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ORIGINAL ARTICLE

Reliability, validity, responsiveness, and minimal important change of the Disabilities of the Arm, Shoulder and Hand and Constant-Murley scores in patients with a humeral shaft fracture

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Background: The Disabilities of the Arm, Shoulder and Hand (DASH) and Constant-Murley scores are commonly used instruments. The DASH is patient-reported, and the Constant-Murley combines a clinician-reported and a patient-reported part. For patients with a humeral shaft fracture, their validity, reliability, responsiveness, and minimal important change (MIC) have not been published. This study evaluated the measurement properties of these instruments in patients who sustained a humeral shaft fracture.

Methods: The DASH and Constant-Murley instruments were completed 5 times until 1 year after trauma. Pain score, Short Form 36, and EuroQol-5D were completed for comparison. Internal consistency was determined by the Cronbach α . Construct and longitudinal validity were evaluated by assessing hypotheses about expected Spearman rank correlations in scores and change scores, respectively, between patient-reported outcome measures (sub)scales. The smallest detectable change (SDC) was calculated. The MIC was determined using an anchor-based approach. The presence of floor and ceiling effects was determined.

Results: A total of 140 patients were included. Internal consistency was sufficient for DASH (Cronbach $\alpha = 0.96$) but was insufficient for Constant-Murley ($\alpha = 0.61$). Construct and longitudinal validity were sufficient for both patient-reported outcome measures (>75% of correlations hypothesized correctly). The MIC and SDC were 6.7 (95% confidence interval, 5.0-15.8) and 19.0 (standard error of measurement, 6.9), respectively, for DASH and 6.1 (95% CI -6.8 to 17.4) and 17.7 (standard error of measurement, 6.4), respectively, for Constant-Murley.

Conclusions: The DASH and Constant-Murley are valid instruments for evaluating outcome in patients with a humeral shaft fracture. Reliability was only shown for the DASH, making this the preferred instrument. The observed MIC and SDC values provide a basis for sample size calculations for future research.

Level of evidence: Basic Science Study; Validation of Outcome Instrument

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Keywords: Humeral shaft fracture; DASH; Constant-Murley; patient reported outcome measure; measurement properties; responsiveness; reliability; validity

This study was exempted by the Medical Research Ethics Committee Erasmus MC (No. MEC-2015-217).

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†A list of the HUMMER Trial Investigators is available in the online [Appendix](#) (available on the journal's website at www.jshoulderelbow.org).

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