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Reliability of the Revised Scoliosis Research Society²² and Oswestry Disability Index (ODI) Questionnaires in Adult Spinal Deformity When Administered by Telephone

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Abstract

Background Context—Non-response rates are as high as 20–50% after 5 years of follow-up in adult spinal deformity (ASD) surgery. Minimizing loss to follow-up is essential to protect data quality in long-term studies. Phone and internet administration of outcomes instruments have grown in popularity and have been found to not only provide a convenient way of collecting data, but have also been shown to improve response rates.

Purpose—To examine reliability the revised Scoliosis Research Society-22 (SRS-22r) and Oswestry Disability Index questionnaires in adult spinal deformity (ASD) when administered by telephone.

Study Design/Setting—Single-center, randomized crossover phone validation of ASD patients

Patient Sample—ASD Patients presenting to tertiary spine care center

Outcomes Measures—ODI, SRS-22r

Methods—49 patients (mean age 55.7 years) with ASD were randomized in a 1:1 ratio to either phone completion of the SRS-22r and ODI first followed by in-office completion, or to in-office completion followed by phone completion. An interval of 2–4 weeks was placed between administrations of each version. A paired t-test was used to assess for a difference in the written versus phone forms and intraclass correlation coefficients were used to assess homogeneity. Finally, goodness-of-fit testing was used to assess version preference.

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Results—There was no significant difference between the phone and in-office versions of the SRS-22r (p-value = 0.174) or the ODI (p-value = 0.320). The intraclass correlation coefficients of the SRS-22r and ODI were 0.91 and 0.86, respectively. Completion over the phone was the most popular option (57% preferred phone, 29% preferred in-office, and 14% had no preference).

Conclusions—Phone administration of the SRS-22r and ODI to ASD patients provides a convenient and reliable tool for reducing loss of follow-up data.

Keywords

Adult spinal deformity; SRS-22r; Oswestry Disability Index; Outcomes; Telephone Administration

Introduction

One measure of success in spinal deformity surgery is health related quality-of-life (HRQOL) outcomes. In particular, the revised Scoliosis Research Society-22 (SRS-22r) and Oswestry Disability Index (ODI) questionnaires are two commonly used outcomes instruments. The SRS-24, an adolescent idiopathic scoliosis (AIS) specific instrument, was first designed by Haher et al. to provide a short, practical, and patient-based assessment for scoliosis surgery.[1] This instrument has undergone several revisions, resulting in the SRS-22r.[2] The written form of the SRS-22 has subsequently been validated as a measure of post-operative pain and body image, consistent across many different languages.[3–7] The SRS-22r, initially designed for AIS, has been shown reliable and valid in adult spinal deformity (ASD) and is a commonly reported disease-specific outcomes instrument.[8, 9] The ODI was first designed in 1980 by Fairbank et al. to assess low back pain disability and was subsequently revised in 2000. It has been widely used and validated for thoracic and lumbar spine pain.[10, 11]

While outcomes after spinal deformity surgery must be tracked for many years, long-term follow-up studies reported loss to follow-up rates as high as 20–50% after 5 years.[12, 13] Loss of these data likely affects the accuracy of conclusions in long-term follow-up studies. In order to properly assess outcomes in long term prospective studies, it is necessary to minimize attrition in long term patient follow-up.[14, 15] Unfortunately, the current method of collecting outcome questionnaires during routine office visits is both cumbersome and limited by the timing interval of the scheduled visits. In order to combat this, mail-based assessments were first developed in 2003 and have been found to be effective in augmenting the completeness of follow-up data.[7, 16, 17] Likewise, phone and internet outcome instruments have also grown in popularity to meet the needs of changing cultural communication norms.[18, 19] These new instruments not only provide a convenient way to collect HRQOL data, but have also been shown to improve patient response rates.[20, 21]

To our knowledge, the SRS-22r and ODI have not been shown to be reliable when administered over the telephone. Therefore, this study serves as the first to examine the reliability of a telephone-based method of collecting spinal deformity outcomes after ASD surgery. We hypothesize that there will be no significant difference between telephone and paper-based versions of the SRS-22r and ODI.

