J Shoulder Elbow Surg (2017) ■■, ■■–■■

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

ORIGINAL ARTICLE

An international, multicenter cohort study comparing 6 shoulder clinical scores in an asymptomatic population

James M. McLean, MS[a,b,*], Daniel Awwad, MBBS[a], Ryan Lisle, MBBS[b], James Besanko, MBBS[a], Donald Shivakkumar, MBBS[a], Jordan Leith, MD[b]

[a]*Discipline of Orthopaedics and Trauma, University of Adelaide, North Terrace, Adelaide, SA, Australia*
[b]*Department of Orthopaedics, University of British Columbia, Vancouver, BC, Canada*

Hypothesis: The study purpose was to assess 6 shoulder patient-reported outcome measure (PROM) values in asymptomatic, healthy, pathology-free individuals. We hypothesized that there would be no difference in PROM values in pathology-free individuals when considering sex, age, ethnicity, and geographical location.
Methods: Electronic questionnaires were completed by 635 individuals (323 Australians and 312 Canadians) without dominant shoulder pathology for the American Shoulder and Elbow Surgeons (ASES) shoulder score; Constant-Murley Shoulder Score (CSS); Oxford Shoulder Score (OSS); University of California, Los Angeles (UCLA) shoulder score; Shoulder Pain and Disability Index (SPADI); and Stanmore Percentage of Normal Shoulder Assessment (SPONSA). Shoulder range of motion and strength were assessed.
Results: No difference was identified between subjective-only and subjective-objective PROMs. Handedness and a current elbow or wrist problem were not associated with differences in PROM values. Poorer PROM values were associated with a history of an inactive shoulder problem and increasing age. Female participants tended to report similar or poorer PROM scores. No significant difference was found between ethnicities. Geographical location was associated with differences in the ASES shoulder score, UCLA shoulder score, and SPADI but not the CSS, SPONSA, and OSS.
Conclusions: Differences in sex, age, and geographical location will affect PROM shoulder scores in pathology-free individuals and should be taken into consideration when PROMs are being used to compare patient outcomes. This study has established normative values for the ASES shoulder score, CSS, OSS, UCLA shoulder score, SPADI, and SPONSA. Future studies assessing a pathologic patient cohort should perform comparisons against a sex- and age-matched control cohort, ideally sourced from the same geographical location.
Level of evidence: Basic Science Study; Validation of Outcome Instruments

Keywords: Assessment; outcome; shoulder score; validation; Constant; Oxford; SPADI

Independent ethics board approval was granted from each institution involved in the study: Royal Adelaide Hospital Human Research Ethics Committee (HREC reference No. HREC/14/RAH/325, RAH Protocol No. 140819) and University of British Columbia–Providence Health Care Research Institute (UBC-PHC REB No. H14-02030).

*Reprint requests: James M. McLean, MS, MBBS, FRACS, FAOrthA, Discipline of Orthopaedics and Trauma, University of Adelaide, North Terrace, Adelaide, SA 5005, Australia.
E-mail address: james.mc_lean@adelaide.edu.au (J.M. McLean).

1058-2746/$ - see front matter
https://doi.org/10.1016/j.jse.2017.08.016

The collection of preoperative and postoperative patient-reported outcome measures (PROMs) has traditionally been used to assess the efficacy of surgical interventions.[12] Since their inception, PROMs have been used with increasing frequency to measure the severity of a patient's symptoms and level of function. They can also be used as adjuncts to enhance communication and understanding during doctor-patient consultations.[7,9]

PROM data have traditionally been collected in the clinic setting using a paper-based method. Newer computer-based, electronic PROM data collection systems allow for remote data collection and questionnaire administration, automated data input and processing, quicker and real-time data collation, and minimal clinician input.[13]

Various shoulder PROM clinical scores have been described and validated. Several studies have confirmed that in an asymptomatic population, the best possible shoulder score may not be equivalent to a perfect score on the outcome scale used.[3,4] Preoperative and postoperative clinical scores are best interpreted when compared with normal, healthy, pathology-free age- and sex-matched individuals.[16] An accurate interpretation of clinical scoring data relies on an understanding that variation may exist with regard to sex, age, ethnicity, and geographical location.

