

The Single Assessment Numeric Evaluation (SANE) Score in the Evaluation of Elbow Conditions: A Systematic Review

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ABSTRACT

Introduction: The Single Assessment Numeric Evaluation (SANE) score is a patient reported outcome measure (PROM) increasingly used across orthopedics, with studies showing moderate to a very strong correlation with established tools such as ASES, WORC, and Quick Dash. However, reported MCID values vary widely, and most validations evidence forces on other joints, leaving elbow specific performance less understood. Given the limited research in elbow conditions and the growing need for efficient outcome measure by consolidating available evidence we aim to clarify the SANE scores utility in both clinical practice and research addressing elbow pathology.

Method: A PRISMA-guided systematic review of PubMed, Embase, and Scopus (2015–2025) identified studies evaluating the SANE score in patients with elbow pathology and comparing it with at least one validated elbow PROM (OES, ASES-Elbow, Quick DASH, or WORC). Cohort, case-control, and cross-sectional designs were eligible. Conference abstracts, non-English studies, and studies lacking comparison data were excluded. Six reviewers independently screened titles, abstracts, and full texts.

Results: Of 28 screened studies, 4 met criteria, representing 844 patients with diverse elbow conditions. Across studies, SANE demonstrated moderate to strong correlations with established PROMs. SANE correlated strongly with the Oxford Elbow Score ($r = 0.903$), including psychosocial ($r = 0.885$), function ($r = 0.847$), and pain ($r = 0.804$) domains, and inversely with VAS pain ($r = -0.631$). Correlation with the ASES-Elbow was moderate ($r = 0.623$), as was correlation with Quick DASH ($r = -0.537$). One study reported a minimal important difference (MID) of 0.8 and smallest detectable change (SDC) of 1.94 for SANE, values lower than those of OES and Quick DASH, suggesting high sensitivity to change.

Conclusion: The SANE score shows moderate to strong validity compared with established elbow-specific PROMs and offers a quick, patient-centered measure of elbow function. However, variation in correlation strength and a limited number of elbow-specific studies suggest that SANE should complement rather than replace comprehensive PROMs. Additional research is needed to refine elbow-specific MCID values and evaluate responsiveness across broader patient populations.

Keywords: Elbow Conditions, Musculoskeletal Disorders, Systematic Review, Systematic Review

Introduction

The Single Assessment Numeric Evaluation (SANE) score is a concise patient-reported outcome measure (PROM) in which patients assign a single percentage value to represent

their perceived level of function [1]. The score's simplicity and ease of administration have led to increasing adoption across orthopaedic subspecialties. Numerous studies have examined its validity by comparing it to established, joint-specific instruments such as the American Shoulder and Elbow Surgeons score (ASES), the Western Ontario Rotator Cuff Index (WORC), and the Quick Disabilities of the Arm, Shoulder, and Hand

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(Quick DASH) questionnaire [2,3]. These investigations have generally reported moderate to very strong correlations, though the strength of association varies by joint, injury type, and timing of assessment. While the SANE score has been applied to multiple anatomical regions including the shoulder, elbow, hand, knee, and ankle most evidence is concentrated in shoulder pathology, with fewer studies evaluating its performance in elbow conditions.

The evidence supporting the validity of SANE scores has been well established in shoulder pathology where correlations between reported SANE scores demonstrate evidence of a reliable, valid and responsive tool in these patients. A systematic review of shoulder-specific studies reported correlations ranging from .50 to .88 between SANE and established PROMS, including the American Shoulder and Elbow Surgeons (ASES) score, Rowe score, and Simple Shoulder Test, while demonstrating excellent reliability ($ICC \geq 0.80$) [4]. Thigpen similarly demonstrated that SANE has good reliability and validity across common shoulder diagnoses, with performance comparable to the ASES score and found to have similar responsiveness to treatment [5]. However, estimates of clinically meaningful change have been found to be substantially variable according to the population and methodology used. Reported MCIDs for SANE in shoulder populations have ranged from 11.8 to 37.1 points, with differences observed between distribution-based and anchor-based approaches.

