Original Article

Does a relationship exist between preoperative expectations and overall satisfaction in spine surgery patients?—a prospective cohort study

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Background: The role of preoperative patient expectation in spine surgery is not completely understood, but could be essential in predicting patient outcomes. The purpose of this study was to create a standard means to assess patient preoperative expectations and its effect on postoperative satisfaction in the midterm follow-up period.

Methods: This is a prospective cohort study design. Forty-five patients undergoing elective cervical or lumbar spine surgery were asked to participate in the study. Using a 10 cm visual analog scale (VAS) score, patients were asked to rate their preoperative pain along with what they expect it to be after surgery. Pre- and postoperative Oswestry Disability Index (ODI) and Neck Disability Index (NDI) were recorded. Overall satisfaction with surgery was recorded along with if they would have surgery again. The patients' preoperative expectations were compared to their postoperative ODI/NDI scores at terminal follow-up around 1 year. Postoperative satisfaction was also correlated as to whether they would have surgery again.

Results: Patients who would have surgery again had an average expected decrease in their disability by 37 (±23) compared to 26 (±19) in patients who would not (P=0.201). For patients who would have surgery again, their postoperative pain more closely matched their preoperative expectations.

Conclusions: In conclusion, the authors found that patients who were satisfied with their spine surgery improved functionally to a much greater degree from baseline, tended to have higher expectations with regards to level of disability improvement, and had lower expectations with regards to improvement in neck/back pain.

Keywords: Lumbar; cervical; outcomes; satisfaction; expectation

Submitted Dec 09, 2022. Accepted for publication Sep 11, 2023. Published online Oct 17, 2023.
doi: 10.21037/jss-22-110
View this article at: https://dx.doi.org/10.21037/jss-22-110

Introduction

The current atmosphere in which health care is measured faces increasing scrutiny, with regards to both the costs of care, and the quality of which it is delivered. Measuring success in surgical care has seen a transition from surgeon-perceived outcome, to the patient's perception of a successful surgical result (1,2). More recently, patient reported outcome surveys have been implemented into the healthcare field in order to measure not only clinical improvement, but to guide reimbursement as well (2). This is especially true with regards to spine surgery. While these outcome surveys may trend patient improvement postoperatively, they often do not take into account the patients' expectations and overall satisfaction of their

surgery (3).

An important contributor to patient outcomes and satisfaction is the expectations that the patient and the surgeon set preoperatively (4). Previous studies have demonstrated significant variability with regards to how patient expectations are measured, as well as the degree to which they may affect patient-perceived outcomes with spine surgery (4,5). While some studies have shown patients with unrealistic preoperative expectations are associated with decreased postoperative satisfaction (6,7), this has not been consistent in the literature (8,9).

The purpose of this study was to create a standard means to assess patient preoperative expectations as well as how those expectations are met in the mid-term postoperative period. The primary outcomes measured were the correlation between patients' preoperative expectations and postoperative satisfaction with surgery between 6 months and 1 year. Secondary outcomes measured were objective functional outcomes between 6 months and 1 year. The authors hypothesized that lower preoperative expectations would correlate with lower satisfaction with surgery at follow-up. We present this article in accordance with the STROBE reporting checklist (available at https://jss.amegroups.com/article/view/10.21037/jss-22-110/rc).

Highlight box

Key findings

- Satisfaction measured postoperatively correlated with those who would have surgery again.
- Patients who would have surgery again, tended to have higher expectations with regard to functional improvement, however, expected less degree of improvement in pain.
- Patients' functional outcomes had significantly greater improvement in patients who were overall satisfied with their surgery.

What is known and what is new?

- Preoperative counseling of patients on expectations regarding their function and pain after surgery may be imperative in predicting their outcome.
- This study created a standard way of measuring satisfaction and seeing its correlation to outcomes.

What is the implication, and what should change now?

- Those who were satisfied had greater functional improvement with greater expectation for improvement preoperatively.
- Greater emphasis needs to be placed on counseling patients on post operative expectations in an effort to achieve improved functional outcomes.

