient considers worthwhile and meaningful.[14] For example, the MCID for the numeric pain rating scale (NRS) is generally considered to be 2 points on a scale from 0 (no pain) to 10 (worst imaginable pain). Once a PRO has been selected that meets both the essential elements and the clinical utility, the implementation into practice becomes easier.

GENERIC PATIENT-RATED OUTCOME MEASURES

When clinicians decide to incorporate PROs into practice, setbacks may arise in difficulty choosing which measures to use. The sheer number of available instruments may leave the clinician feeling overwhelmed before beginning. A good starting place for the novice PRO user is generic measures because they are designed to be appropriate to a wide range of patients.[18] Generic patient-rated outcome measures are defined as "scales intended to measure a broad range of health status facets."[6] Benefits to generic PROs include applicability to a wide range of patients, ability to compare across groups, and the establishment of normative values within practice.[6] Generic PROs provide the athletic trainer information about both individual patient

Table 1. Psychometric Measures in Patient-Rated Outcome Scales

Psychometric Measure	Definition	
Validity	The soundness or correctness of an instrument in measuring what it is designed to measure[8,10,11,15-18] Does it measure what it is supposed to measure?	Must be established for each target population[8] Correlation Coefficient Values:[19] -1.0: Perfectly negative correlation -0.8: Strongly negative correlation -0.5: Moderately negative correlation -0.2: Weakly negative correlation 0.0: No association +0.2: Weakly positive correlation +0.5: Moderately positive correlation +0.8: Strongly positive correlation +1.0: Perfectly positive correlation
Content Validity	The extent to which the items on a measure assess the same content, or how well the content material was sampled[8,10, 18,20,21] Do experts/patients think it measures what it is intended to measure? Has it been tested on a large enough sample population?	May be evaluated by expert panel and/or patients[8,10]
Criterion Validity	The extent to which a statistically significant relationship exists between the measure and a criterion[15,18] Does it correspond with a "gold standard" measure?	Gold standards are difficult to find for PROs because there is wide variation[8,10] Often evaluated in comparison with other PROs or clinical data[22]
Construct Validity	The extent to which a measure evaluates the theoretical construct or trait[8,10,17,18,20] If it is intended to measure a particular construct (e.g. pain, function), is that what it measures?	Must be established for each population[8]
Reliability	The measure of consistency of date when measurements are taken more than once under the same conditions[8,15, 17,18,20] If nothing has changed in the patient's condition, is the score the same from one point to another?	Establishes that changes observed are due to intervention and not problems with the instrument[18] Reliability Ranges:[23] 0.00-0.10: Virtually no reliability 0.11-0.40: Slight reliability 0.41-0.60: Fair reliability 0.61-0.80: Moderate reliability 0.81-1.0: Substantial reliability
Test-Retest Reliability	The reliability of a patient's response when the instrument is administered multiple times[24] If a patient's health status does not change, will the answers remain the same?	Reflects patient's condition rather than instrument error[8,18,24]

Table 1. Psychometric Measures in Patient-Rated Outcome Scales (Continued)

Internal Consistency	The reliability of the items within the scale[8,18,24] Do all items in the instrument measure the same health domain?	Homogeneity of the questions related to a specific health domain[8]
Responsiveness	The instrument's ability to detect change over time[7,15,16,20, 21,25] Does it measure change? If no change occurs, does it remain static?	Instrument must detect changes over time that matter to patients[18] Can be measured statistically or clinically[8]
Standard Error of Measurement (SEM)	The variation in score due to error rather than true observed change[8, 11,14] How much change is due to error?	Point values associated with scale[8]
Minimal Detectable Change (MDC)	The smallest change that can be measured above that which would occur due to error[8,11,20,26,27] How much change is due to genuine change?	Point values associated with scale[8]
Minimal Clinically Important Change (MCID)	A threshold value representing change that is considered meaningful and worthwhile by the patient[8,14,20,24,28,29] What amount of change is meaningful to the patient?	Point values associated with scale[8] Important because clinical measures of improvement are not necessarily meaningful to patients, or may not correspond to patients' perception of improvement or deterioration[14]

care and overall practice trends.[8] Disadvantages include information without sufficient detail to assess specific patient condition, lack of relevancy to some conditions, and less sensitivity to change from an intervention than specific scales.[6] Commonly used generic PROs are the Short-form Health Survey, Sickness Impact Profile, Child Health Questionnaire, and Pediatrics Outcomes Data Collection Instrument.[6]

