



The effect of medical comorbidity on self-reported shoulder-specific health related quality of life in patients with shoulder disease

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Background: The purpose of this study was to investigate further the effect of medical comorbidity on a patient reported shoulder specific health related quality of life (HRQoL) measure. We investigated which types of comorbidities have a detrimental effect upon shoulder specific HRQoL. We hypothesized that general medical comorbidity would not negatively affect shoulder specific HRQoL questionnaires, but that comorbidities specific to the chest region would, when properly controlling for other patient factors.

Methods: A cohort of 173 consecutive patients who underwent shoulder surgery for osteoarthritis and/or rotator cuff repair was extracted from a clinical outcomes database. Their health related quality of life (HRQoL) was evaluated with the University of Pennsylvania (PENN) shoulder score and the Short Form-36 (SF-36). Nonadjusted and multivariate risk-adjusted models were built to investigate the effect of medial comorbidity on shoulder specific HRQoL and were tested using linear modeling.

Results: Nonadjusted models showed patients with more total comorbidities ($P = .01$) and more chest-related comorbidities ($P = .006$) had lower PENN scores. But, when risk adjusting for other patient factors, the PENN scores decreased with an increase in the number of chest comorbidities ($P = .008$), but not the number of total comorbidities ($P = .391$) or other (nonchest) comorbidities ($P = .163$).

Conclusion: Shoulder specific HRQoL measures are joint specific, but they are influenced by disease or conditions that affect the chest region. This may be important in understanding why patients with certain comorbid diseases report worse shoulder pain and function and may respond differently to treatment over time.

Level of Evidence: Level IV, Case Series, Prognosis Study.

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Clinical data obtained from patient-completed questionnaires are commonly used as outcomes measures in orthopedic surgery. There are 2 basic types of questionnaires: general health related quality of life (HRQoL) measures and joint specific HRQoL measures. General measures provide

information on the overall health status of the patient. Joint specific measures are designed to measure the most salient aspects of the health of a specific joint. These measures provide complimentary information on the HRQoL of patients with shoulder disorders; therefore, it has been recommended both are used to quantify outcomes of shoulder procedures.^{2-4,8,23}

Commonly used general HRQoL measures are the Short Form-36 (SF-36) and the Short Form-12 (SF-12).^{25,26} There

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are many different shoulder specific instruments that have been described in the literature and are currently in use, like the American Shoulder and Elbow Surgeons (ASES) Standardized Form, UCLA shoulder score, disabilities of the shoulder and hand (DASH), simple shoulder test (SST), and the University of Pennsylvania (PENN) shoulder score, among many others.^{13,17}

While shoulder specific HRQoL instruments are designed to be shoulder specific, there have been published reports of medical comorbidities influencing their scores. Patients with glenohumeral degenerative joint disease, adhesive capsulitis, and rotator cuff tears showed similar negative correlations between the number of medical comorbidities and scores of shoulder specific instruments, specifically the DASH and the SST.^{10,19,23,27} These authors concluded that general medical comorbidity has a negative effect upon shoulder specific HRQoL and that the overall medical status of a patient affects scores that are designed to reflect the conditions of the shoulder and upper extremity.^{19,23} These conclusions suggest that existing shoulder specific HRQoL measures have insufficient specificity, although the underlying mechanisms are not known.

While these studies all showed a negative correlation between the number of medical comorbidities and scores of shoulder specific HRQoL instruments, 3 of the 4 did not use multivariate methods to control for confounding variables in the statistical analysis.^{10,19,27} None of these studies explored which medical comorbidities are correlated with shoulder specific HRQoL scores. Based on our knowledge, the differential impact of medical comorbidities has not been investigated in any joints of the musculoskeletal system. Exploring this is important to understanding the clinical reasons and implications of the observed correlations between medical comorbidities and joint specific outcomes instruments.