Methods

Recruitment

This was a prospective cohort study performed at a single institution. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by institutional ethics board of UConn Health System (No. 16-010-3) and informed consent was taken from all the patients. All patients that were seen in a single academic orthopaedic spine surgeon's office from August 2015 to November 2016 were eligible to participate in the study. All patients meeting appropriate indications for and considering undergoing cervical or lumbar spine surgery were invited to participate in the study. Included criteria included patients who were English speaking, greater than 18 years old, considering undergoing cervical or lumbar spine surgery, and able to provide written informed consent. Exclusion criteria included those were those under the age of 18 and members of vulnerable populations including those who were incarcerated or possessed cognitive disability.

Preoperative expectation measures

All patients who provided informed consent for the study were asked to complete a series of preoperative documents to assess their expectations regarding upcoming spine surgery. These were completed at the initial office visit where surgery was proposed as an option for the patient's spine condition. During this visit they were involved in a detailed conversation with the attending surgeon regarding the proposed surgical intervention and expected postoperative course. Following this conversation, patients completed a series of documents to measure expectations.

Preoperative expectations were measured using a 10 cm visual analog scale (VAS) where patients were asked to indicate with a single hash mark where they "expected their neck/back and arm/leg pain to be 1 year after surgery". On the VAS scale, 0 indicated "no pain" and 10 indicated "the most severe pain imaginable" for each location. In addition, the Neck Disability Index (NDI) was also completed after cervical spine patients were prompted to complete each form how they would "expect to fill it out at 1 year after surgery". Lumbar spine patients completed the Oswestry Disability Index (ODI) in a similar manner.

All patients had at least one additional office visit prior to surgery during which they completed functional scores (ODI or NDI) and VAS extremity/spine pain scales to indicate their current functional status which served as their

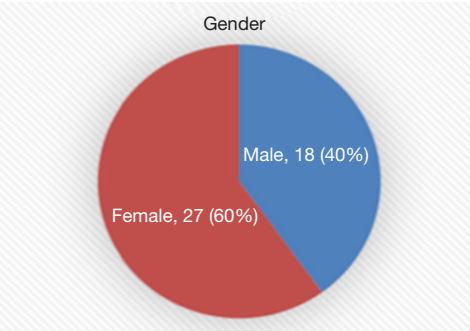

Figure 1 Gender breakdown of entire cohort.

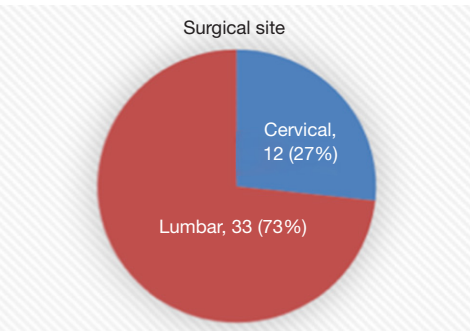

Figure 2 Surgical site breakdown of entire cohort.

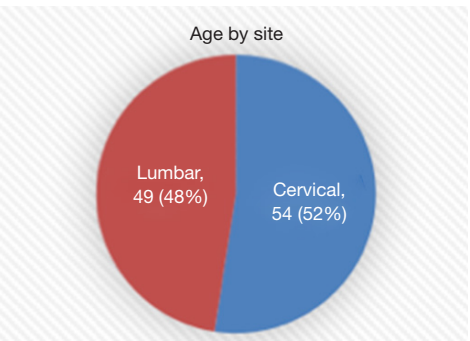

Figure 3 Age breakdown for each surgical site.

preoperative baseline.

The NDI and ODI are validated, self-administered questionnaires used to assess disability in cervical and lumbar spine patients (9,10). There are 10 sections in each form which are scored from 0–5 with 0 indicated "no disability" and 5 representing "maximum disability". Scores are summed to obtain a final score with 100 representing "maximum disability".

Postoperative outcome measures and satisfaction

All patients had regularly scheduled postoperative visits at approximately 2 weeks, 6 weeks, 3 months, 6 months, and 1 year after surgery. Patients were seen at interval visits as needed. At the 3-, 6-month, and 1-year post-op visits patients were asked to complete either the NDI or ODI. They were also asked to complete a VAS scale from 0–10 with a hash mark indicating where their current arm/leg and neck/back pain was.