Despite the growing literature and evidence supporting SANE in shoulder pathology, the application to elbow diagnoses remains limited. The elbow presents unique challenges in patient-reported outcomes assessments giving the wide range of conditions impacting factors such as; pain, strength, stability, and functional limitations [6-8]. Despite SANE being elevated in several elbow populations, evidence challenging its responsiveness and validity remain comparatively limited. Therefore, further evaluation of SANE as an efficient measure of elbow function is warranted. Subsequently, the purpose of this systematic review is to synthesize the readily available evidence of the SANE score in patients with elbow pathology to compare its overall performance with currently established outcome measures.

Methods

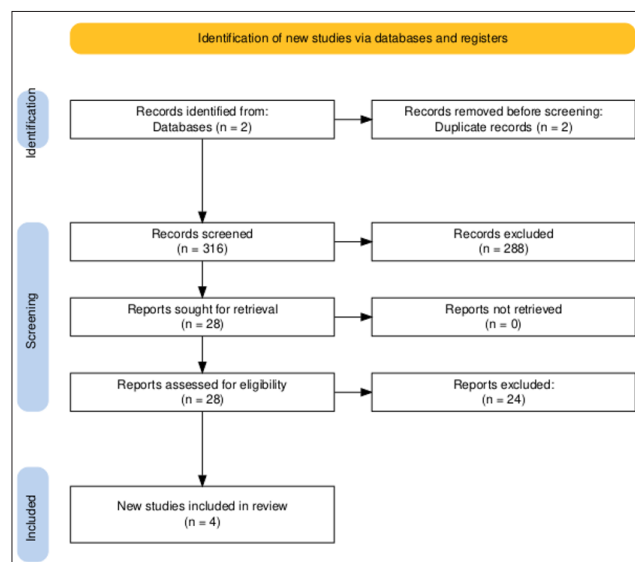
This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) 2020 statement. Eligible studies were published between 2015-2025 and evaluated the Single Assessment Numeric Evaluation (SANE) score in patients with elbow conditions, and compared SANE to at least one validated elbow-specific patient reported outcome measure (PROMS). This included the Oxford Elbow Score (OES), American Shoulder and Elbow Surgeons-Elbow score (ASES-E), Western Ontario Rotator Cuff Index (WORC) and Quick DASH. Cohort studies, case-control studies, and cross sectional studies were included. Studies were excluded if they were not published in English, were only available as conference abstracts without full text, or did not provide comparison data.

This systematic review followed the Preferred Reporting Items for Systemic Review and Meta-Analyses (PRISMA) 2020 guidelines to identify published studies within the threshold of 2015 through 2025 that compared the SANE score with ASES, WORC, or

QuickDash in patients with upper extremity pathology specifically localized to the elbow. A search of Pubmed, Embase, and Scopus relying on targeted keywords presented studies meeting inclusion criteria: adult, elbow-specific cohorts, direct patient reported outcome measures (PROMs), and quantitative psychometric analysis to measure validity and reliability of various testing methods. Studies excluded were conference abstracts, editorials, or non-peer-reviewed sources. The relevant studies were screened by six reviewers independently and four studies were included.

Studies were considered eligible to be included in this review if they: compared the SANE score to other PROMs, used SANE score as the primary PROM, focused on upper extremity injuries, or reported on the responsiveness, reliability, or validity of the SANE score. Given the heterogeneity of the studies included, the data was reported in a systematic review format as opposed to a meta-analysis. Studies were assessed for quality and credibility. Following this, basic demographic data was extracted from the studies, in addition to Pearson and Spearman coefficients for PROM correlation studies, MCIDs, and some relevant qualitative information. The extracted data was then pooled and analyzed so the authors could come to a consensus on the overall effectiveness of the SANE score usage in cases of upper extremity injury.

To extract the data, there was a focus on the variables of sample size, study design, patient population characteristics, and statistical approaches. Every article in the study was reviewed to identify exclusion and inclusion criteria, psychometric evaluations, and outcomes measures all relevant to the SANE score for upper extremity. Articles were pulled from PubMed, Emboss, Web of Science and other relevant medical journals. There was a particular focus on establishing correlation coefficients between PROMIS and SANE while measuring validity, reliability, and responsiveness related to Intraclass Correlation Coefficients (ICC), Minimally Clinically Important Differences (MCIDs), and effect sizes. This literature review also contained a detailed record of operative versus non-operative patients, follow-up visit intervals, and the different pathologies related to upper extremity. The data and literature was collected in a complete table to drive analysis and conclusion of findings across the different clinical settings.