Materials and Methods

Study Design

This study represents a randomized crossover phone validation for patients undergoing spinal deformity correction surgery at a single, tertiary referral center. A power analysis was conducted to detect a 0.6 standard deviation difference between the phone and in-office version for a two-tailed significance level of 0.05 and power of 0.8, yielding 44 required patients. To account for possible dropout, 52 patients were enrolled.

Patient Selection

Institutional Review Board approval was obtained and patients were subsequently identified from the scheduling calendar available for two fellowship trained spine surgeons. Subjects were included if they were equal or greater than 18 years old and had spinal deformity surgery of the thoracolumbar spine within the last 10 years. Patients were excluded if their surgery was limited to the cervical spine, if they were unable to complete both in-office and phone-based questionnaires, or if they were unable to provide written consent. Patients were randomized in a 1:1 ratio to either phone completion first of the SRS-22r and ODI followed by in-office completion, or to in-office completion followed by phone completion. Randomization was performed at the point of consent and was completed using a random number generator.

Questionnaire Completion

For the phone first group, a standardized version of the SRS-22r and ODI was administered over the phone by script by a single research assistant between two and four weeks prior to their office visit. An equivalent written version of each form was subsequently administered during their office visit. Likewise, if the patient were randomized to the in-office first group, they were contacted by phone, by the same research assistant, between two and four weeks following their in-office completion of the paper SRS-22r and ODI. The time interval of 2–4 weeks was intentionally chosen to reduce the effect of recall bias (too short of an interval) and to minimize the effect of time on patient pain (too long of an interval). Of the 52 patients, 3 were unable to complete both forms (1 appointment no-show; 2 failing to return phone calls within 4 weeks of in-office completion) for a total of 49 patients. Average total scores for the SRS-22r and percentage disability scores for the ODI were calculated. Finally, upon completion of both versions, patient preference for phone versus in-office format was assessed.

Statistical Analysis

A dependent samples *t*-test for matched pairs was used to assess a difference in the score for each version of both the SRS-22r and ODI and the standard error of the mean (SEM) for each was calculated. An intraclass correlation coefficient (ICC) with a 2-way random model with absolute agreement was used to assess the homogeneity of both versions of the SRS-22r and ODI. Finally, a chi-square goodness-of-fit test was used to assess version preference assuming that written (in-office), over the phone, and no-preference all occurred

with equal frequency. Alpha levels were set at 0.05. Statistical analyses were performed using SPSS 20.0 (SPSS Inc., Chicago, IL).

Results

Both phone and office surveys were obtained for a total of 49 patients (25 in the phone first group, 24 in the office first group). As shown in Table 1, there was no significant difference between the groups in terms of age ($p = 0.472$), gender ($p = 0.689$), or months post-operatively that their initial survey was completed ($p = 0.253$). Therefore, the groups were combined in order to perform a matched pair t -test.

As demonstrated in Table 2, there was a high degree of homogeneity and no significant difference between the phone and in-office versions of the SRS-22r with a mean difference of only 0.063 (p -value = 0.174) and an ICC of 0.91. Likewise, there was no significant difference between the phone and in-office versions of the ODI with a mean difference of only 1.67 (p -value = 0.320) and an ICC of 0.86. The average time between completion of both surveys was 3.0 ± 0.9 weeks. Goodness-of-fit testing rejected the model that written (in-office), over the phone, and no-preference were all selected equally ($p = 0.001$) with phone being the most popular option (57% preferred phone, 29% preferred in-office, and 14% had no preference).

Discussion

Loss of follow-up continues to be a major issue in prospective research, and has a significant impact on outcome analysis with attrition rates as high as 50%. [12, 13] While the loss of the patients is often assumed to have no effect on comparisons, patients who are lost to follow-up have been found to have worse pain, range of motion, and radiographic findings. [14] Similarly, HRQOL results may be biased towards a benefit if the majority of patients lost to follow-up have experienced poor results. In order to combat this problem, telephone administration of outcome instrument measures has gained interest with validation of numerous commonly used tools. [22–25] However, as with any new outcomes instrument, the reliability and reproducibility of telephone questionnaires must be proven in order to prove that no biases exist.

