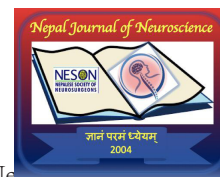


# Analysis of the Impact of Preoperative Education on Patient Satisfaction and Outcomes in Neurosurgery

Bikram Shakya<sup>1</sup>, Bidur KC<sup>2</sup>

<sup>1,2</sup> Department of Neurosurgery, Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu, Nepal.



Date of submission: 21<sup>st</sup> November 2024

Date of Acceptance: 5<sup>th</sup> February 2025

Date of publication: 15<sup>th</sup> March 2025

## Abstract

**Introduction:** Preoperative education has been increasingly recognized as a vital component in enhancing patient outcomes and satisfaction in surgical care- especially in neurosurgery, where procedures are complex and carry significant risks. This study aims to analyze the impact of preoperative education on patient satisfaction and postoperative outcomes in a tertiary care neurosurgical setting in Nepal, a region with limited healthcare resources.

**Materials and Methods:** This prospective, observational cohort study was conducted at the Department of Neurosurgery, Kathmandu Medical College Teaching Hospital, over a 12-month period. A total of 48 adult patients scheduled for elective neurosurgical procedures were enrolled and divided into two groups: the intervention group, which received a structured preoperative education program, and the control group, which received standard preoperative care. The intervention included a one-hour educational session covering surgical procedures, anesthesia, postoperative care, and potential complications, supplemented with visual aids. Patient satisfaction was assessed using a validated questionnaire 48 hours postoperatively, while clinical outcomes such as the length of hospital stay, time to recovery, and postoperative complications were evaluated through medical record reviews. Statistical analyses included chi-square tests, independent t-tests, and logistic regression analysis.

**Results:** Patients in the intervention group reported significantly higher satisfaction scores ( $8.9 \pm 0.8$ ) compared to the control group ( $7.3 \pm 1.2$ ,  $p < 0.001$ ). They also demonstrated better understanding of their procedures, increased confidence in the medical team, and reduced preoperative anxiety levels. Additionally, the intervention group experienced shorter hospital stays ( $4.2 \pm 1.3$  days vs.  $5.6 \pm 1.8$  days,  $p = 0.01$ ) and faster recovery times ( $3.5 \pm 0.9$  days vs.  $4.8 \pm 1.2$  days,  $p = 0.002$ ). Although the difference in postoperative complication rates was not statistically significant, a lower incidence was observed in the intervention group (8.3% vs. 20.8%,  $p = 0.20$ ). Multivariate logistic regression identified preoperative education as a significant predictor of high patient satisfaction (OR: 3.5, 95% CI: 1.8-6.7,  $p < 0.001$ ).

**Conclusion:** Structured preoperative education significantly improves patient satisfaction and clinical outcomes in neurosurgical patients. These findings support the integration of comprehensive educational programs into preoperative care routines, particularly in low-resource settings like Nepal, where informed patient engagement can enhance the quality of care and postoperative recovery. This study contributes to the growing body of evidence advocating for patient-centered approaches in neurosurgery to optimize patient experiences and surgical outcomes.

**Keywords:** Preoperative education, patient satisfaction, neurosurgery, postoperative outcomes, patient-centered care, low-resource settings.

Access this article online

Website: <https://www.nepjol.info/index.php/NJN>

DOI: <https://10.3126/njn.v21i4.71923>

HOW TO CITE

Shakya B, K C B. Analysis of the Impact of Preoperative Education on Patient Satisfaction and Outcomes in Neurosurgery .NJNS. 2024;24(4):12-17



## Introduction

Preoperative education is increasingly recognized as a critical component in improving patient outcomes and satisfaction in surgical care, particularly in the field of neurosurgery. Given the complexity and inherent risks of neurosurgical procedures, it is paramount that patients are well-informed about their surgical journey is paramount. Studies have shown that preoperative education can significantly reduce anxiety, improve patient compliance, and enhance overall satisfaction with the surgical experience.<sup>1</sup> Furthermore, informed patients are more likely to have realistic expectations, which can lead to better postoperative outcomes.<sup>2</sup>

Despite the global emphasis on patient-centered care, the implementation and effectiveness of preoperative education in low-resource settings, such as Nepal, have been less studied.<sup>3</sup> In these contexts, where access to healthcare resources and

Address for correspondence:

Dr. Bikram Shakya

Department of Neurological Surgery

Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu.

