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Specificity of the Minimal Clinically Important Difference of the Quick Disabilities of the Arm Shoulder and Hand (QDASH) for Distal Upper Extremity Conditions

Enrique V. Smith-Forbes
Fort Sam Houston Clinic, e_vsf12@hotmail.com

Dana M. Howell
University of Kentucky

Jason Willoughby
Drayer Physical Therapy Institute

Donald G. Pitts
Drayer Physical Therapy Institute

Timothy L. Uhl
University of Kentucky, tluhl2@uky.edu

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Major(P) Enrique, V. Smith-Forbes, PhD, OTR/L, CHT, Dana, M. Howell, PhD, OTD, OTR/L, Jason Willoughby, MHS, OTR/L, CHT, Donald, G. Pitts, MS, OTR/L, CHT, Tim, L. Uhl, PT, ATC, PhD, FNATA

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Authors:

Major(P) Smith-Forbes, Enrique, V., PhD, OTR/L, CHT[a,*]

Howell, Dana, M., PhD, OTD, OTR/L[bc]

Willoughby, Jason, MHS, OTR/L, CHT[d]

Pitts, Donald, G., MS, OTR/L, CHT[d]

Uhl, Tim, L., PT, ATC, PhD, FNATA[b]

[a] *Graduate Medical Education, Fort Sam Houston Clinic, Building 1179, Room 1A43, 3100 Schofield Road, Fort Sam Houston, TX 78234, USA*

[b] *Department of Rehabilitation Sciences, College of Health Sciences, University of Kentucky, Lexington, KY, USA*

[c] *Department of Occupational Therapy, Eastern Kentucky University, Richmond, KY, USA*

[d] *Kentucky Hand & Physical Therapy/ Drayer Physical Therapy Institute, Lexington, KY, USA*

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** Corresponding author. Tel.: +1 832 971 7757; fax: +1 859 323 6003.*

E-mail address: enrique.smith-forbes@uky.edu; e_vsf12@hotmail.com (E.V. Smith-Forbes).

ABSTRACT: Retrospective cohort design. The minimal clinically important difference (MCID) for the quick Disabilities of the Arm, Shoulder and Hand (QDASH) has been established using a pool of multiple conditions, and only exclusively for the shoulder. Understanding diagnoses-specific threshold change values can enhance the clinical decision-making process. Before and after QDASH scores for 406 participants with conditions of surgical distal radius fracture, non-surgical lateral epicondylitis, and surgical carpal tunnel release were obtained. The external anchor administered at each fourth visit was a 15-point global rating of change scale. The test-retest reliability of the QDASH was moderate for all diagnoses: intraclass correlation coefficient model 2,1, for surgical distal radius = 0.71; non-surgical lateral epicondylitis = 0.69; and surgical carpal tunnel = 0.69. The minimum detectable change at the 90% confidence level was 25.28; 22.49; and 27.63 points respectively; and the MCID values were 25.8; 15.8 and 18.7, respectively. For these three distal upper extremity conditions, a QDASH MCID of 16-26 points could represent the estimate of change in score that is important to the patient and guide clinicians through the decision making process.

KEY WORDS: *disability evaluation, musculoskeletal diseases, outcome assessment, psychometrics, rehabilitation, upper extremity*

Level of Evidence: 2c

INTRODUCTION

The Minimal Clinically Important Difference (MCID) represents a change in score on a standardized assessment that is perceived to be beneficial or harmful by the patient.[1] The MCID may be calculated for patients with upper extremity (UE) deficits using two common UE assessments, the quick Disabilities of the Arm, Shoulder and Hand (QDASH)[2] and The Global Rating of Change (GROC).[3] The MCID can be clinically used to interpret patient change scores to guide clinical decision-making.

The QDASH, a region specific outcome measure, is a shortened version of the Disabilities of the Arm Shoulder and Hand (DASH).[4] Both instruments are widely used in rehabilitation.[5,6] The GROC, a generic global change scale, allow patients to decide how much they have changed during recovery. The QDASH's MCID has been determined using the GROC to identify those patients who have improved and comparing them to those who have not improved with UE diagnoses.[7] However, the results of these studies have generated a wide range of MCID (8-20),[7-11] which represents 10-20% of the 100-point scale and suggests the instrument may have poor responsiveness. One potential explanation for this variance may be because a single diagnosis was not used in most of the previous studies.[7] The MCID may differ among diagnoses, and this may help explain the varying results in the literature.[12] This is the primary rationale for examining MCID among separate diagnoses.