At 6 months, 1 year, and thereafter, patients were also asked to complete outcomes for their current satisfaction with surgery. Using a VAS scale, each patient's overall satisfaction with surgery were recorded with 0 indicating "not satisfied at all" and 10 indicating "completely satisfied". Finally, patients were asked whether or not they would have the same surgery again under the same circumstances (yes or no). Patients' terminal outcome scores were used for data analysis. Of note, patients were not given any specific instruction on how or what to base their satisfaction scores on.

Data analysis

Descriptive statistics including mean standard deviation (SD) for continuous data and frequency and proportion for categorical data were calculated to characterize the study group. Differences in actual and expected ratings in disability and pain between those who would have surgery again and those who would not were examined with the Wilcoxon rank sum (Mann Whitney *U*) test. Point biserial correlation coefficient was calculated to examine the strength of the relationship between satisfaction with the procedure (Would you have surgery again?) and satisfaction as measured on a VAS. The alpha level for all analysis was set at 0.05. All analysis were performed with Stata 14 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP., TX, USA).

Results

Out of 170 eligible potential operative candidates during the study interval, a total 45 patients elected to participate in the study. Of those 45 patients, there were 27 females and 18 males (*Figure 1*) with a mean age of 50.6 years (SD =12.8). There were 12 patients who underwent cervical surgery and 33 who underwent lumbar surgery (*Figure 2*). The average age for the cervical group was 54.3 years and for the lumbar group was 49.3 (*Figure 3*). Five of the patients in the

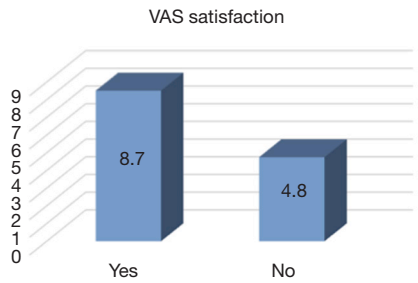

Figure 4 Degree of satisfaction per group. x-axis = Would you have the same surgery again? y-axis = Degree of post-operative satisfaction from 0–10. VAS, visual analog scale.

cohort were enrolled for a revision surgery. Mean follow-up was 13.4 months post-operatively (SD =4.2 months).

Preoperative baseline

Overall, the cervical and lumbar cohorts each began with a similar level of preoperative disability. The mean level of actual preoperative disability (NDI/ODI) for the entire cohort was 49.0/100. The mean preoperative NDI for cervical spine patients was 49 (SD =15.1), and the mean preoperative ODI for lumbar spine patients was 49.1 (SD =19.2).

Using the VAS scale, the mean degree of actual arm pain in the cervical group preoperatively was 6.0 (SD =3.1), and the mean degree of leg pain in the lumbar group was also 6.0 (SD =2.9). The mean degree of actual neck pain preoperatively in the cervical group was 6.7 (SD =1.9) while the mean degree of back pain in the lumbar group was 5.7 (SD =2.3).

Preoperative expectations

With regards to level of disability, the cervical cohort had slightly higher expectations with a mean expected NDI at one year postoperatively of 12.2 (SD =9.2), while the lumbar group had a mean expected ODI of 15.6 (SD =8.4). The mean level of expected disability for the entire cohort was 14.5/100.

On the VAS scale, the mean expected degree of arm pain in the cervical group at 12 months postoperatively was 2.0 while the mean expected degree of leg pain in the lumbar group was 1.3. The mean degree of expected neck pain in the cervical group was 2.4 and the mean degree of expected back pain for the lumbar group was 1.9.

Postoperative satisfaction

Of the 45 patients who were enrolled in the study, 38 completed the full set of questions relating to postoperative satisfaction (84%). Thirty-one patients (82%) stated that they would undergo the same surgery again given the same initial circumstances, while 7 patients indicated that they would not. The mean VAS score for satisfaction of the entire cohort was 8.1/10 (range, 1–10, SD =2.6). The mean VAS satisfaction score for the group who would undergo surgery again was 8.5, while for the group who would not, was 4.8 (*Figure 4*).