Several PROs are applicable in the athletic training setting. The numeric pain rating scale (NRS) is commonly collected during history intake in practice, and can be used as a PRO.[30] The global rating of change (GRoC) is another easy-to-implement scale that can be adopted into practice.[22,31] Further, two generic scales may be useful in athletic training because they were designed for physically active populations experiencing musculoskeletal injuries: the Patient-Specific Functional Scale (PSFS)[32] and the Disablement in the Physically Active scale (DPAS).[24] These generic PRO measures may be used individually or in conjunction to increase the clinician's understanding of the patient's functional status, disablement, and HRQoL.

FOUR GENERIC PATIENT-RATED OUTCOME MEASURES TO CONSIDER IN PRACTICE:

Numeric Pain Rating Scale (Table 2)

Pain is one of the primary reasons patients seek medical attention.[15,30] Each patient presents with a different pain experience that is complete and multidimensional,[15] and the clinician cannot compare the meaning of one person's pain to another.[33] The NRS can be used to compare the intensity of pain from one time point to another. The NRS is an 11-point scale with no pain as its lower anchor (0) and worst pain imaginable as its upper anchor (10).[15,17,30,33-43] The numeric values lack word assignment, allowing each patient to assign importance at each level based on life experience and interpretation.[33] The clinician can establish a time frame when asking the patient to

rate pain, such as best, worst, current, at onset, on average, during the last 24 hours, on average during the past 2 days, etc.[15,30,33] A reduction of score by any patient indicates improvement.[33] In athletic training practice, the NRS may be used to evaluate immediate changes in the patient's pain from before to after intervention as well as over the duration of care for a particular injury or illness.

Global Rating of Change Scale (Table 3, Appendix 1[22])

Health-related quality of life (HRQoL) may be difficult to measure as a multifaceted construct. The GRoC is a quick and simple scale used to measure self-perceived change in HQoL.[31] Unlike other outcome measures which are designed to evaluate a specific dimension of health such as

Table 2: Psychometrics for Numeric Pain Rating Scale (NPRS).

PURPOSE	Measure perceived intensity of pain[15,30,36,37]
GENERAL DESCRIPTION	11-point interval scale ranging from no pain to worst pain imaginable[15,17,30,36,38]
METHOD OF COLLECTION	Verbal[38]
TEST-RETEST RELIABILITY (Intraclass correlation coefficient 2,1)	Fair reliability: 0.59[44] Moderate reliability: 0.63 for last 24 hours, 0.70 for 2-day average [35] 0.63, CI95%:0.28-0.86[45] 0.74[17] Substantial reliability: 0.92[25]
VALIDITY (Spearman's R)	0.74, p<0.001: High validity[34] (Strong positive correlation)
SEM	1.07 (90%CI)[17] 0.86 (95%CI)[25] 1.5 (95% CI: 1.3-1.6) 24 hours; 1.3 (95% CI: 1.1-1.4) 2 day[35] 1.7 (unchanged condition), 1.8 (minimum change in condition)[44] 1.453 Back and buttock, 1.58 Thigh and leg [46]
MDC	2.5[17] 2.4[25] 3.5 (31%) 24 hours; 3.0 (27.3%) 2 day[35] 4.1[44] 3.69 Thigh and leg, 3.39 Back and buttock[46]
Minimum Clinically Important Difference	
Low Back Pain	4.0[25] 2.0[41] 1.0[47]
Shoulder Pain	1.1[17] 2.2[39]
Patellofemoral Pain	1.2[40]
Acute Pain	1.3[37] 1.4[38]
Fibromyalsia Pain	2.1[43]
Cervical Radiculopathy	2.2[44]
Average MCID (from these studies) is 1.5 **MCID for clinical use (based on these studies): 2.0**	