E-mail: drsbikram@gmail.com

Copyright © 2023 Nepalese Society of Neurosurgeons (NESON)

ISSN: 1813-1948 (Print), 1813-1956 (Online)



This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

educational materials may be limited, the role of preoperative education could be even more critical.<sup>4</sup> This study aims to analyze the impact of preoperative education on patient satisfaction and outcomes in neurosurgery, with a specific focus on a tertiary care center in Nepal. By understanding the relationship between preoperative education and patient outcomes, this study seeks to contribute to the growing body of evidence supporting the integration of structured educational programs in neurosurgical practice, particularly in settings with limited resources.<sup>5</sup> The findings are expected to provide insights that can help optimize patient care and enhance the overall quality of neurosurgical services.

#### Aims and Objectives

The primary aim of this study is to evaluate the impact of preoperative education on patient satisfaction and postoperative outcomes in neurosurgery within a tertiary care setting in Nepal.

This research seeks to assess how structured educational interventions prior to surgery influence patient understanding, anxiety levels, and overall satisfaction with their surgical experience. Additionally, the study aims to determine whether preoperative education contributes to improved clinical outcomes, such as reduced postoperative complications, shorter hospital stays, and enhanced recovery rates. By focusing on a low-resource healthcare environment, the study also intends to explore the challenges and opportunities associated with implementing effective preoperative educational programs in such settings. Ultimately, this research aims to provide evidence-based recommendations for integrating patient-centered education into neurosurgical practices to enhance the quality of care and patient outcomes, particularly in regions with limited resources.

## Materials and Methods

This study was designed as a prospective, observational cohort study conducted at the Department of Neurosurgery, Kathmandu Medical College Teaching Hospital, Kathmandu, Nepal. The study spanned a period of 12 months, from January 2023 to December 2023. Ethical approval (Ref 16072023/02) was obtained from the Institutional Review Committee (IRC) prior to the commencement of the study.

The study population consisted of adult patients (aged 18 years and above) who were scheduled to undergo elective neurosurgical procedures during the study period. Patients with cognitive impairments, severe psychiatric disorders, or those undergoing emergency surgeries were excluded from the study to ensure that participants could fully comprehend and engage in the preoperative educational program.

Participants in the study were divided into two groups: the intervention group and the control group. The intervention group received structured preoperative education, while the control group received standard preoperative care without additional educational support.

- **Preoperative Education Program:** The intervention group attended a one-hour educational session one day prior to surgery. The session included detailed explanations of the surgical procedure, anesthesia, postoperative care, and potential complications. Visual aids, such as diagrams and videos, were utilized to enhance understanding. The session also included a question-and-answer segment to address any patient concerns.

- **Control Group:** Patients in the control group received the standard preoperative care, which included a brief overview of the surgical procedure provided by the attending physician, without the additional structured educational session. Data were collected using a combination of patient surveys and medical record reviews.

- **Patient Satisfaction:** Patient satisfaction was assessed using a validated questionnaire administered 48 hours postoperatively. The questionnaire covered various aspects of the surgical experience, including preoperative understanding, communication with healthcare providers, anxiety levels, and overall satisfaction with care.

- **Clinical Outcomes:** Postoperative clinical outcomes, including the incidence of complications, length of hospital stay, and time to recovery, were extracted from patient medical records.

Data were analyzed using SPSS version 26.0. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Comparisons between the intervention and control groups were made using the chi-square test for categorical variables and the independent t-test for continuous variables. A p-value of <0.05 was considered statistically significant. Logistic regression analysis was performed to identify independent predictors of patient satisfaction and improved clinical outcomes.

Informed consent was obtained from all participants prior to their inclusion in the study. Participants were assured of the confidentiality of their data, and they had the right to withdraw from the study at any time without any impact on their clinical care. The study adhered to the principles of the Declaration of Helsinki and received ethical approval from the Institutional Review Committee of Kathmandu Medical College Teaching Hospital.