The QDASH's psychometric and clinimetric properties have been investigated. Rasch analysis[13] and classical theory[14-16] have been used to investigate the strength and weaknesses of the QDASH measures. A recent systematic review found the QDASH English version tool to perform well with strong positive evidence for reliability and validity (hypothesis testing) and moderate positive evidence for structural validity testing. Strong negative evidence was found for responsiveness due to lower correlations with global estimates of change.[17]

Multiple approaches have been used to calculate the responsiveness of these measures. The MCID current and previous values become critical in assisting providers in making clinical decisions. Several authors have suggested clinicians and researchers work with a range of MCID values instead of a fixed value,[18,19] another has questioned the validity of a single overall MCID.[8] Distribution-based and anchor-based methods have been the two general approaches used to interpret changes. The strategy for distribution-based approaches lies in identifying the Minimal Detectable Change (MDC), which is the smallest change in score that can be distinguished beyond random error.[20] Distribution-based approaches do not give a good indication of the importance of the observed change and therefore cannot provide the MCID.[18] In contrast, with anchor-based methods the choice of the anchor among other things will determine the precision of the MCID.

Recent studies recommend the MCID be based primarily on anchor-based procedures,[21] not be based on one study[1] and should be higher than the MDC values (the typical boundary of stable patients),[20,21] and not be based on a single study.[1] Nevertheless, there are limited studies calculating the MCID through anchor-based approaches for the QDASH.[7-10] Furthermore, it seems the best option to determine MCID is to select a small range of threshold estimates from the same sample and compare and interpret multiple reference standards.[1,21,22] This approach has been applied in a few studies on the DASH and QDASH.[11,16] Some of the approaches to calculate the MCID utilized in the literature are: 0.2 x standard deviation at baseline, 0.5 x standard deviation at baseline, and one standard error of measurement (test-retest), among many others.[16]

The main aim of this study was to use both anchor-based and distribution methods to triangulate on MCID values for the QDASH. We used a retrospective large sample of patients with UE musculoskeletal disorders who had undergone hand therapy. The objective was to determine condition specific thresholds for the MCID in order to enhance confidence in interpreting patient change scores for clinical decision-making.

METHODS

Subjects

This retrospective study population consisted of patients in a database seen at an outpatient UE orthopedic condition rehabilitation multi-center, over the last 4 years. There were approximately 5,000 patients in the existing database treated for multiple orthopedic conditions. All data in the database was de-identified and transferred to a data sheet for study purposes and then provided to the primary investigator (PI) for use by the database manager. The University of Kentucky's Institutional Review Boards approved this exempt category study prior to data analysis.

Inclusion and Exclusion Criteria

Subjects age 18-89, were included if they were not missing QDASH scores at initial visit and visit 4, not missing last visit score determined per diagnoses at either visit 8 or visit 12, and not missing associated GROC scores for the QDASH. Diagnoses not totaling at least 100 records, based on the above criterion were excluded. Surgical distal radius fracture, non-surgical lateral epicondylitis, and carpal tunnel release were included as the three most common conditions treated by hand therapists at these facilities.

Assessment

The QDASH uses 11 items to measure the degree of difficulty in performing various physical activities due to a shoulder, arm, or hand problem. It utilizes a 5-point Likert scale for seven functional items and three symptom items. Ten of the 11 items need to be completed for the scores to be valid. The score is calculated on a 0-to-100 point scale. A higher score reflects greater disability. The 2 optional scales of the QDASH (work and sport/music) are not commonly collected in this clinical practice and therefore were not part of this study.

In contrast, the GROC scale [23] asks that a person assess his or her current health status in relation to when they start their treatment and rate their level of change on a 15-point scale (-7 = a very great deal worse, 0 = same, +7 = a very great deal better).[24] Both instruments have been reported to be valid and reliable.[2,25,26]

Procedure

The database was reviewed to identify the most commonly treated diagnoses. It is known from review of the database that the typical number of visits for all diagnoses ranged from 8 to 12 visits. A screening process was used to identify that adequate scores were present at the time point of interest at initial, 4th, 8th, and 12th visit (Figure 1). In addition, the range of days treated was explored to determine a cutoff point for the last visit.

Statistical Analysis

Descriptive statistics

All statistical analyses were performed using Stata/ IC Version 13.1 (StataCorp LP, College Station, TX). Baseline characteristics per diagnoses between improved and not improved patients were determined for patient demographics of age, initial QDASH, and length of days in care using a *t*-test for parametric data and a Wilcoxon Mann-Whitney test for nonparametric data. A Chi-square test was used to calculate baseline gender differences (Table 1).[9] Patients were sub-divided per diagnoses into two groups each, stable and improved, in order to analyze baseline characteristics. Stable patients were categorized from -2 to +3. Improved patients were determined as reported scores on the GROC of (≥ +4),[9] at visit 12 or visit eight for carpal tunnel release.