Postoperative functional outcomes

The mean level of disability (NDI/ODI) at final follow-up for all patients in the cohort was 28.3/100. The group which would have surgery again had a mean postoperative disability of 23.3 while the group that would not have surgery again had a mean of 50.7. For the cervical spine group, the mean postoperative NDI was 32.4 (24.3 for the "Yes" group *vs.* 54 for the "No" group. For the lumbar spine group, the mean postoperative ODI was 26.7 (22.9 for the "Yes" group *vs.* 48.2 for the "No" group). The mean level of limb pain for the entire cohort was 2.3 (2 for the "Yes" group *vs.* 4 for the "No" group). The total level of spine pain for the cohort was 3.52 (3.1 for the "Yes" group *vs.* 5.3 for the "No" group). There was no significant change in pre- and postop limb or spine pain between those who were satisfied with surgery (*Table 1*).

Outcomes to satisfaction

When comparing postoperative pain between cohorts, patients who would have surgery again had a 0.6 difference in limb pain postoperatively compared to what the expected, as opposed to a 2.9 difference of those were dissatisfied (*Table 2*). When comparing outcomes to preoperative expectation, patients who reported they would have surgery again expected to decrease their disability by 37 points compared to only 26 points in those who would not have surgery again (*Table 3*).

Discussion

With increasing scrutiny regarding health care costs, it has

Table 1 Differences between preoperative and final values for disability (NDI/ODI), limb pain (arm/leg), and spine pain (neck/back)

Survey question	Mean Δ	SD	95% CI	P value
Δ = (preop NDI/ODI – postop NDI/ODI)				
Would you have the same surgery again?				–
Yes	27	19	20 to 35	
No	–10.0	34	25 to –46	
Δ = (preop limb pain – postop limb pain)				
Would you have the same surgery again?				0.118
Yes	4.0	3.8	2.5 to 5.5	
No	1.4	3.2	3.4 to 6.5	
Δ = (preop spine pain – postop spine pain)				
Would you have the same surgery again?				0.351
Yes	3.0	4.3	1.3 to 4.7	
No	1.5	3.8	–2.4 to 5.5	

Positive number indicates improvement. SD, standard deviation; CI, confidence interval; NDI, Neck Disability Index; ODI, Oswestry Disability Index.

Table 2 Differences between expected and final limb and spine pain

Expected *vs.* post-op	Would you have the same surgery again?		
	Yes	No	Total
Expected limb pain	1.4	1.1	1.3
Post-op limb pain	2.0	4.0	2.3
Expected spine pain	2.0	1.5	1.9
Post-op spine pain	3.1	5.3	3.5

Post-op, postoperative

become imperative to focus on delivering high-quality care with a drive towards improving patient-perceived outcomes.

Patients' perception of the benefits gained as a result of their spine surgery (satisfaction) is a critical determinant of the overall benefit to their quality of life, and whether or not they continue to seek similar care in the future (11-15). This study sought to evaluate a standardized method of assessing patients' preoperative expectations with regards to spine surgery and how they relate to overall mid-term postoperative patient satisfaction and functional outcomes in spine surgery. The most important finding of this study was that those who were satisfied with surgery came closer to meeting their expected levels and they also demonstrated a greater absolute decrease in limb and spine pain at final follow-up (*Table 2*). This finding exemplifies the difficulty of measuring to what degree a patients' experience is due to a surgical result (decreased pain) and to what degree is due to meeting their goals (preoperative expectation). To help understand this question, it is important to consider where this data fits within a greater body of literature.

A previous systematic review published by several authors of this study found that there was a significant correlation between increased preoperative expectations and certain postoperative functional outcomes (4). That study also demonstrated a significant amount of heterogeneity with regards to how expectations were measured. The current study aimed to utilize a consistent and small number of validated tools (VAS, NDI/ODI) in order to assess expectations and satisfaction.