Results

Of the 28 studies screened for SANE score use in the upper extremity, four studies focusing on SANE score use for elbow pathologies were identified. These four studies were evaluated to assess the reliability and validity of the SANE score for elbow pathologies as well as the compatibility of the SANE score with other PROMs. The four studies included in this review encompass a total of 844 patients who received care for elbow pathologies.

The SANE score demonstrated significantly ($p < 0.001$) strong correlations with established elbow-specific outcome measures across multiple studies. In a cohort of 555 patients with various elbow pathologies, the SANE-E showed a moderate correlation with the ASES-E ($r = 0.623$), with the strongest association observed with the VAS for pain ($r = -0.518$). Demographic factors did not influence score discrepancies [9]. In a study of 33 patients, eighteen patients responded better and five patients responded slightly worse on the transition item and the mean change scores with 7.9 (9.3) for OES and -7.4 (11.4) for the Quick DASH. The study concluded that change scores needed to exceed 12.1 points for OES, 11.4 points for Quick DASH and 1.94 for SANE to measure a clinically relevant change.

In a study of 86 patients, the SANE significantly correlated with the OES ($r = 0.903$, $p < .001$), particularly in the psychosocial domain ($r = 0.885$). Strong correlations were also noted with OES function ($r = 0.847$) and pain ($r = 0.804$) domains. SANE and OES mean scores were comparable (62.13% vs. 60.36%), and SANE inversely correlated with VAS ($r = -0.631$) [10]. Another study of 82 patients showed only moderate correlation between SANE and OES following either radial head arthroplasty or total elbow arthroplasty ($r = 0.502$, $p < 0.001$) [1]. This study also showed a moderate correlation between SANE and the Quick DASH score ($r = -0.537$, $p < 0.001$).

Discussion

This systematic review assessed the validity and clinical usefulness of the Single Assessment Numeric Evaluation (SANE) score in evaluating elbow problems. Among the four included studies, the SANE score showed moderate to strong correlations with established patient-reported outcome measures, including the ASES-Elbow (ASES-E), Oxford Elbow Score (OES), and Quick DASH. One study reported a strong correlation between SANE and OES ($r = 0.903$), especially within the psychosocial, function, and pain subdomains [10]. Conversely, correlations between SANE and Quick DASH were more moderate ($r = -0.537$), and the correlation with ASES-E was also in the moderate range ($r = 0.623$) [9]. These findings suggest that SANE can provide a meaningful, patient-centered assessment of elbow function and may serve as a convenient alternative in clinical settings where time or administrative burden is a concern.

However, there is variability in correlation strength across studies and tools, and the number of validation studies specific to the elbow remains limited. While the SANE score seems to reflect patient-reported functional status, it might not fully capture the complexity of elbow pathology. Especially in cases involving emotional, psychosocial, or subtle functional limitations, a tool

with a more expanded scoring spectrum may be needed. SANE may be best used as a supplementary tool rather than replacing multi-item outcome measures. Future research should focus on clarifying the responsiveness of the SANE score in elbow-specific conditions, establishing consistent minimal clinically important difference (MCID) thresholds, and assessing its usefulness across broader and more diverse patient populations.

The primary limitation in evaluating the SANE score for elbow pathology is the limited volume of elbow-specific research. Of 28 screened upper extremity studies, only four met the inclusion criteria, encompassing 844 patients. This relatively small evidence base restricts generalizability and contrasts with the more robust literature available in shoulder pathology. Additionally, the correlation strength between SANE and established PROMs varied across studies. While one study demonstrated a very strong correlation with the Oxford Elbow Score ($r = 0.903$), others reported only moderate correlations with ASES-Elbow ($r = 0.623$), OES in arthroplasty populations ($r = 0.502$), and QuickDASH ($r = -0.537$) [9,10]. This variability may reflect differences in patient populations, pathology types, and outcome constructs measured, making it difficult to define the SANE score's role as a standalone measure. Interpretation of clinically meaningful change is also limited. Only one study reported minimal important difference (MID = 0.8) and smallest detectable change (SDC = 1.94) values for the SANE score, underscoring the need for further validation across diverse elbow conditions [11].

Future research should focus on larger, prospective elbow-specific studies to better establish validity, responsiveness, and consistent thresholds for meaningful change. Clarifying whether SANE functions best as a standalone tool or as an adjunct to multi-item PROMs will be essential for optimizing its role in both clinical practice and research.

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