

1 **Correlation of Single Assessment Numeric Evaluation (SANE) with other Patient Reported**
2 **Outcome Measures (PROMs)**

3 **Abstract**

4 Background: The Single Assessment Numeric Evaluation (SANE) is a simple, one-question
5 patient-reported outcome measure (PROM). We systematically reviewed correlations between
6 SANE and more extensive PROMs.

7 Methods: We identified studies with correlation coefficients between SANE and other shoulder,
8 knee, and ankle-specific PROMs. We calculated mean, median and range across studies and time
9 points of data collection.

10 Results: Eleven studies provided 14 correlations, six shoulder-specific PROMs in four studies,
11 six knee-specific PROMs in six studies and two ankle specific PROMs in one study. The mean
12 correlation comparing SANE and knee-specific PROMs was 0.60 (SD 0.24), median 0.66, and
13 range 0.12 to 0.88. Among studies comparing SANE and shoulder-specific PROMs mean
14 correlation was 0.59 (SD 0.20), median 0.62 and range 0.20 to 0.89. The mean correlation
15 between SANE and ankle-specific PROMs was 0.69 (SD 0.17), median 0.69 and range 0.75 to
16 0.81.

17 Conclusion: There seems to be moderate correlation amongst PROMs, even those that are a
18 single question. Future research might address whether patient reported outcome measure a
19 common underlying construct even when they consist of a single question.

20 **Keywords:** SANE, Single Assessment Numeric Evaluation, Patient-reported outcome measures,
21 PROMs

22 **Level of Evidence:** Systematic review, level V.

23

24 **Introduction**

25 Patient reported outcome measures (PROMs) quantify symptoms and limitations in
26 people with musculoskeletal illness. Quantification of symptoms and limitations helps identify
27 the most effective and resource-efficient treatments. Early PROMs included dozens of
28 questions, but shorter questionnaires, computer adaptive tests in particular have proved equally
29 valid and responsive(1-6) (7, 8).The Single Assessment Numeric Evaluation (SANE) is a patient
30 rating from 0-100. Patients rate their current illness score in relation to their pre-injury baseline.
31 SANE scores are most commonly used by orthopedic sports specialist surgeons, and usually for
32 the shoulder and the knee. Current best evidence demonstrating good correlation of shorter and
33 more general measures with longer and more specific measures suggests even a single simple
34 question (SANE) could be sufficient (2-4, 9-12).

35 We systematically reviewed correlations between single question measures and longer
36 PROMs to determine how well they correlate.

37

38 **Methods**

39 This study followed the Preferred Reporting Items for Systematic Reviews and Meta-
40 Analyses (PRISMA) guidelines. We searched Pubmed for English language studies using Single
41 assessment numeric evaluation (SANE) and another PROM, published from January 1999 to
42 April 2018. The following MeSH terms were used: Single assessment numeric evaluation,
43 SANE, Single assessment numeric evaluation AND orthopedic surgery, numeric evaluation
44 AND orthopedic surgery, SANE AND patient reported outcomes, SANE AND PROMs, single
45 assessment numeric evaluation AND patient reported outcomes, SANE AND shoulder scores,

46 SANE AND knee scores. Articles were preliminarily screened using title and abstracts to
47 identify publications that met the inclusion criteria. Full manuscripts that fulfilled the inclusion
48 criteria were further reviewed (Figure 1).

49

50 *Inclusion and Exclusion Criteria*

51 We included full peer-reviewed publications in English that addressed correlation of
52 SANE with another PROM. We excluded studies that did not report correlation coefficients.

53

54 *Data Extraction*

55 We recorded the title, journal, study design, patient population, PROM used, time from
56 surgery or initial evaluation, and the absolute value of the correlation coefficients with SANE.

57

58 *Patient Reported Outcome Measures (PROMs)*

59 Fourteen PROMs were used in the eleven studies included. Six knee specific PROMs
60 were used, two ankle specific PROMs and six specific shoulder PROMs were used. The
61 Lysholm score and the ASES scores were the most frequently used appearing in 50% of the knee
62 specific studies and 75% of the shoulder specific studies, respectively. Other knee specific scores
63 used were the IKDC, Tegner, KOOS, IKDC, KOS and WOMAC scores. The additional shoulder
64 specific scores used were Rowe, WOSI, SST, DASH and PASS. The ankle specific scores
65 reported were the Martin and Berndet & Harty.