The aim of this study was to assess whether 6 commonly used shoulder PROM clinical scores were equivalent in asymptomatic, healthy individuals of different sexes, ages, ethnicities, and geographical locations. The study compared subjective-only and combined subjective-objective PROMs with questionnaires administered and data collected electronically, including over 600 participants. The clinical scores under investigation included the American Shoulder and Elbow Surgeons (ASES) shoulder score; the Constant-Murley Shoulder Score (CSS); the Oxford Shoulder Score (OSS); the University of California, Los Angeles (UCLA) shoulder score; the Shoulder Pain and Disability Index (SPADI); and the Stanmore Percentage of Normal Shoulder Assessment (SPONSA).

Our hypothesis was that there would be no difference in shoulder PROM clinical scores in an asymptomatic population between sexes, age groups, ethnic groups, and geographical locations. If no difference existed, then any shoulder PROM could be interpreted at face value, with a score of 100% being assumed as the goal for all postoperative patients, irrespective of sex, age, ethnicity, or geographical location.

Methods

From November 2014 to November 2015, healthy volunteers were recruited from a variety of sources. Participants were approached at driver's licensing offices, public libraries, the outpatient services of both public and private medical facilities, and various community centers (sporting, childcare, recreation, and senior activity facilities). There were no study advertisements, and participants were not paid for their involvement.

Participants were included if they were aged at least 18 years; were fluent in English; were Australian or Canadian citizens; and had no diagnosed shoulder pathology in the dominant arm. The exclusion criteria included participants with a history of any inflammatory arthritis, significant neck problems, or cognitive impairment or language problems. Participants were also excluded if they had active dominant shoulder pathology or had a history of dominant shoulder surgery that included recent surgery (within the past 3 years) or joint arthroplasty. A history of inactive dominant shoulder pathology including previous surgery (>3 years ago) was recorded but was not considered part of the exclusion criteria. A history of ipsilateral elbow, wrist, or hand pathology was recorded, but this was also not considered part of the exclusion criteria.

Eligible participants underwent an informed consent process. The study included 635 participants free of active shoulder pathology (323 Australian and 312 Canadian citizens). The Australian cohort included 163 male and 160 female participants; the average age was 53.5 years (range, 20-89 years); 31 were left hand dominant. The Canadian cohort included 153 male and 159 female participants; the average age was 53.8 years (range, 19-90 years); 26 were left hand dominant.

An electronic, Web-based software system (OBERD [Outcomes Based Electronic Research Database]; Universal Research Solutions, Columbia, MO, USA) was used to combine several of the shoulder PROM instruments to create 1 condensed instrument. Condensed, electronically administered questionnaires have been shown to have comparable results to individually administered paper-based PROMs.[13,25] All questions were stated exactly as in the original instruments, added sequentially together. When appropriate, both imperial and metric values were stated. The shoulder outcome instruments assessed included the ASES shoulder score, CSS, OSS, UCLA shoulder score, SPADI, and SPONSA. The details of these instruments are described in the following section.

The questionnaire was self-administered by participants with reference to their dominant shoulder, using an electronic mobile device (smartphone or tablet computer) or a laptop computer. If participants had difficulty in completing the questionnaire because of computer unfamiliarity, visual impairment, or impaired dexterity, an investigator completed it for them by verbally asking the questions and recording their responses.

All participants were then assessed clinically, and measurements of their range of motion (ROM) and strength were recorded. ROM was assessed using the smartphone application DrGoniometer (version 1.9; CDM SrL, Milan, Italy).[20] Participants' pain-free active ROM was assessed in the seated position, using the axis of the arm and the spinous processes of the thoracic spine as reference points.[6] Subjective shoulder strength was assessed using the 6 grades (0-5) described by the Medical Research Council.[15] Objective shoulder strength was measured using an IDO Isometer (Innovative Design Orthopaedics, Reading, UK) and using the technique described by Constant et al.[6]

Primary outcome measures

ASES shoulder score

The ASES shoulder score is a 17-item patient report of pain, function, and disability, scored out of 100, which has been shown to have acceptable reliability and construct validity.[17,22]