In general, there was a correlation between the degree of satisfaction on the VAS scale and patients' willingness to undergo the same surgery again. There were several outliers with low VAS satisfaction scores who would have surgery again, and high VAS satisfaction scores who would not, but when these 5 patients were removed the correlation coefficient increased from 0.57 to 0.90 (*Figure 5*). Determining whether preoperative factors could help identify these outliers was outside of the scope of the current study but is important for future research on this topic. Mannion *et al.* previously examined which portion of the patients' preoperative expectation, if met, would help predict postoperative satisfaction (15). The authors of that

Table 3 Differences between preoperative and expected values for disability, limb pain, and spine pain

Survey question	Mean Δ	SD	95% CI	P value
Δ = (preop NDI/ODI – expected NDI/ODI)				
Would you have the same surgery again?				–
Yes	37	23	28 to 46	
No	26	19	6 to 46	0.201
Δ = (preop limb pain – expected limb pain)				
Would you have the same surgery again?				
Yes	4.5	4.2	2.7 to 6.2	
No	4.7	4.7	–0.3 to 9.6	0.856
Δ = (preop spine pain – expected spine pain)				
Would you have the same surgery again?				0.622
Yes	3.6	3.9	1.9 to 5.2	
No	5.0	1.5	3.4 to 6.5	

SD, standard deviation; CI, confidence interval; NDI, Neck Disability Index; ODI, Oswestry Disability Index.

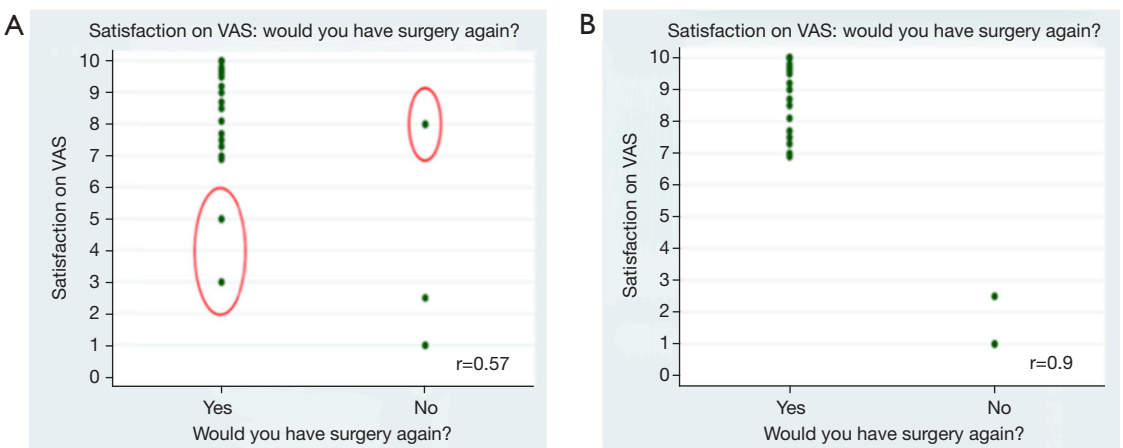

Figure 5 Scatterplots depicting correlation between patient satisfaction with surgery (yes/no) and degree of satisfaction (VAS scale) with all patients (A), and with outliers removed (B). VAS, visual analog scale.

study found that preoperative expectations neither predicted postoperative function or rating of the treatment effective (15). This differed from Yee *et al.* reported that patients with greater preoperative expectations demonstrated greater postoperative improvements in the SF-36 scores (16). However, this was not found to be consistent with ODI score (16).