66

67 *Study Characteristics*

68 The characteristics for the eleven studies included six studies with PROMs specific to the
69 knee. The time of administration of the PROMs ranged from initial presentation to 384 months
70 post-operatively or post-intervention. The most common reported PROMs for the knee were
71 IKDC and Lysholm score.

72 Four studies included correlations of SANE and PROMs specific to the shoulder. The
73 mean time of questionnaire administration was 59 months (range from initial presentation to
74 >104 months after surgery or intervention. The most common reported PROM for the shoulder
75 was the ASES. Only one study measured correlation with the Pediatric/Adolescent Shoulder
76 Survey (PASS).

77 One study measured correlations of SANE with two ankle specific PROMs.

78
79 *Statistical analysis*

80 Correlation coefficients for each PROM were extracted from each study. Patient reported
81 outcome measures were grouped based on their anatomical location. The absolute value of the
82 correlation coefficients with knee, ankle and shoulder-specific outcome measures were used for
83 data analysis. For each anatomical location mean, median and range of correlation coefficients
84 were calculated.

85

86 **Results**

87 Among the 6 studies comparing SANE and knee-specific PROMs the mean correlation
88 was 0.60 (SD 0.24), the median was 0.66, and the range was from 0.12 to 0.88.

89 Among the 4 studies comparing SANE and shoulder-specific PROMs the mean
90 correlation was 0.59 (SD 0.20), the median was 0.62 and the range was from 0.20 to 0.89.

91 There was one study comparing SANE with two ankle-specific PROMs, the mean
92 correlation between ankle-specific PROMs was 0.69 (SD 0.17), the median was 0.69 and the
93 range was from 0.75 to 0.81.

94

95 **Discussion**

96 As measurement of patient reported outcomes becomes more commonplace, it's useful to
97 keep the instruments short and meaningful (1, 13-15). Our study examined the correlation of a
98 single question assessment (SANE) with other longer multi-question shoulder, knee and ankle-
99 specific PROMs. The study reported the mean, median and range of correlation coefficients
100 between SANE and other validated knee, ankle and shoulder specific patient reported outcome
101 measures.

102 The data from this study should be interpreted along with its limitations. There are
103 relatively few studies that compare SANE with longer PROMs and the correlations with other
104 PROMs might change with additional data. Single question measures are used in very specific
105 situations, largely by one subspecialty and may not apply in other settings. The advantages and
106 disadvantages of various PROMs are best evaluated in studies specifically designed to test
107 validity and responsiveness of SANE compared to current measures such as PROMIS Physical
108 Function Computer Adaptive Test.

109 Our study identified moderate correlation of shoulder, knee, and ankle-specific SANE
110 and longer PROMs on average. Seventy percent (31 of 44) of the total number of correlations
111 were stronger than 0.5. Among the shoulder correlations 26% were below 0.5, 35% of knee, and
112 neither of the two ankle correlations were below 0.5.

113 The American Shoulder and Elbow Surgeons (ASES) Value Committee evaluated patient
114 reported outcome measures for use in daily practice and quality measure reporting and
115 recommended the use of SANE, a general health measure (VR-12), and the ASES score for
116 shoulder problems. For the elbow the ASES recommended the SANE, VR 12, and the Quick
117 Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH). The SANE is recommended
118 for its simplicity, low burden, similar reliability and responsiveness compared to the ASES score
119 across various patient populations. (14).

120 Current best evidence shows moderate intercorrelation of general, disease, and region
121 specific PROMs be they single question, multi-question, or computer adaptive tests (1-4, 9-11,
122 13-17). The data presented in our study suggests that regardless of the number of questions
123 patient reported outcome measures may be correlated. This suggests that all measures are driven
124 by similar underlying constructs. There is also evidence that the key underlying constructs are
125 the psychological and social determinants of human illness more so than measures of
126 pathophysiology (18-22). Future research might address the possibility that all PROMs—simple
127 to complex--are driven by common underlying constructs.

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129 **Figure Legend**

130 Figure 1. Flow diagram of search strategy

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