Table 3: Psychometrics for Global Rating of Change (GROC) Scale

PURPOSE	Measure overall health status based on what is important to the patient[22,31]
GENERAL DESCRIPTION	Recall-based questionnaire of well-being based on progress since initial treatment encounter[22,48] 15-point scale ranging from "a very great deal worse" (-7) to "a very great deal better" (+7)[22,48] *May also use 11-point scale (-5 to +5)[22]
ANTICIPATED TEST LENGTH	Seconds
NUMBER OF ITEMS	One item[22,31,48]
METHOD OF COLLECTION	Verbal,[22] paper,[22] electronic
TEST-RETEST RELIABILITY (Intraclass correlation coefficient 2,1)	Substantial reliability: 0.90, CI95%:0.84-0.93 for 11-point scale[16]
VALIDITY (Spearman's correlation)	0.72, $p<.05$ for 15-point scale[16] 0.87 for 7-point scale[50] (Strong positive correlation)
SEM	None reported
MDC	.45 on 11-point scale[22]
Minimum Clinically Important Difference **MCID for clinical use: 2**[22]	

pain or function, the GRoC allows patients to provide a global rating of their overall health status by choosing what is most important to them.[22] The GRoC consists of a single question requesting the patients to assess their change on a designated scale from a previous time point to the current time point.[13,14,48,49] Various numeric scales (i.e., 7-, 11-, and 15-point scales) have been used in research.[31] Based on clinometric properties, there isn't a difference in responsiveness among the different point scales; however, the 11-point scale may be easiest to use in clinical practice because it aligns with the 11-point NRS and has similar values (e.g. MDC and MCID) to the NRS.[22] There are indications that recall bias, i.e. inability to recall the initial status after a period, affects the accuracy of the GRoC.[13,14,48,49] The GRoC can be meaningful in the athletic training setting when used in conjunction with other generic and regional PROs

Patient-Specific Functional Scale (Table 4, Appendix 2[32])

Stratford et al.[32] developed the PSFS in 1995 to provide a resolution to the following problems they observed in the implementation of PROs in orthopedic practice. First, clinicians' caseloads were too varied to support the use of any one, two, or multiple questionnaires.[33] Secondly, traditional health status measures lacked adeptness at providing valid assessment for patients functioning at a high level of independence.[32] Finally, available measures of improvement did not necessarily emphasize the patient's concept of improvement over that of clinician perceived improvement.[32] The PSFS is a self-reported, patient-specific measure designed to assess functional change primarily for patients suffering from musculoskeletal disorders.[20]

The format of the PSFS is simple and easy to administer. Patients identify 3-5 important activities that they are unable to perform or with which they are having difficulty due to their injury.[32] Each activity is rated from 0-10 regarding the current level of difficulty, with the lower anchor (0) indicating that the patient is "unable to perform activity" and the upper anchor (10) indicating an ability "to perform activity at pre-injury level."[32] The PSFS is administered before intervention occurs to maximize focus on functional activity instead of impairment.[51] Post-intervention, the PSFS may be re-administered, and the identified activities may be used throughout the treatment duration to assess change.[33] However, the patient may nominate new activities that arise when completing the PSFS during follow-up visits.[32] The structure of the PSFS renders it extremely adaptable to the patient's

Table 4: Psychometrics for Patient Specific Functional Scale (PSFS).