In the current study, the authors found that the mean improvement of patients who were satisfied with surgery at the time of final follow was 27 points on the NDI/ODI, while non-satisfied patients declined by a mean of 10 points (*Table 1*). ODI scores for lumbar spine patients improved by a mean of 21.7 points at final follow up compared to a 17.3-point improvement in NDI for cervical spine patients, with no significant difference between groups. Interestingly, the difference between all patients' actual preoperative NDI/ODI scores and their expected post-operative NDI/ODI was quite different between

the satisfied and non-satisfied groups (*Table 3*). While not statistically significant (P=0.201), the difference between groups is clinically meaningful, as those that were satisfied had higher expectations as evidenced by their 11-point larger delta value for the above-mentioned measures. This indicates that satisfied patients had higher preoperative expectations regarding subjective functional outcomes as measured by patient reported NDI/ODI. Further, the expected improvement in limb pain was neither clinically or statistically different between the satisfied and non-satisfied group (P=0.856), while the group who was not satisfied expected a larger degree of relief with regards to spine pain P=0.62). With spine surgery typically seen as having the greatest ability to positively affect radicular pain as opposed to neck/back pain, this may reflect that non-satisfied patients expected improvement in spine pain was larger than the expectation set by the surgeon, while the satisfied group had expectations more consistent with convention. Further research is needed to identify characteristics of those patients who may have expectations for spine relief that is not consistent with those generally accepted in patients undergoing spine fusion and/or decompression procedures. Counseling techniques should be explored to ensure effective communication between the provider and the patient during the preoperative period.

This study aimed to investigate whether there was an effect of patient's preoperative expectation on their eventual satisfaction which has not been previously evaluated to our knowledge. The unique nature of this study design helped to not only examine this relationship, but also made patients involved in the study keenly aware of the need to understand and pay close attention to the conversation regarding what can be expected of their upcoming spine surgery. The value of this study could go a long way towards ensuring that both patients and providers expectations appropriately coincide prior to undergoing major spine surgery. There were limitations to this study. Although a significant amount of time was spent explaining the study and how to complete the forms with patients in the preoperative phase, some patients may have found it difficult to accurately relay their expectations onto the questionnaires used. This may be improved in the future by repetition and perfecting the wording of the questions along with our explanation to patients. This study also included a large variety of surgical procedures, including cervical and lumbar spine, decompression and/or fusion procedures, as well as primary and revision cases. While this could influence functional outcomes of surgery, this should be minimized as long as appropriate preoperative expectations were set by the surgical providers. Finally, this study captures 45 out of 170 eligible patients which the authors recognize is a small cohort. Patients chose not to participate for a variety of reasons but largely there was reluctance to fill out this survey during what was a lengthy preoperative visit. Future research may consider a more efficient design to capture a larger cohort.

Review of current literature

The topic of the impact of preoperative expectations on postoperative satisfaction and outcomes has been an interest within the field of spinal surgery for many years. In 2006, Gepstein *et al.* published a retrospective review of a cohort of 367 patients undergoing surgery to address lumbar spinal stenosis (5). Patients rated their expectation to have a successful surgical outcome as either high or low. Satisfaction was also rated on a dichotomous scale with patients choosing either satisfaction or dissatisfaction. Outcomes were assessed using VAS pain scale, duration of symptoms, and walking distance. While their methodology was simple, their study established important early principles on this topic. They observed that satisfied patients were more likely to express higher preoperative expectations and concluded that the closer a patient's expectation met postoperative outcome, the more likely those patients were to be satisfied. This study was limited secondary to its retrospective design.

Mannion *et al.*, in 2009, sought to answer this question prospectively (15). They surveyed 100 patients preoperatively, all undergoing lumbar decompression, using the Roland-Morris disability questionnaire, 0–10 pain rating, and Likert scale to establish postoperative expectations. These measurements were recorded again at two and twelve months postoperatively. This study broke from Gepstein *et al.* as they did not observe any significant correlation between expectations and outcomes. They did, however, observe that patients whose expectations were most closely met, were likely to have a good outcome which was consistent with previously published work.

In 2012, Soroceanu *et al.* conducted a prospective multicenter study to answer the question as to what, if any, relationship exists between preoperative expectations and post-operative outcomes (17). They included 402 patients at two study centers that underwent decompression with or without fusion of the cervical and lumbar spine. Expectations were measured using

the Musculoskeletal Outcomes Data Evaluation and Management System (MODEMS) expectation survey, postoperatively patients completed the MODEMS satisfaction survey, and functional outcomes were measured using ODI and 36-item short form health survey (SF-36). Authors observed that higher preoperative expectations were associated with decreased postoperative satisfaction. Furthermore, when preoperative expectations were met, there was greater satisfaction but also better functional outcomes. This important finding is consistent with previously established works on this topic.