We hypothesized that medical comorbidities that could cause pain or discomfort in the chest and shoulder region would have a significant detrimental effect upon patient-reported shoulder specific HRQoL, while medical comorbidities that do not have the potential to cause these symptoms in the shoulder and chest region would not.

Methods

Study design

This cohort was selected retrospectively from a prospective clinical outcomes database for 2 subspecialty trained shoulder surgeons at an academic institution based on eligibility criteria. These surgeons attempted to collect an SF-36 questionnaire,²⁶ a PENN shoulder questionnaire,¹⁴ a Modified Charlston Comorbidity questionnaire,⁶ and a demographic questionnaire from each patient evaluated. Only patients that subsequently underwent surgery were entered into the database. All eligible patients agreed to participate in the outcomes database (IRB #6235). All were preoperative patients that had surgery between June of 2000 and

November of 2006. All patients underwent surgery for either rotator cuff pathology, osteoarthritis, or a combination of both conditions. Patients with rheumatoid arthritis, adhesive capsulitis, glenoid labral tears, and traumatic fractures were excluded. The final cohort for analysis was selected based upon completion of all of the above questionnaires. Patients with partially completed questionnaires were not included in the cohort.

Patient evaluation

Taking into account the limited sample size, significant effort was devoted to increasing the power of the study by selecting the most relevant variables for inclusion into the analysis.

The SF-36 measures eight specific domains of general HRQoL (Physical Functioning, Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional, and Mental Health) and two composite scores (Physical Component Score, PCS and Mental Component Score, MCS).²⁶ The average scores in the general non-patient population are equal to 50 with a standard deviation of 10. Higher scores correspond to better HRQoL. The PCS was chosen as a measure of general physical HRQoL. The MCS was chosen as a major measure of patients' emotional status that could impact their reporting of shoulder-specific HRQoL.

PENN shoulder questionnaire was introduced in 1999, validated and used in multiple clinical outcomes studies as a measure of shoulder-specific HRQoL.^{7,12,14,15,21,22} It contains 24 questions representing 3 domains: Pain (3 questions); Satisfaction (1 question); and Function (20 questions). The sum of scores from these 3 domains is used to obtain an estimation of overall shoulder-specific HRQoL - PENN Total (0-100). PENN Total score was chosen as a measure of shoulder-specific HRQoL.

The Modified Charlston Comorbidity questionnaire⁶ is a patient self-report instrument that asks the patients if they have ever been diagnosed or treated with the following: coronary artery disease, heart attack, congestive heart failure, peripheral vascular disease, cerebrovascular disease or a stroke, dementia, chronic pulmonary disease, connective tissue disease, ulcer disease, mild liver disease, diabetes, hemiplegia/paraplegia, moderate or severe kidney disease, neuromuscular disease, organ damage due to diabetes, cancer, leukemia, lymphoma, moderate or severe liver disease, metastatic cancer, or AIDS.

We divided the full list of comorbidities into 2 sub-lists. The first sub-list contained comorbidities that could cause pain/discomfort in and around the chest and shoulder region (chronic pulmonary disease, ulcer disease, coronary artery disease, heart attack, and congestive heart failure).^{5,9,20,24} The second sub-list contained all comorbidities from the full list that were not included into the first sub-list.

Frequency of positive responses for the comorbidity questions were analyzed and the following measures with improved statistical properties were built: 0, 1, 2, 3, 4+ for the full list (Comorbidity_Total) and 0, 1, 2+ for the number of chest-related (Comorbidity_Chest) and chest-unrelated (Comorbidity_Other) comorbidities. These variables were selected as primary predictors of interest.

Demographic data asked the patients for their age, gender, height, and weight; body mass index (BMI) was computed based on height and weight. Based on the results of preliminary analysis, age was presented as a 4-level variable with cut-off points at 55, 65, and 75 years, and BMI was presented as a 3-level variable (<30 – nonobese, 30-35 – obese, >35 – severely obese).

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