Validity and Reliability

1) We examined *Convergent Validity* to determine the correlation between the QDASH and the GROC using Pearson correlation coefficient (r). This was performed because the GROC was the reference standard, or external criteria by which we judged that a real patient improvement had occurred. We expected an at least a fair association ($r > 0.30$) between their final QDASH score (visit eight or twelve), and their final GROC score (visit eight or twelve).

2) *Test-retest reliability* was calculated for the QDASH using an ANOVA ($ICC2,_{2,1}$) using a group of stable patients on GROC (-2 to +2).[9] In order to assess reliability, the fourth visit of the QDASH was compared to the initial visit scores, as they were the earliest available repeated QDASH scores.

Responsiveness

Responsiveness was determined by distribution-based and anchor-based methods.

a) *Distribution-based methods* determine the ability to detect change in general, and are based on the statistical characteristics of the sample. We calculated the Standard Error of Measurement (SEM), which links the reliability of a measurement tool to the standard deviation of the population. This was obtained from an ANOVA using the entire population for the diagnosis. We calculated the Minimal Detectable Change (MDC), which represents the smallest change in score likely to reflect a true change, free from measurement error, ($MDC = SEM * z\text{-value} * \sqrt{2}$.) We established a 90% confidence level (MDC_{90}) corresponding to a *z*-value of 1.65. Meaning: If the patient has a change score greater or equal to the MDC_{90} threshold it is possible to state with 90% confidence that this change is real and not due to measurement error.

b) *Anchor-based methods* utilize an external patient criterion (an anchor) to determine if changes in outcome are clinically meaningful. Two approaches were used; the mean change and receiver-operating-characteristic (ROC) curve approaches. The GROC assessment was used as the external reference in evaluating responsiveness.

c) *The Mean Change Approach:* Was calculated as the mean change score in the different subgroups of patients who respectively reported themselves as not improved (-7 to 0), minimally improved (+1 to +3), moderately improved (+4 to +5) and large changes (+6 to +7). We used changes in those minimally improved to triangulate the MCID values.

d) *The ROC Curve Approach:* We determined the optimal cutoff score and the area under the curve (AUC) considering the subjects improved with a GROC of +4 or greater.

A ROC curve plots sensitivity (y-axis) against 1 – specificity (x-axis). Following this rationale, sensitivity was calculated as the number of patients correctly identified as improved based on the cutoff value divided by all patients identified as having had a meaningful change (GROC +4 or greater), whereas specificity refers to the number of patients who were correctly identified as not improved based on the cutoff value divided by all patients who truly did not have a meaningful change (GROC, less than +4). The optimal cutoff was chosen as the point that jointly maximized sensitivity and specificity (was associated with the least amount of misclassification).

The AUC can be interpreted as the probability that a given diagnostic tool will correctly assign a patient to the appropriate diagnostic category. In general, AUC values between 0.7 and 0.8 are judged as acceptable, and an AUC value greater than 0.8 is considered to have good to excellent discrimination.[27] The greater the AUC, the greater a measure's ability to distinguish patients who have improved from those who have not improved. In accordance with Turner et al,[28] our ROC analysis will use the entire cohort, rather than just those subjects with ratings adjacent to the dichotomization point to increase accuracy and obtain more reasonable estimates of the MCID. We used the ICC test-retest from the product of our ANOVA that utilized a GROC of (-2 to +2).[9]

To obtain CIs for the ROC-derived parameters, we drew 50 bootstrap samples and calculated both the cutoff value and the AUC in each bootstrap replication. The mean of the 50 bootstrap AUC values was taken as the best estimate, with the 95% CI calculated as 1.96 . SD (as an estimate of the standard error) of the bootstrap values.[1] This was done because the AUC does not provide a CI, which in turn provides an estimate of how acceptable are our findings (.50 not good .70 acceptable, .80 good).