Ellis *et al.* conducted a systematic review of the current research published on the topic of preoperative expectations prior to lumbar spine surgery (4). The authors aimed to study the collective findings to shed light on how preoperative expectations impacts functional outcomes after surgery as well as their overall satisfaction. Published in 2015, their work reviewed 13 independent studies totaling 2,366 patients who underwent lumbar decompression or decompression and fusion. Generally, the authors concluded that expectations correlated positively with satisfaction and with functional outcomes, however there was significant heterogeneity within the data. Across 13 studies there were numerus preoperative expectation methods and categories, varying ways to measure postoperative satisfaction and 13 different functional outcome tools. While this review observed a significant and important relationship between patient expectations and outcomes, it also revealed the need to attain standardized and more homogenous measurements.

In 2018, Witiw *et al.* published a systematic review gathering research examining the impact of preoperative expectations in the field of elective spine surgery (3). Their work included review of 19 studies totaling 3,383 patients. Again, authors discovered vast heterogeneity amongst methods employed to measure patient expectations. Despite this, authors observed that higher preoperative expectations were associated with higher satisfaction post operatively and that expectations tend to exceed outcomes. Furthermore, authors cite limitations of their findings and emphasize the diverse nature of methods and outcome measures which weaken the conclusion. Again, this study reinforced the need for standardized and more uniform methods to study and measure patient expectations and its impact on spine surgery.

This topic has recently been studied in patients undergoing surgery to address adult spine deformity (ASD). In 2020, Raad *et al.* (18) sought out to determine the impact of preoperative expectations on postoperative pain in patients undergoing ASD surgery. A total of 140 patients at a single institution were included. Expectations were rated on a 5-point scale and patients were subsequently divided into a high or low expectation group. Outcomes were measured using a 10-point numeric rating scale, scoliosis research society patient survey, and ODI. Consistent with previous works, authors observed that patients with higher expectations of pain relief reported less pain post operatively. While this study represents a cohort of patients which is unique from our current study, it does highlight the importance of preoperative expectations and attitude in the surgical spine patient.

The topic of preoperative expectations and its role in spinal surgery outcomes and satisfaction has been a topic of interest for many years. Despite this, there remains vast heterogeneity regarding the tools used to measure expectations and satisfaction, and also inconsistent findings with respect to their impact on outcomes. The evidence does consistently suggest, however, that if a patient's expectation does more closely match their postoperative outcome, they are more likely to be satisfied with that outcome.

Conclusions

In conclusion, the authors found that patients who were satisfied with their spine surgery after greater than 6 months improved to a much greater degree from baseline, tended to have higher expectations with regards to level of disability, and had lower expectations with regards to improvement in neck/back pain alone.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Journal of Spine Surgery* for the series "Minimally Invasive Techniques in Spine Surgery and Trend Toward Ambulatory Surgery". The article has undergone external peer review.

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jss.amegroups.com/article/view/10.21037/jss-22-110/rc

Data Sharing Statement: https://jss.amegroups.com/article/view/10.21037/jss-22-110/dss

Peer Review File: Available at https://jss.amegroups.com/article/view/10.21037/jss-22-110/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jss.amegroups.com/article/view/10.21037/jss-22-110/coif). The series "Minimally Invasive Techniques in Spine Surgery and Trend Toward Ambulatory Surgery" was commissioned by the editorial office without any funding or sponsorship. I.M. disclosed consulting fees from Stryker Corp. and Pfizer Inc, and received royalty fees from SpineArt SA. C.K. served as the unpaid Guest Editor of the series. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by institutional ethics board of UConn Health System (No. 16-010-3) and informed consent was taken from all the patients.

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Cite this article as: Silver J, Mallozzi S, Kia C, O'Sullivan M, Cote M, Moss I. Does a relationship exist between preoperative expectations and overall satisfaction in spine surgery patients?—a prospective cohort study. J Spine Surg 2023;9(4):444-453. doi: 10.21037/jss-22-110