PURPOSE	Determine functional activities most important to an individual patient with associated rating of difficulty[20,52-55]
GENERAL DESCRIPTION	11-point interval scale rating patient-specified functional activities from 0 (unable to perform activity) to 10 (can perform fully)[32,52-54]
ANTICIPATED TEST LENGTH	2-6 minutes[51,55]
NUMBER OF ITEMS	Patient-dependent (3-5 activities chosen by the patient) [20,32,55]
METHOD OF COLLECTION	Written[32,55]
TEST-RETEST RELIABILITY (Intraclass correlation coefficient 2,1)	Slight reliability: 0.17 (average)[44] Fair reliability: 0.59, CI95%:0.23-0.81[46] Moderate reliability: 0.71, CI95%:0.51-0.84[53] 0.73, CI:0.49-0.86 (Individual Activity 1), 0.75 CI:0.56-0.87 (Individual Activity 2)[56] Substantial reliability: 0.82, CI95%:0.54-0.93[45] 0.84, CI95%:0.78-0.88[51] 0.86, CI:0.74-0.93 (Individual Activity 3)[56] 0.87, CI95%:0.72-0.94[57] 0.91, $p<0.05$[25] 0.92, CI95%(lower limit):0.78 (average), 0.91, CI95%(lower limit):0.77 (Individual Activities)[58] 0.97[32]
VALIDITY (Pearson's R)	0.77, CI95%:0.61-0.89, $p<0.002$[51] (Strong positive correlation)
SEM	0.5[25] 0.41[32] 1.5[45] 1.03[46] 1.3, CI90% (individual activity); 0.62, CI90% (average score)[51] 0.35[57]
MDC	1.4[25] 3.3, CI90% (average)[44] 2.1[45] 3.4[46] 2.5 (individual activity); 1.5 (average score)[51] 2.9, CI95%:1.7-4.2[53] 0.97[57] 2.0 (individual activity)[58]
Minimum Clinically Important Difference (all reported on average score)	
Low Back Pain	2.3[25]
Cervical Radiculopathy	2.2[44] 2.0 (Sensitivity 0.95, CI95%:0.77-0.92, Specificity 1.0, CI95%:0.82-1.0)[45]
Spinal Stenosis	1.3[46]
Upper Extremity	1.2 (Sensitivity 0.88, Specificity 0.79)[53]
Shoulder Complaint	1.29[57]
Musculoskeletal Injuries	1.3, 2.3, 2.7 (small, medium, large change)[59]
Average MCID (for average score based on these studies) is 2.1 **MCID for clinical use (based on Stratford's original report): 2.0 average score; 3.0 for single activity score**[32,55]	

needs and priorities, further enhancing its applicability in athletic training practice. To be effective in improving patient care, PSFS scores from follow-up visits are compared to those on the initial administration of the scale.

Disablement in the Physically Active Scale (Table 5, Appendix 3[24])

The Disablement in the Physically Active (DPA) scale was developed by athletic training researchers and is "derived from a disablement framework that includes measures of impairment, functional limitations, and disability."[24] The scale is multidimensional, incorporating measures that evaluate impairments, functional limitations, and disability.[24] The DPA scale has enhanced value because it includes psychosocial measures.[24] The DPA scale is an excellent tool to begin use of outcome measurement in clinical practice because it was developed specifically for and by athletic trainers. The format of the scale involves 16 questions.[24] Questions are rated on a scale of 1-5, where 1 indicates that the patient does not have this problem and 5 indicates that the patient is severely affected by this problem.[24] Scores for each question are added, then 16 is subtracted; thus the total score can range from 0-64 where 0 indicates no dysfunction and 64 indicates severe dysfunction.[24]

PRACTICAL USE OF PATIENT-RATED OUTCOME MEASURES

Hankemeier et al.[61] investigated the use of PROs in athletic training practice, finding that most respondents were unfamiliar with various PRO measures and rarely implemented them in practice. Their results were consistent with those of Valier et al,[4] who reported that 26% of the athletic trainers responding incorporated PRO measures in patient care. Hankemeier et al.[61] proposed increased knowledge, behavioral change, organizational support, and professional responsibility to increase the use of PROs in athletic training practice. A central factor in the adoption of PROs in clinical practice is the intention to do so; the willingness and effort clinicians plan to exert.[62] One method to increase knowledge about PROs is the publication of

Table 5. Psychometrics for Disablement in the Physically Active (DPA) Scale.