The MCID was set at the best triangulation of the results coming from both anchor-based (mean change and the ROC curve) and distribution-based (the MDC_{90} threshold) methods. This is considering that the MCID should be based primarily on anchor-based procedures[21] and be higher than the MDC value. In this regard, the MDC should be interpreted as another piece in the puzzle toward establishing the MCID, by benchmarking it to the boundaries of error.[11]

According to Turner et al,[20] "if the two anchor-based methods calculated on the same population yield different MCID values, then the knowledge that one value is below the MDC could aid in the decision to select the other." In addition, the ROC-curve approach was preferred as the first choice as it successfully addresses most limitations of the mean change approach.[1,21,28] Furthermore, our calculation of the 95% CIs gave a useful indication of the sampling variation.[18]

RESULTS

Descriptive Statistics and Validity of the Measures

After excluding for missing data, 406 patients met inclusion criteria for three diagnoses; surgical distal radius fracture (n = 151), non-surgical lateral epicondylitis (n = 137), and carpal tunnel release (n =118). Most demographical data yielded no significant differences between improved and not improved groups with exception of lower initial QDASH scores for the improved group for surgical distal radius fracture, $P = .006$ and gender for carpal tunnel release, $P = .04$, see Table 1. Scores for the QDASH (initial and last visit), last visit GROC, as well as cutoff treatment sessions and duration of treatment days are presented in Table 2. Based on a previous study consisting of multiple diagnoses, with an average duration of 10 visits /22 days,[11] a cutoff of 12 visits was chosen for surgical distal radius fracture and non-surgical lateral epicondylitis. A cutoff of 8 visits for carpal tunnel release occurred due to a shorter duration, see Table 2. Mean score changes for the QDASH questionnaire according to each GROC grade are shown in Table 3.

The correlation between GROC and the score changes of the QDASH was significant for all three diagnoses with a fair relationship for surgical distal radius fracture ($r = 0.39$, $P < 0.001$) and for non-surgical lateral epicondylitis ($r = 0.39$, $P < 0.001$), and a weak, but significant relationship for carpal tunnel release ($r = 0.22$, $P = 0.029$.) The test-retest reliability using a group of stable patients on GROC (-2 to +2), had moderate agreement for all three diagnoses surgical distal radius fracture: $ICC_{2,1} = 0.71$, (95% CI: 0.51, 0.83)- non-surgical lateral epicondylitis: 0.69, (95% CI: 0.56, 0.79)- and carpal tunnel release: 0.69, (95% CI: 0.43, 0.84).

Responsiveness

Distribution-based methods

For the surgical distal radius fracture the SEM was 10.83 and the MDC_{90} corresponded to 25.28, for the non-surgical lateral epicondylitis the SEM was 9.63, and the MDC_{90} was 22.49;

and for the carpal tunnel release the SEM was 11.84, and the MDC_{90} was 27.63.

Anchor-based methods

The mean changes for the QDASH, per diagnoses, are reported in Table 3. In particular those patients who were rated as having a small improvement (GROC, +1 to +3) had a mean change improvement for surgical distal radius fracture of 25.8 points (95% CI: 14.4, 35.6) for the QDASH; for non-surgical lateral epicondylitis of 15.3 points (95% CI: 11.4, 19.1); and for carpal tunnel release of 18.7 points (95% CI: 8.5,25.2). Splitting the data according to a presence of moderate or larger improvement (≥ +4) versus the remainder of the entire cohort, the AUC for the QDASH for surgical distal radius fracture was 0.66 (95% CI: 0.56, 0.77), (Figure 2); 0.64, (95% CI: 0.55, 0.73), (Figure 3); and for carpal tunnel release 0.66, (95% CI: 0.55, 0.77), (Figure 4). The ROC-curve cutoff scores that best identified meaningful improvement in clinical status (as measured by GROC values of +4 or greater) for surgical distal radius fracture 15.8 points (95% CI: -5.3, 36.9); for non-surgical lateral epicondylitis 15.8 points (95% CI: 1.0, 30.6) points; and for carpal tunnel release 13.3points (-1.7, 28.3) for the QDASH.

Surgical distal radius fracture triangulation

We took into account the following data (a) an MDC_{90} of 25.28 points for the QDASH, (b) a mean change for small improvement of 25.8 points for the QDASH, and (c) an ROC cutoff score that best identified meaningful improvement in clinical status of 15.8 points (sensitivity 86%, specificity 37%, correctly classified 74%), for the QDASH. Analyzing the overall results we had two competing anchor-based methods, the mean change = 25.8 and the ROC = 15.8. Based on Turner et al,[20] recommendations, the MCID = 25.8, was selected since it was just right over the MDC_{90} = 25.28 points.

