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Estimation of health-related-quality of life depends on which utility measure is selected for patients with carpal tunnel syndrome

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ABSTRACT

Study Design: Cross-sectional.
Introduction: Carpal tunnel syndrome (CTS) refers to the compression neuropathy of the median nerve at the wrist.
Purpose of the Study: To establish the interinstrument reliability, convergent construct validity, and the levels of agreement of health utility indexes 2 and 3 (HUI-2 and HUI-3), EuroQol 5-dimensions (EQ-5D), EuroQol-visual analog scale (EQ-VAS) and to determine the difference of these utility measures based on age and gender in patients with carpal tunnel syndrome.
Methods: Seventy-four patients with a confirmed diagnosis of carpal tunnel syndrome completed the 3 questionnaires and EQ-VAS a month before surgery. Demographic characteristics were reported. Intraclass correlation coefficients were used to assess relative interinstrument reliability. Pearson correlation coefficients (r) were used to establish convergent construct validity. Bland-Altman plots and t tests were used to describe the levels of agreement between the 4 utility measures. A 2-way analysis of variance was performed to determine the effect of age and gender on the utility measures; HUI-2, HUI-3, and EQ-5D.
Results: The intraclass correlation coefficients were 0.85 for HUI-3 vs HUI-2 and 0.80 for HUI-2 vs EQ-VAS. Pearson correlation coefficients ranged from 0.60 to 0.89; HUI-3 vs HUI-2: 0.89, and HUI-3 vs EQ-5D: 0.60. One-sample t test demonstrated significant differences between HUI-3 vs HUI-2, HUI-3 vs EQ-5D, and HUI-3 vs EQ-VAS measures, with mean differences of −0.12, −0.15, and −0.14, respectively. A 2-way analysis of variance test controlling for age and gender indicated neither as predictors of outcome scores.
Conclusions: The HUI-3 vs HUI-2 and HUI-2 vs EQ-VAS demonstrated excellent interinstrument relative reliability measures. The HUI-3 vs HUI-2 displayed very strong convergent construct validity measures, and strong validity measures were established between the remaining utility measures. In addition, the pair-wise utility comparisons demonstrated minimal bias between HUI-2 vs EQ-5D, HUI-2 vs EQ-VAS, and EQ-VAS vs EQ-5D measures.
Discussion: N/A.
Level of Evidence: N/A.

Introduction

Carpal tunnel syndrome (CTS) refers to the compression neuropathy of the median nerve at the wrist, resulted from mechanical distortion associated with compressive forces.[1] The clinical symptoms of CTS include pain, weakness, numbness and tingling in the distal distribution of median nerve.[1] Furthermore, both the grip strength and hand function are reduced.[2] Environmental and medical risk factors have been reported to be associated with CTS.[3] Environmental factors include forceful hand motions, awkward and prolonged postures of wrist in extremes of flexion or extension, continuous repetitive use of flexor muscle groups, and exposure to vibration.[3] Medical conditions that lead to fluid imbalance that cause an increased volume within the carpal tunnel such as renal failure, hypothyroidism, and congestive heart failure can contribute to CTS.[3] In the United States, an estimated $197-$382 million over 6 years

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was accounted for loss of earnings of CTS claimants.[4] This condition is more dominant in women than men with the prevalence of electrophysiologically confirmed cases of 8.7%-11.3% and 5.80% in women and men, respectively.[5] Furthermore, it has also been reported that 76% of patients with CTS become symptomatic between the ages of 40 and 70 years.[6] Therefore, both the female gender and increasing age are associated with the prevalence of CTS. However, information provided to clinicians based on physiological measures (such as nerve conduction studies in CTS) are often poorly associated with functional capacity and well-being, as 2 patients with similar clinical symptoms often have dramatically different responses on health-related quality of life (HRQoL) measures.

Generic self-administered questionnaires are used to assess HRQoL.[7] These measures are used to encompass and assess widely valued physical, emotional, and social aspects of life that are not generally considered as health.[8] In addition, HRQoL questionnaires provide valuable information regarding the impact of a disease from a patient's perspective.[7,8]

Examples of these generic measures include health utility indexes 2 and 3 (HUI-2 and HUI-3), EuroQol 5-dimensions (EQ-5D), EuroQol-visual analog scale (EQ-VAS), and the Medical Outcomes Study 26-Item Short Form Health Survey (SF-36). Based on the current literature, the SF-36 was identified as the only generic instrument used to measure HRQoL in patients with CTS.[7,9-12]

Validity and reliability parameters are essential for utilization of an instrument to assess HRQoL.[13] Reliability refers to the ability of an instrument to measure a series of outcomes with minimum amount of random error over an unchanged population, whereas validity is the extent to which an instrument measures what it is intended to measure.[14] Construct validity is an evaluation of the extent to which the scores of an instrument are correlated with other measures based on hypothesized relationships.[14] In addition, assessing the levels of agreement among instruments enables researchers and clinicians to use instruments interchangeably.[15] There is a lack of literature on the psychometric and agreement properties of HUI-2, HUI-3, EQ-5D, and EQ-VAS HRQoL measures in patients with CTS. And because age and gender are determinants of CTS prevalence, it is important to know if these also affect HRQoL.