PURPOSE	Generic measure of health used in the evaluation of physically active individuals with musculoskeletal injuries measuring impairment, functional limitations, disability, and quality of life[24,26,60]
GENERAL DESCRIPTION	6-item instrument with each response based on a 5-point Likert scale from 1 (no problem) to 5 (severe). Once scored, 16 points are subtracted from total score. Score ranges from 0 to 64, with higher scores representing lower levels of HRQoL status[24,26,60]
METHOD OF COLLECTION	Written[24,26,27, 60]
TEST-RETEST RELIABILITY (Intraclass correlation coefficient 2,1)	Moderate reliability: 0.79[26] Substantial reliability: 0.94, CI95%:0.89-0.97[24]
VALIDITY (Pearson correlation)	-0.75, p<0.001 (acute injuries)[24] -0.71, p<0.002 (persistent injuries)[24] (Strong negative correlation)
SEM	4.5[26]
MDC	12.48[26]
Minimum Clinically Important Difference	
Acute Injuries	9[24]
Persistent injuries	6[24]
MCID for clinical use based on Vela & Denegar, 2010: 6 for persistent injuries, 9 for acute injuries[24]	

easyto-use and read guidelines regarding specific PRO measures. These publications may reduce clinicians' burden in researching measures to use. Clinicians may be more likely to adopt the use of PROs in practice if they perceive a professional obligation to do so.[62] Employer requirements, as well as National Athletic Trainers' Association position statements, may help increase PRO collection in practice.[61] Step-by-step guidelines to ease the adoption of PROs into use is necessary to support behavior change as well as knowledge.

One practical guideline for adopting PROs into practice is to use measures that most likely reflect the effects of the athletic training intervention.[63] The NRS, a measurement of pain intensity, is routinely collected during history and can easily be transformed into an outcome measure by asking for NRS scores after intervention and across subsequent patient encounters. The PSFS scale to assess function can be adopted into the history portion of evaluation, then re-administered after intervention and subsequent encounters. The clinician can use NRS and PSFS scores together to form a multifaceted understanding of the patient's pain and function. After intervention, the GRoC is administered to gain understanding of the patient's experienced change. Although all three of these measures can be printed to add to the patient's file, they do not require pen and paper and are therefore easily administered during on-field evaluations, as well as in a clinic-based setting. The DPAS does require pen and paper, and can be administered while the clinician is preparing for the evaluation, then administered at regular intervals during the patient's rehabilitation progression. Overall, the administrative burden in using these PROs is low. (See Table 6 for advantages and disadvantages of each PRO listed.)

The following steps may be taken to adopt these PROs into clinical use:

1. When possible, incorporate PROs into electronic health record (EHR) platforms to save time and improve direct care. [2,67] Some scales have not been validated for electronic use and scores may vary between paper and electronic versions, so clinicians who chose to incorporate PROs into electronic format must switch between formats for a given patient.
2. Use patient portals, tablets, or clinician terminals to collect PROs such as the DPAS before a visit or before beginning evaluation,[2,67] or have pen and paper versions available at check in. Alternatively, DPAS forms may be kept with evaluation form, SOAP notes, or near regularly used evaluation tools (e.g. goniometers).
3. Use the most actionable, relevant PROs with fewer than 30 questions.[67] Together, the NRS (current, best, worst, average), PSFS (3-5 specific activities), DPAS (16 questions), and GRoC (1 question) include no more than 26 questions, most of which can be collected during the routine history.
4. Incorporate NRS scores (best, worst, average, current) and PSFS scores into standard evaluation and rehabilitation documents (e.g. flow sheets).
5. Make the PROs relevant to the patient by reviewing the patient's responses in real time and asking follow up questions as part of the evaluation. [2,67]
6. Create a sheet with MCIDs for all four PROs or print out accompanying tables.
7. Evaluate patient flow through the athletic training clinic for each clinician to identify key personnel involved in and appropriate timing for the administration of PROs.[2,3] When all staff members are committed to the collection of PROs, they can work together to determine the best point of collection, analysis, and integration into patient encounters.[3]