Non-surgical lateral epicondylitis triangulation

We took into account the following data (a) an MDC_{90} = 22.49 points for the QDASH, (b) a mean change for small improvement of 15.3 points for the QDASH, and (c) an ROC cutoff score that best identified meaningful improvement in clinical status of 15.8 points (sensitivity 65%, specificity 59%, correctly classified 63%) for the QDASH. Analyzing the overall results our two anchor-based methods yielded similar results, the mean change = 15.3 and the ROC = 15.8. However, both values were lower than the MDC_{90} of 22.49 points. Therefore, we selected a MCID = 15.8 points from the AUC since it was the closest to the MDC_{90}.

Carpal tunnel release triangulation

We took into account the following data: (a) an MDC_{90} of 27.63 points for the QDASH, (b) a mean change for small improvement of 18.7 points for the QDASH, and (c) an ROC cutoff score that best identified meaningful improvement in clinical status of 13.3 points (sensitivity 76%, specificity 50%, correctly classified 69%) for the QDASH. Analyzing the overall results we had competing values of mean change = 18.7, and an ROC = 13.3 points. However, again both values were lower than the MDC_{90} of 27.63 points. Therefore, we selected a MCID = 18.7 points from the mean change approach, since it was the closest to the MDC_{90}.

DISCUSSION

In this era of evidence-based medicine, patients, clinicians and third-party payers demand to know the effectiveness of therapeutic interventions. This study contributes to the body of knowledge on the psychometric properties of the QDASH by examining the MCID for three distal upper extremity conditions: surgical distal radius fracture, non-surgical lateral epicondylitis, and carpal tunnel release.

In order to assess reliability, the fourth visit of the QDASH was compared to the initial visit scores, as they were the earliest available repeated QDASH scores. The average time from the initial to fourth QDASH visit were 9 ± 3 days for surgical distal radius fracture, 10 ± 6 days for non-surgical lateral epicondylitis, and 11 ± 7 days for the carpal tunnel release. The test-retest reliability for all three diagnoses ranged from 0.69 to 0.71, indicating moderate agreement. Mintken et al., found a higher reliability of 0.90 examining a cohort of shoulder patients.[9] Although, in our study the average length of days between tests was 10 days, which may have contributed to recall bias. In Mintken et al's., study the average length of follow-up time was even larger at 27 days.

This study used anchor-based and distribution-based methods to triangulate and assess the MCID for the QDASH on three diagnoses: surgical distal radius fracture, non-surgical lateral epicondylitis, and carpal tunnel release. During the triangulation of our results we considered that the MCID should be based primarily on anchor-based procedures, and in the first instance on the ROC curve,[11,21,29] and if possible, to be higher than the MDC value.[30]

Regarding the distribution-based approach, in our sample the MDC_{90} for all three diagnoses was larger than the ROC calculated values. This is not uncommon[9,31] as distributional approaches are complicated by competing suggestions for the ''beyond error'' thresholds (e.g., 1, 1.96, or 2.77 SEM).[32,33] Some authors have recommended a more reliable method to estimate the MDC is to calculate 0.5 of the SD or 1 SEM.[20] Applying this method, all our MDC_{90}'s would fall below the ROC calculated values. For the three diagnoses, the MDC_{90} values obtained were above 20 points, and were larger than what is commonly reported in the literature. One reason may be due to the retrospective nature of the data as higher quality control could have been provided in a prospective study design. Nevertheless, one strength of this study was that all data were collected on patients being treated in the course of normal hand therapy. The retrospective nature is a limitation, but it is more indicative of a real and typical clinical result as this is exactly what it is. Patients may or may not participate in a study due to time limitation. However, these data were collected as a standard operation procedure and were extracted after the fact. This data has strong external validity due to the manner in which it was originally collected.

The MCID measures important change because it uses a patient generated anchor for comparison. In contrast, the MDC measures statistical distribution of margins of error.[20] Following Turner et al's recommendation, the MDC_{90} was regarded as a benchmark to establish margins of error for the MCID, and in our sample it represented the higher bound.[11,20] Regarding the anchor-based method, the first concern about the appropriateness of the cutoff values is the selection of the anchor. We used a 15-point anchor (-7 = a very great deal worse, 0 = same, +7 = a very great deal better) and considered patients +4 to +7 as significantly improved and others as not significantly improved, to utilize the entire cohort.[28] There is no agreement in the literature on what type of GROC's to use, which groups to include in the analysis, or the level at which to dichotomize.[11,28] Furthermore, different standards have been used to determine and select the cutoff values for the QDASH.[2,9-11] In addition, it is difficult to make any direct comparisons to MCID's due to the methods employed including the choice of anchor, decision rules and types of calculation procedures.[11,20] In our sample, we found the ROC yielded values that were smaller than the mean change approach within each category of small, moderate, and large changes, with one exception (small changes for non-surgical lateral epicondylitis) which is similar to the MCID review findings by Turner et al.[20] See Table 3.

