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Responsiveness of three Patient Report Outcome (PRO) measures in patients with hand fractures: A preliminary cohort study

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ABSTRACT

Study design: Clinical measurement.
Introduction: Few studies describe the responsiveness of functional outcomes measures in patients sustaining hand fractures.
Purpose: 1 – To explore the responsiveness of three function-oriented Patient Report Outcome (PRO) measures with a cohort of hand fracture patients. 2 – To examine patients' PRO preference.
Methods: 60 participants with 74 hand fractures at an outpatient hospital-based hand therapy clinic consented to participate in this study. They completed the Disabilities of the Arm, Shoulder, and Hand Questionnaire (DASH), Michigan Hand Outcomes Questionnaire (MHQ), and Patient-Rated Wrist/Hand Evaluation (PRWHE) at three trials: T1 (evaluation), T2 (one month later), and T3 (two months later). Participants also identified which PRO they felt best reflected their hand use and which was easiest to complete. Descriptive statistics, analyses of variance (ANOVA), effect size, and standardized response mean (SRM) were employed to describe participants, determine functional change between trials, and examine and compare PRO responsiveness. Questionnaire preference at T1 was reported.
Results: Participants demonstrated functional improvement, as measured by the DASH, PRWHE, and MHQ. T1 scores: DASH = 41.85 (SD ± 22.78), MHQ = 50.13 (SD ± 18.36), and PRWHE = 48.18 (SD ± 22.07). T2 scores: DASH = 22.11 (SD ± 18.18), MHQ = 69.89 (SD ± 15.93), and PRWHE = 22.62 (SD ± 18.15). T3 scores: DASH = 17.56 (SD ± 18.01), MHQ = 75.37 (SD ± 19.19), and PRWHE = 22.40 (SD ± 19.04). Each PRO demonstrated significant test score differences between trials ($p < .001$). Large responsiveness ($\geq .80$) was noted between T1 and T2: (effect size: .98–1.23; SRM: 1.31–1.49) and T1 and T3 (effect size: 1.21–1.54; SRM 1.49–1.84). Smaller responsiveness effects were noted between T2 and T3 (effect size: .35–.64, SRM: .38–.81). No significant differences between questionnaire responsiveness were found. Patients reported PRWHE easiest to complete and MHQ best reflecting their hand use.
Conclusions: DASH, MHQ, and PRWHE were each able to describe functional limitations in this cohort of patients with hand fractures. In capturing improvement over time they demonstrated comparable responsiveness in assessing change in patients with hand fractures.
Level of evidence: 2c.

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Introduction

Hand fractures encompass metacarpal and phalangeal fractures[1–8] and present unique challenges during the post-reduction healing and rehabilitation process.[9–11] Over 40% of all hand and forearm fractures occur in the metacarpals (18%) and phalanges

(23%).[1] Potential complications impact functional hand use in daily activities.[3,5,9–12] Fractures range in severity, type of reduction, and subsequent contraindications.[6,7] Simple non-displaced non-articular fractures are treated with early mobilization and limited protection,[5–7,10] while complex fractures require surgical intervention, periods of immobilization, and/or restricted motion.[3,6,7,9–12] Specific knowledge of the duration and extent of functional limitations can inform patient care.

Clinicians and researchers increasingly consider patient functional ability when describing this population.[4,6,13] The importance of helping patients engage in activities and participate in life

situations[14] is stated in the World Health Organization's International Classification of Functioning, Disability, and Health[15] and echoed in the mission of hand therapy.[16] Accurate assessment of patients' participation in daily activities is a necessary first step toward identifying and targeting limitations.[17] While numerous instruments to assess upper extremity function are available,[8,17-23] clinicians are challenged to select those most appropriate for use.[24]

Patient Report Outcome (PRO) measures are one option that uses patient perspective to describe the functional impact of a disease process or injury.[18,25,26] Often structured in questionnaire format, PROs vary in length, type of questions, and focus. PROs are standardized when they have undergone psychometric testing to determine reliability, validity, and responsiveness to change in functional status.[18,24,26]

While reliability and some types of validity are consistent across diagnoses, responsiveness of a PRO is not consistent for all diagnoses. Responsiveness is defined as a measure's sensitivity to change over time.[24,27] Responsiveness to change in a single group can be calculated using effect size, standardized response mean (SRM), or paired t-test.[27] Determining PRO responsiveness for a specific condition is integral for effectively highlighting patient concerns[24] and documenting change in status over time.