PRACTICE IMPLICATIONS

The consensus in the literature indicates each of these PRO measures may be used in conjunction with other generic measures as well as specific measures related to the patient's injury. Both the DPAS and the PSFS are developed specifically for the patient population treated by athletic trainers and are therefore most applicable.

As novice PRO users adopt these measures into their practice, individual patient care will likely improve as they become more competent and comfortable with their use. Clinicians may improve their practice using the information gleaned in regular PRO measurement. Once the athletic trainer becomes adept at the use of these generic measures, more specific measures may be integrated as appropriate.

Table 6: Advantages and Disadvantages of Specific Generic PROs.

	ADVANTAGES	DISADVANTAGES
NRS	Commonly used[15,17,33] Simple to score[15,34,37] Quick[38] Easy to administer and record[15,30,34,36-38] Individuals who are older or less literate, or have sustained trauma or lack intact motor skills, can easily complete the scale[35,36,38]	Only measures one dimension (intensity) of a multifaceted, complex, and contextual symptom[15,30] Has less ability to detect change than self-reported functional measures[35]
GRoC	Quick[22] Applicable to wide ranges of patient populations[22] Easy to understand[22] Strong clinical relevance[22] Adaptable[22,31] Measures deterioration as well as improvement[22]	Relies on patient's estimates of previous health status[22,31,48] Patients may demonstrate recall bias (basing previous health status on current status)[22,31,48] Scores may fluctuate with repeated measure[48] Only correlated to functional measures up to 3 weeks[48]
PSFS	Patient specific[20,32, 51,55,64] Fast and Efficient[20,51,55] Easy to use[20,32,65] Able to assess important change over time[32] Formalizes questions asked during routine evaluation[32,66] Aids clinicians in planning treatments and evaluating progress[51,55,64] Applicable to a variety of clinical presentations and demographic populations[58]	Difficult to compare between patients[20,53,54,58] Little range available on the scale for patient to describe decreased ability when condition deteriorates[51]
DPAS	Specifically designed for use among the physically active[24, 27,26,60] Includes 4 important dimensions of HRQoL (impairment, functional limitations, disability, quality of life)[24]	Scale is new (developed in 2010)[24] Lacks clinimetric support[24,26,27,60]

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Appendix 1. Global Rating of Change (GROC)

Patient Name/Number: _____

Date: _____

Global Rating of Change Scale (GROC)

Please rate the overall condition of your shoulder from the time that you began treatment until now (check only one):

A very great deal worse (-7)
A great deal worse (-6)
Quite a bit worse (-5)
Moderately worse (-4)
Somewhat worse (-3)
A little bit worse (-2)
A tiny bit worse (-1)

About the same (0)

A very great deal better (7)
A great deal better (6)
Quite a bit better (5)
Moderately better (4)
Somewhat better (3)
A little bit better (2)
A tiny bit better (1)

Jaeschke R, Singer J, Guyatt GH. Measurement of health status. Ascertaining the minimal clinically important difference. Control Clin Trials 1989: 407-415.

Appendix 2. Patient-Specific Functional Scale (PSFS)

The Patient-Specific Functional Scale
This useful questionnaire can be used to quantify activity limitation and measure functional outcome for patients with any orthopaedic condition.

Clinician to read and fill in below: Complete at the end of the history and prior to physical examination.