We found the ROC values to fall within previously established MCID estimates for the QDASH ranging from 8 to 20 points.[11] In particular, two of our ROC values of 15.8 points for the surgical distal radius fracture and non-surgical lateral epicondylitis were similar to recent estimates by the Franchignoni group at 15.91 points.[11] However, based on the recommended methods of triangulation in the literature, the ROC value was only selected for non-surgical lateral epicondylitis. After triangulation, only one of our MCID values (post-surgical distal radius fracture, 25.8 points) fell outside the upper limit of 20 points reported in the literature. Overall, one benefit of this sample is that it is one of the largest groups of patients to examine the responsiveness of the QDASH.

In a recent review measuring clinical outcomes for distal radius fractures, pain and function were regarded as the primary domains out of seven core areas of recommendations.[34] Considering this, in our study one explanation for a larger MCID for the two post-surgical diagnoses, may be the perceived initial pain and edema restrictions from the surgical intervention. Patients can be limited by the anticipation of pain and expectations of decreased function following surgery.[35] Therefore, patients may perceive the need to regain greater ROM and decrease pain before they can report a minimal improvement in their status. This reasoning is supported by another study that examined patient satisfaction with outcomes after surgical distal radius fractures.[36] That study concluded patients need to regain greater wrist range of motion than what is necessary to perform activities of daily living, to be satisfied with treatment outcomes.[36]

Limitations

Patient baseline status and patient demographics can significantly affect MCID scores.[37] In our study there were significant baseline QDASH differences for surgical distal radius fracture, *P* = .006; and gender for carpal tunnel release, *P* = .04. Therefore, the MCID should be interpreted with caution. It is important to note the MCID will fluctuate based on what is important to the patient, as it is not a fixed value,[37] and will vary based on the method chosen to determine the MCID, as well as the type of population.[29] For this reason, the results of this study can only be generalized to those groups of patients and individuals with similar characteristics to this sample.[31] In addition, the use of the GROC may have introduced recall bias and the use of a retrospective sample, without pre-existing controls, may explain the large MDC_{90} obtained for each diagnosis as above indicated.

CONCLUSION

This study proposes the specific MCID values for the surgical distal radius fracture, non-surgical lateral epicondylitis, and carpal tunnel release diagnoses, based on a comprehensive triangulation of anchor-based and distribution-based approaches.[11] Based on triangulation rules,[1,16,20,21] we selected MCID values of 25.8 points for surgical distal radius fracture, 15.8 points for non-surgical lateral epicondylitis, and 18.7 points for carpal tunnel release. The respective MDC_{90} values can serve as margins of error[20] for surgical distal radius fracture (25.28), non-surgical lateral epicondylitis (22.49) and carpal tunnel release (27.63) points for the QDASH. We agree with other studies noting a need of the standardization of the MCID methodology.[11,20,29]

Clinical Implications

Clinicians can use these MCID scores for the surgical distal radius fracture, non-surgical lateral epicondylitis and carpal tunnel release to understand how much change represents a meaningful change to a patient with these specific diagnoses. Previously reported QDASH MCID values ranged from 8- 20 points.[7-11] The results from this study indicate a MCID range of 16 to 26 points represents the minimal clinical change meaningful to patients presenting with three specific elbow and wrist conditions. Specifically, post-surgical distal radius fracture patients may need to have a larger improvement (25.8 points) than previously reported using a pool of conditions (up to 20 points). These diagnoses specific MCID's can help guide decision-making during the course of treatment. The selected MCID’s serve as a gauge on how much change a patient may need to undergo to experience a true change during the course of treatment, while the MDC_{90}’s serve as error margins to the MCID’s.

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Table 1
Baseline Statistics for improved patients and the not improved (scores represent means and standard deviations unless otherwise indicated)

Descriptor	Surgical Radius	Distal Fracture		Nonsurgical Epicondylitis	Lateral		Carpal Tunnel	Release	
	IP (n = 114)	NP (n = 37)	*P*	IP (n = 69)	NP (n = 68)	*P*	IP (n = 84)	NP (n = 34)	*P*
Age	56(14.1)	52(12.6)	.16[a]	47(9.2)	46(8.0)	.47[c]	53(12.0)	53(11.9)	.93[c]
Gender, (% male)	31(27%)	9(24%)	.73[b]	35(51%)	31(46%)	.55[b]	23(27%)	16(47%)	.04[b]
Initial QDASH	60(19.8)	70(22.3)	.006[c]	39(17.8)	43(19.8)	.23[c]	56(23.6)	55(22.7)	.93[c]
Duration of treatment (days of care)	35(12.3)	35(13.4)	.73[a]	41(12.6)	38(10.1)	.22[a]	26(10.0)	26(10.1)	.77[a]

