



REVIEW ARTICLE

# Evaluation of shoulder-specific patient-reported outcome measures: a systematic and standardized comparison of available evidence

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**Background:** The aim of this study was to perform a standardized and systematic evaluation of the available evidence on multi-item shoulder-specific patient-reported outcome measures that are applicable to a wide spectrum of disorders.

**Materials and methods:** A systematic review was conducted in PubMed to identify articles with information regarding the development process, metric properties, and administration issues of shoulder-specific patient-reported outcome measures. Two experts independently reviewed all the articles identified for one instrument and applied the EMPRO (Evaluating Measures of Patient Reported Outcomes) tool, which was designed to assess the quality of attributes in a standardized way. An overall EMPRO score and 6 attribute-specific scores were calculated (range, 0-100) to describe the quality of instrument performance.

Ethical committee approval: not applicable.

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**Results:** We identified 11 instruments and 112 articles (2-30 articles per instrument). The American Shoulder and Elbow Surgeons (ASES) shoulder assessment, Simple Shoulder Test (SST), and Oxford Shoulder Score (OSS) were the best rated, with overall scores of 77.4 points, 72.6 points, and 69.7 points, respectively. They have been shown to be valid, reliable, and responsive, with a low administration burden. Acceptable results were also found for the Flexilevel Scale of Shoulder Function, Shoulder Pain and Disability Index, and Dutch Shoulder Disability Questionnaire, but some of their attributes need further evaluation.

**Conclusions:** Current evidence supports the use of the ASES, SST, or OSS. We recommend the SST for longitudinal studies or clinical trials, the Dutch Shoulder Disability Questionnaire for clinical practice to minimize administration burden, and the ASES or OSS to discriminate among patients' or groups' evaluations at one point of time.

**Level of evidence:** Validation of Outcome Instruments, Systematic Review.

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**Keywords:** Shoulder pain; disability evaluation; quality of life; questionnaires; outcome assessment; psychometrics; validation studies

The shoulder is one of the most complex joints of the human body. Shoulder-related disorders account for substantial medical, economic, and social costs<sup>21,43,46</sup> and comprise a wide spectrum of problems. Shoulder disorders are mostly accompanied by pain and restricted movement of the arm or shoulder that lead to difficulties in performing certain activities.<sup>1,21,34</sup> Recent research suggests that shoulder pain not only affects function during work and leisure-time activities but also may interfere with psychological and social well-being.<sup>30</sup> A systematic review showed that the estimated prevalence of shoulder pain in the general population varies greatly among studies, with a lifetime prevalence from 7% to 67%.<sup>24</sup> In fact, shoulder or neck pain is one of the most frequent work-related complaints and a frequent reason for work absence.<sup>26</sup> Data from a prospective study conducted in the Netherlands showed that 30% of the workers diagnosed with a new episode of shoulder pain reported taking sick leave during the 6-month follow-up time because of the shoulder disorder.<sup>19</sup>

The impact of shoulder disorders can be assessed in different ways. Traditionally, the assessment has been performed locally by focusing on the functional aspects of the pathology and evaluating the range of motion, strength, or pain.<sup>3</sup> However, especially because the value of patient-reported outcome (PRO) measures is becoming recognized and widely used in medical research, this approach is changing. Nowadays, research aims to determine the overall impact this problem has on daily life activities and how the psychological well-being of the patient is affected.<sup>3</sup> PRO instruments provide subjective information given by the patient himself or herself. PROs generally focus on the assessment of physical function, psychosocial issues, or general health-related quality of life, trying to capture the possible effect of a condition, a disease, or an intervention by incorporating the experience and perception of the patient.<sup>4,41</sup> Numerous generic and disease-specific PRO measures exist.<sup>13</sup> Several share a similar purpose,

and applicability, yet slight differences might exist, calling for the need to evaluate those instruments considering their strengths and weaknesses. For example, some of the PRO measures have been designed for the whole upper extremity; others, specifically for the shoulder. Some instruments are shoulder disease-specific (eg, rotator cuff disease or osteoarthritis) or population specific (eg, wheelchair users),<sup>9,25,48</sup> whereas others are independent of the underlying condition. Therefore, it is a complicated task to select the correct PRO measure for a specific purpose, considering among all those available.

PRO measurement requires reliable and valid instruments, which must be adequately selected based on the individual study purpose, setting, and available resources. Direct comparison among instruments regarding their performance characteristics, such as measurement model, metric properties, and administration issues, can facilitate this task. Efforts have been made to classify or evaluate shoulder-specific PRO measures,<sup>2,3,16,27,29,33,37,38</sup> but so far, neither has the whole spectrum of the performance characteristics been examined nor has a direct comparison among shoulder-specific PRO measures been undertaken.

The EMPRO (Evaluating Measures of Patient Reported Outcomes) tool was developed to facilitate a standardized, comprehensive, and comparative evaluation of PRO measures.<sup>42</sup> It combines 3 fundamental requirements: (1) well-described and established quality attributes for assessment, (2) expert reviewers to conduct the assessment, and (3) scores that allow direct comparisons among outcome measures. The EMPRO tool is based on an exhaustive series of recommendations regarding the ideal attributes of PRO measures.<sup>40</sup> It has been shown to be valid and useful in the evaluation of generic patient-reported outcome measures,<sup>42</sup> as well as for specific pathologies such as heart failure<sup>12</sup> and localized prostate cancer.<sup>39</sup>

The aim of this study was to perform a standardized and systematic evaluation of the available evidence on the

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