Initial Assessment:
I am going to ask you to identify up to three important activities that you are unable to do or are having difficulty with as a result of your_problem. Today, are there any activities that you are unable to do or having difficulty with because of your_problem? (Clinician: show scale to patient and have the patient rate each activity).

Follow-up Assessments:
When I assessed you on (state previous assessment date), you told me that you had difficulty with (read all activities from list at a time). Today, do you still have difficulty with: (read and have patient score each item in the list)?
Patient-specific activity scoring scheme (Point to one number):

0 1 2 3 4 5 6 7 8 9 10

Unable to perform activity

(Date and Score)

Able to perform activity at the same level as before injury or problem

Activity	**Initial**					
1.						
2.						
3.						
4.						
5.						
Additional						
Additional						

Total score = sum of the activity scores/number of activities Minimum detectable change (90%CI) for average score = 2 points Minimum detectable change (90%CI) for single activity score = 3 points
PSFS developed by: Stratford, P., Gill, C., Westaway, M., & Binkley, J. (1995). Assessing disability and change on individual patients: a report of a patient specific measure. Physiotherapy Canada, 47, 258-263.
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Appendix 3. Disablement in the Physically Active Scale (DPA) Scale

Disablement in the Physically Active Scale©

Instructions: Please answer **each statement** with one response by shading the circle that most closely describes your problem(s) within the past **24 hours.** Each problem has possible descriptors under each. Not all descriptors may apply to you but are given as common examples.

KEY
1 - no problem
2 - I have the problem(s), but it does not affect me
3 - The problem(s) slightly affects me
4 - The problem(s) moderately affects me
5 - The problem(s) severely affects me

	No problem 1	Does not affect 2	Slight 3	Moderate 4	Severe 5
Pain – *"Do I have **pain**?"*	O	O	O	O	O
Motion – *"Do I have impaired **motion**?"* **Ex.** decreased range/ease of motion, flexibility, and/or increased stiffness	O	O	O	O	O
Muscular Functioning – *"Do I have impaired **muscle function**?"* **Ex.** decreased strength, power, endurance, and/or increased fatigue	O	O	O	O	O
Stability – *"Do I have impaired **stability**?"* **Ex**. the injured area feels loose, gives out, or gives way	O	O	O	O	O
Changing Directions – *"Do I have difficulty with **changing directions** in activity?"* **Ex.** twisting, turning, starting/stopping, cutting, pivoting	O	O	O	O	O
Daily Actions – *"Do I have difficulty with **daily actions** that I would normally do?"* **Ex**. walking, squatting, getting up, lifting, carrying, bending over, reaching, and going up/down stairs	O	O	O	O	O
Maintaining Positions – *"Do I have difficulty **maintaining the same position** for a long period of time?"* **Ex.** standing, sitting, keeping the arm overhead, or sleeping	O	O	O	O	O
Skill Performance – *"Do I have difficulties with **performing skills** that are required for physical activity?"*					
1.) **Ex**. running, jumping, kicking, throwing, & catching	O	O	O	O	O
2.) **Ex.** coordination, agility, precision & balance	O	O	O	O	O
Overall Fitness – *"Do I have difficulty maintaining my **fitness** level?"* **Ex**. conditioning, weight lifting & cardiovascular endurance	O	O	O	O	O
Participation in Activities – *"Do I have difficulty with **participating in activities**?"*					
1.) **Ex**. participating in leisure activities, hobbies, and games	O	O	O	O	O
2.) **Ex.** participating in my sport(s) of preference	O	O	O	O	O
Well Being – *"Do I have difficulties with the following…?"*					
1.) Increased uncertainty, stress, pressure, and/or anxiety	O	O	O	O	O
2.) Altered relationships with team, friends, and/or colleagues	O	O	O	O	O
3.) Decreased overall energy	O	O	O	O	O
4.) Changes in my mood and/or increased frustration	O	O	O	O	O