IP: Improved Patients; NP: Not-improved Patients; *P*: Significance
a: Wilcoxon (Mann Whitney-U); b: Chi-square tests; c: *t-test*
QDASH: The Quick Disabilities of The Arm Shoulder and Hand

Table 2
Scores of the QDASH and GROC

Descriptor	Surgical Distal Radius Fracture	Nonsurgical Lateral Epicondylitis	Surgical Carpal Tunnel Syndrome
Initial QDASH	63 ± 20.7	41 ± 18.8	56 ± 23.3
Last visit QDASH	29 ± 20.5	24 ± 15.6	30 ± 17.6
Last visit GROC	3.4 ± 2.0	3.4 ± 2.1	4.8 ± 1.7
Cutoff treatment sessions	12	12	8
Duration of treatment, d*	35 ± 13(21-97)	39 ± 11(24-92)	25 ± 9(14-56)

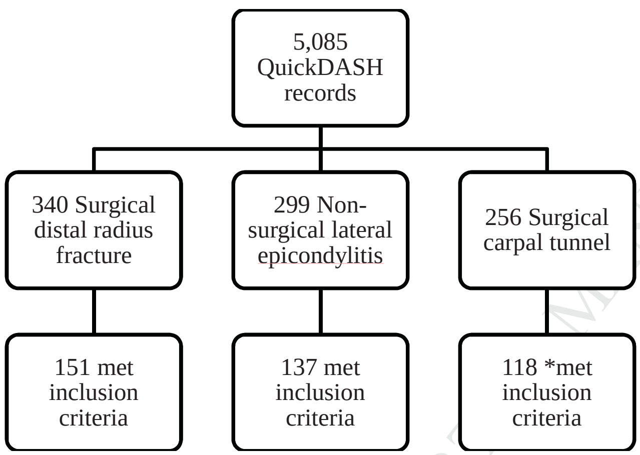
d*: Days of care, values are mean ± *SD* (range).
QDASH: The Quick Disabilities of The Arm Shoulder and Hand.
GROC: Global Rate of Change Scale.

Table 3
Mean score changes for the QDASH questionnaire according to each GROC scale grade

	Surgical Distal Radius Fracture		Nonsurgical Lateral Epicondylitis		Surgical Carpal Tunnel Syndrome	
	n(%)	QDASH	n(%)	QDASH	n(%)	QDASH
0 or less	4(3%)	9.7	11(8%)	2.6	7(6%)	15.9
+1 to +3	33(22%)	25.8	57(42%)	15.3	27(23%)	18.7
+4 to +5	54(36%)	29.6	52(38%)	17.6	57(48%)	26.6
+6 to +7	60(39%)	44.3	17(12%)	33.5	27(23%)	34.3

QDASH: The Quick Disabilities of The Arm Shoulder and Hand.
GROC: Global Rate of Change Scale.

Figure 1
Flow of charts meeting inclusion criteria



Inclusion criteria: have values for QDASH initial, visits 4,8 and 12, and GROC visit 12.
*= last visit for QDASH and GROC is visit 8 instead of 12.

Figure 2
QDASH Area Under The Curve (AUC) for surgical distal radius fracture.

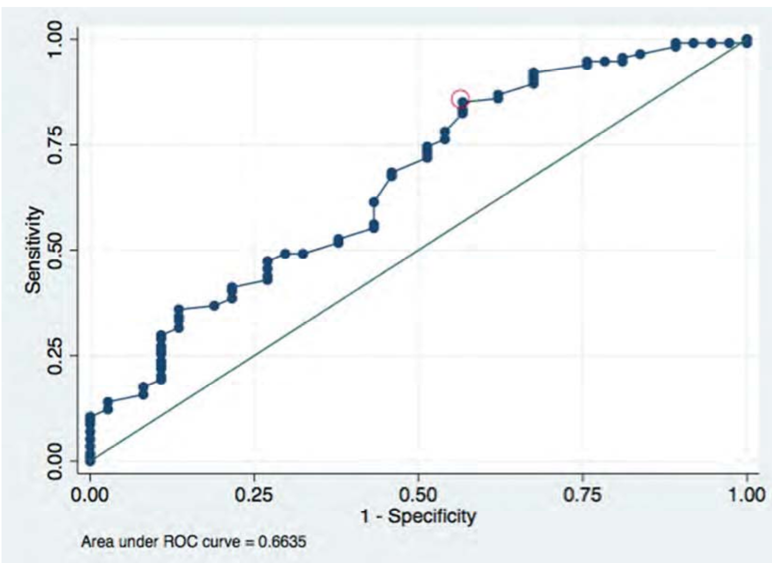


Figure 3
QDASH Area Under The Curve (AUC) for nonsurgical lateral epicondylitis.