Three widely used PROs have been described in the literature as suitable functional measures for patients with hand fractures.[4,6] The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire,[19,21] the Michigan Hand Questionnaire (MHQ),[20] and the Patient Rated Wrist/Hand Evaluation (PRWHE)[8,23] differ in content, format, length, and complexity. They have demonstrated reliability and validity after undergoing extensive psychometric testing.[20-23,26] However, none has been tested for responsiveness to change, specifically in patients with hand fractures (Appendix A).[8,21,22,28-37] An additional concern is that existing responsiveness studies are predominantly conducted at intervals of at least 3 months, too large a time frame to capture the nuanced and often briefer recovery of patients with hand fractures.[6,8,28,32] Both of these factors affect decisions about which measure to employ.[8] Patient preference, a subject heretofore unexamined and addressed in this study, also can inform PRO selection.

Purpose

This study compares the responsiveness of three valid, reliable, and well-known PROs (DASH, MHQ, and PRWHE) in individuals with hand fractures. A second purpose is to examine patients' preferences regarding which of the three best reflects their hand use and is easiest to complete. We hypothesized that the DASH, MHQ, and PRWHE would demonstrate responsiveness to change in patients with hand fractures and, furthermore, that the PRWHE would be most responsive, with better SRM and effect size than the other two measures. It is further hypothesized that patients will identify the MHQ as best reflecting their current level of hand use and find the PRWHE easiest questionnaire to complete.

Methods

Participants

Patients with hand fractures referred to the Hospital for Special Surgery Outpatient Hand Therapy were identified and recruited. This study was approved by the Hospital for Special Surgery Institutional Review Board (IRB# 25082), and informed consent was obtained for all participants. A proposed sample of 59 participants was determined using a prior, similar study.[32] Enrolling 75 participants would allow for a 25% dropout rate. Participants were recruited over a period of three and a half years, at the end of which further recruitment was no longer pragmatic.

Patients ages 18—99 diagnosed with hand fractures and referred by a physician for hand therapy were recruited for this study. Participants had to be able to read, speak, and understand English. They were included in the study after consenting to participate and responding to PROs for at least one trial. Participants were excluded if they were referred for orthosis/home exercise program only or otherwise did not meet inclusion criteria. Some participants with simple fractures who completed therapy within a month did not return for subsequent trials. Their responses to only one set of PROs were included to incorporate their experience.

Participants received routine hand therapy for presenting symptoms as needed, including modalities, soft tissue and joint mobilization, scar management, active/passive motion, orthosis, functional tasks, and retraining for activity of daily living and work.

Data collection

Data were collected at three time points: initial evaluation (T1), one month after evaluation (T2), and two months after evaluation (T3). At each trial, questionnaires were administered in the same order (DASH, MHQ, and PRWHE), followed by the two patient preference questions (identifying which questionnaire was easiest to complete and best reflected current ability of hand function). Descriptive data and demographic information, including active range of motion (AROM) measurements, were also collected.

The DASH and PRWHE were scored manually, using the standard algorithms,[8,21,23] and the MHQ was scored either manually, using the designated MHQ Scoring Algorithm[20] or by computer, using a specifically designed, excel spreadsheet offered on the University of Michigan, MHQ website.[38]

The DASH[21] was developed to measure disability in patients with disorders in any part of the upper extremity.[21] Beaton et al conducted extensive psychometric testing, demonstrating test-retest reliability (Pearson correlation: .96, Spearman Rank correlation: .95, and intraclass correlation coefficient [ICC]: .96), discriminative validity, and convergent validity in a sample of patients with proximal and distal injuries.[21] While numerous studies reported responsiveness to patients with a variety of hand and wrist problems (Appendix A),[8,21,28-34] few included patients with hand fractures[8,29] and none exclusively for this group. The DASH contains 30 items and optional sports and work modules, each with five response options (1—5). Lower scores indicate better functional hand use. Total scores range from 0 to 100, with 0 representing no difficulty in the performance of daily tasks.[21]

The MHQ also underwent extensive psychometric testing,[20,22] demonstrating test-retest reliability (ICC $\geq$ .85, N = 22 for five of its scales) and construct validity. While responsiveness was calculated for patients with a variety of wrist and hand problems (Appendix A),[22,28-30,35-37] only one study[29] included patients with hand fractures, and none were conducted exclusively for this group. The MHQ's 57 items are grouped into six sections: overall hand function, activities of daily living, pain, work performance, aesthetics, and patient satisfaction with hand function.[20] Four of these sections inquire how right and left hands are impacted separately. Section scores are normalized and summed for a total between 0 and 100, with 100 representing excellent perceived hand function.

The PRWHE underwent extensive reliability and validity testing in its earlier iteration, the Patient Rated Wrist Evaluation (PRWE).[23] MacDermid demonstrated test-retest reliability (ICC: .93) and content, construct, and criterion validity in patients with wrist fractures.[23] MacDermid and Tottenham subsequently modified the PRWE by referring questionnaire items to the wrist/hand instead of the wrist alone.[8] Responsiveness of the PRWHE was demonstrated