In the current study, we demonstrate that administration of the SRS-22r and the ODI over the telephone provides reliable and highly homogenous results compared to in-office administration in ASD patients. As a measure of similarity between the telephone and in-office versions, the ICC's of the SRS-22r and ODI both approach one and are similar to those found in the telephone validation of the Patient Health Questionnaire-9 (PHQ-9), the PHQ-2, and the *QuickDASH*. [22–24] Therefore, telephone administration of either the SRS-22r or ODI should be considered when patients are unable to attend scheduled follow-up visits. The results of this study also show that patients may even prefer to be contacted over the telephone, though clinical evaluation is necessary to truly evaluate the results of spinal deformity surgeries. Not surprisingly, telephone administration of a questionnaire allows patients to select a convenient time of day that works best for them.

Not only was telephone administration the preferred method in this study, but it also provides several distinct advantages. As shown in the verbal validation of the *QuickDASH*, administering the questionnaire over the phone resulted in zero incomplete surveys whereas written administration resulted in 17% of surveys being incomplete and, as a result, unscorable.[26] Likewise, verbal administration of a questionnaire is efficient and can be completed in only a matter of minutes once the patient has been reached.[26] While we report a follow-up rate of 92% in this study, follow-up rates in similar studies have not been as high.[22] Therefore, administration of validated questionnaires over the telephone should be viewed as a supplement to in-office administration. Along these lines, future methods of internet-based administration must be developed in order to further supplement HRQOL data.

Limitations of this study include the variable post-operative follow-up date at which the patient completed their first survey, thus creating a more heterogeneous group. As we sought to evaluate the validity of telephone administration of the instrument, the time of follow-up should not affect the results of our study. Likewise, we believe that the crossover design was a strength of the study in controlling for time effects on pain, especially given that a small number of patients were contacted as soon as two weeks after surgery. One additional strength of the study was that by placing a 2–4 week interval between completion of each questionnaire, patients were given an appropriate buffer to prevent recall of previous answers; a well-known phenomenon without an interval of at least 1 week.[27] Similar to previous phone validation studies, the telephone counterpart of the SRS-22r and ODI yielded slightly higher, yet statistically insignificant, scores compared to the written version.[28, 29] A potential disadvantage of the phone administered questionnaire is the time demands this must place on the surgeon's office staff. Finally, we must emphasize that the patient population investigated here are adults with spinal deformity and phone administration of the SRS-22r has not been shown reliable in AIS.

In order to combat non-response rates as high as 20–50% after 5 years, here we provide a tool for reducing loss of follow-up by showing no statistically significant difference between the telephone and written versions of the revised Scoliosis Research Society-22 and Oswestry Disability Index questionnaires. The intraclass correlation coefficients between the telephone and in-office versions of the SRS-22r and ODI were 0.91 and 0.86, respectively. Finally, completion of both surveys over the phone was the most popular option reported by ASD patients (57% preferred phone, 29% preferred in-office, and 14% had no preference).

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Table 1

shows the patient characteristics for both the phone first group and office first group. SD: Standard Deviation

	Phone First <i>n</i> = 25	Office First <i>n</i> = 24	<i>p</i> -value
Age (Years) Mean ± SD	55.8 ± 15.7	55.6 ± 15.3	0.472
Gender			0.689
Male	7	8	
Female	18	16	
Months Post-operative Mean ± SD	15.9 ± 29.7	27.3 ± 38.5	0.253

Table 2

Summary of paired *t*-test and intraclass correlation coefficients (ICC) for the differences between the phone and in-office versions of the SRS-22r and ODI.

	Mean Score	SD	Mean of Paired Differences	<i>p</i> -value	SEM	ICC (95% CI)
Phone SRS-22r	3.61	0.75	0.063	0.174	0.045	0.91 (0.84 – 0.95)
Office SRS-22r	3.54	0.73				
Phone ODI	30.41	21.94	1.67	0.320	1.66	0.86 (0.76 – 0.92)
Office ODI	28.73	21.41				