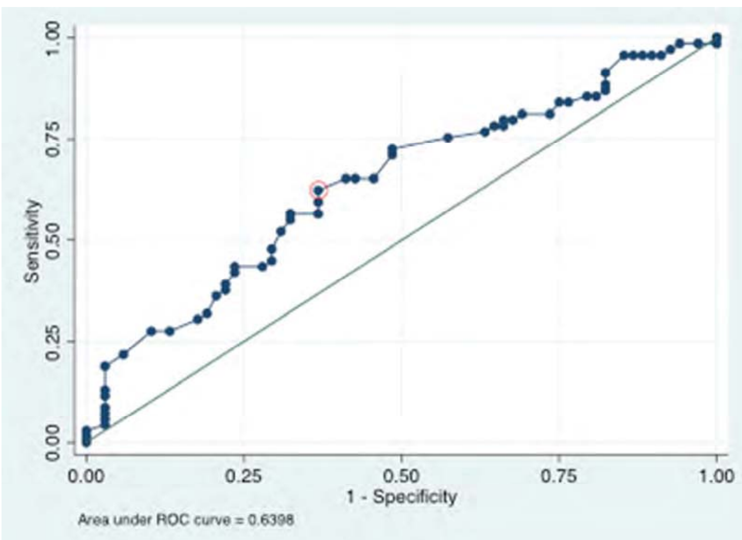
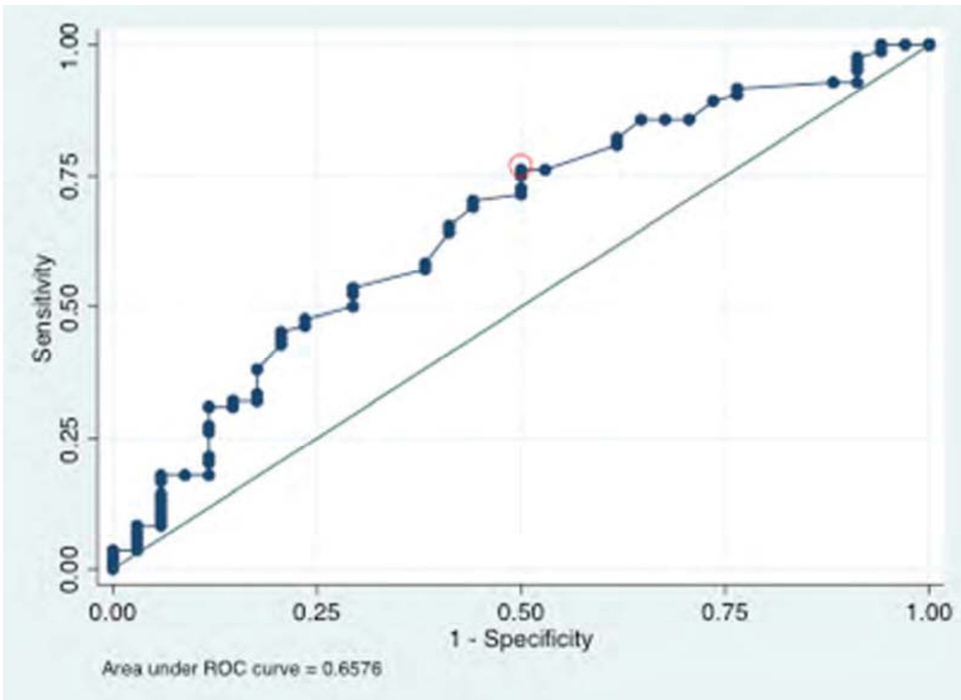


Figure 4
QDASH Area Under The Curve (AUC) for surgical carpal tunnel syndrome.



Highlights

- 406 participants, three diagnoses were assessed using triangulation methods
- For surgical distal radius fracture the MCID=25.8, MDC_{90}=25.28, and AUC=.66
- For non-surgical lateral epicondylitis the MCID=15.8, MDC_{90}=22.49, and AUC=.64
- For carpal tunnel release the MCID=18.7, MDC_{90}=27.63, and AUC=.66