The overall aim of the study was to examine the performance of HUI-2, HUI-3, EQ-5D, and EQ-VAS in patients with CTS to determine the extent to which they provide comparable results and examine the impact of age and gender on these scores. Specifically (1) to assess the inter-instrument reliability of these 4 utility measures using the multiattribute utility (MAU) for HUI-2 and HUI-3, time trade-off (TTO) scores for EQ-5D, and patient-reported scores for EQ-VAS; (2) to establish cross-sectional convergent construct validity of these 4 measures; (3) to determine the level of agreement between utility measures and to see whether differences in estimated utilities are based on choice of measure; and (4) to examine the difference of HUI-2, HUI-3, and EQ-5D utility measures based on age and gender.

Methods

Sample

Seventy-four patients participated in this cross-sectional design study. A convenient sample of patients with a confirmed diagnosis of CTS scheduled for a surgery from St. Joseph's and Hamilton General Hospitals was recruited by hand surgeons' referrals. The contact information regarding each eligible patient were provided by the hand surgeons to the research assistant. The research assistant then contacted each eligible patient, and the study was explained in detail. Patients who provided their consent over the phone and agreed to participate were enrolled in the study. After providing an informed consent over the phone and agreeing to participate, the HUI-2, HUI-3, EQ-5D self-administered questionnaires, and EQ-VAS, along with a written consent form, were mailed to each patient in advance of a scheduled laboratory visit. Patients were requested to bring the completed questionnaires to their visit to the MacHANd Laboratory at McMaster University, Canada. A laboratory visit was scheduled to perform further assessments that have not been included in this study. Four health utility measures were administered independently at 1 month before each patient's scheduled surgery date between September 2008 and August 2012. Ethical approval for this study was obtained through Hamilton Health Sciences' McMaster Research Ethics Board.

Inclusion criteria

The patients were required to have a confirmed diagnosis of CTS; 18 years and older; able to read, speak, and comprehend English; and to complete the 4 self-administered questionnaires on their own. The CTS was confirmed by electrodiagnostic test—nerve conduction velocity test. Three board member hand surgeons confirmed each CTS diagnosis and ruled out differential diagnosis.

Exclusion criteria

The exclusion criteria included the inability to complete any of the 4 self-administered questionnaires. Patients also completed the comorbidities questionnaire. Patients with conditions that placed them at a high risk for surgery determined by the hand surgeons before referral were also excluded from the study. These conditions included acute myocardial infarction, stroke late-stage vascular disease involving aorta, age older than 70 years with limited physiological reserve in 1 or more vital organs, and history of extensive surgery for carcinoma (esophagectomy, gastrectomy, and cystectomy), acute massive blood loss $>$ 8 units, septicemia, respiratory failure: mechanical ventilation $>$ 48 hours, and acute renal failure: urea $>$ 20 mmol/L.

Concurrent medical issues

The concurrent medical issues were assessed by administering the comorbidity questionnaire, which consists of 12 common medical conditions: heart disease, high blood pressure, lung disease, diabetes, ulcer or stomach disease, kidney disease, anemia, cancer, depression, osteoarthritis and/or degenerative disease, back pain, and rheumatoid arthritis.[16] Patients were asked to indicate if they currently had any of the aforementioned conditions.

HUI-2 and HUI-3

HUI is a family of generic health profiles consisting of 2 systems: mark 2 (HUI-2) and mark 3 (HUI-3), where each includes a generic comprehensive health status classification.[17,18] It is a 15-item questionnaire intended for self-completion, with an estimated 5-10 minutes of completion time.[19] The HUI-2 classification system includes 7 attributes—sensation, mobility, emotion, cognition, self-care, pain, and fertility, whereas the HUI-3 comprises 8 attributes—vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain. The 2 systems are independent but have a common core conceptual framework and together describe almost 1,000,000 unique health states, report HRQoL, and generate utility scores.[19] HUI is scored using MAU functions. HUI converts comprehensive health state descriptions into preference measures of overall HRQoL with a scoring system that provides utility scores on a generic scale where dead = 0.00 and perfect health = 1.00. There are health states that are considered to be worse than being dead; therefore, both HUI-2 and HUI-3 allow for negative scores.[19]