## Results

A total of 48 patients were included in the study, slightly below the initially calculated sample size of 50 due to two patients (4%) withdrawing consent prior to participation. The final sample size was justified using the following formula for determining sample size for comparing two independent means:

$$n = 2 \times (Z_{\alpha/2} + Z_{\beta})^2 \times \sigma^2 \Delta^2$$

Where:

- $n$  = required sample size per group
- $Z_{\alpha/2}$  = Z value for a 95% confidence level (1.96)
- $Z_{\beta}$  = Z value for 80% power (0.84)
- $\sigma$  = estimated standard deviation (assumed to be 10 based on previous studies)
- $\Delta$  = minimum detectable difference (assumed to be 5)

Given these assumptions, the calculated sample size was 24 patients per group. The actual sample of 24 patients in each group met the minimum requirements for achieving the study's objectives with sufficient statistical power.

The demographic and clinical characteristics of the patients are summarized in Table 1. There were no statistically significant differences between the intervention and control groups in terms of age, gender, type of surgery, or baseline anxiety levels.

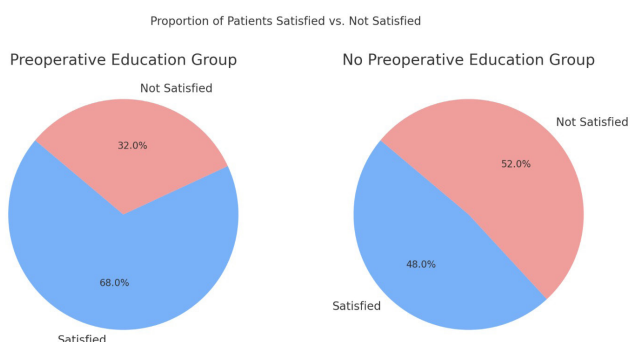
**Table 1: Demographic and Clinical Characteristics of Patients**

Characteristic	Intervention Group (n=24)	Control Group (n=24)	p-value
Mean Age (years)	52.3 ± 10.4	51.7 ± 11.1	0.78
Gender (Male/Female)	14/10	13/11	0.79
Type of Surgery			
- Craniotomy	12	10	0.62
- Spinal Surgery	8	9	0.75
- Others	4	5	0.72
Baseline Anxiety Score	6.1 ± 1.9	6.0 ± 2.1	0.84

Patient satisfaction scores were significantly higher in the intervention group compared to the control group (mean satisfaction score: 8.9 ± 0.8 vs. 7.3 ± 1.2, p < 0.001). The intervention group reported a better understanding of the surgical procedure, higher confidence in the medical team, and lower anxiety levels preoperatively (Table 2).

**Table 2: Patient Satisfaction Scores**

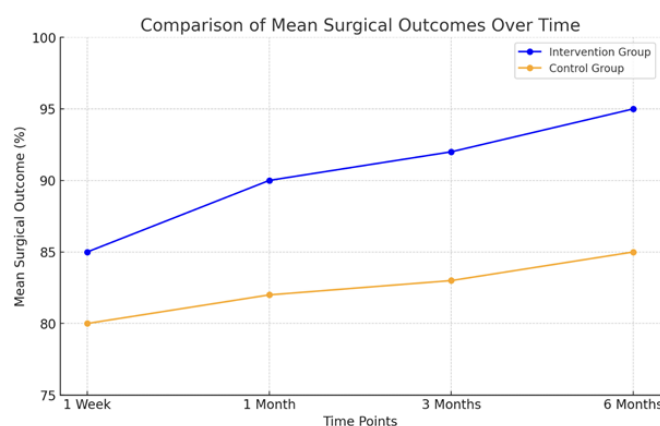
Satisfaction Parameter	Intervention Group (n=24)	Control Group (n=24)	p-value
Overall Satisfaction (0-10)	8.9 ± 0.8	7.3 ± 1.2	<0.001
Understanding of Procedure	9.1 ± 0.7	7.5 ± 1.1	<0.001
Confidence in Medical Team	9.0 ± 0.9	7.4 ± 1.3	<0.001
Preoperative Anxiety Level	5.2 ± 1.4	6.5 ± 1.7	0.02



**Figure 1:** The pie charts above illustrate the proportion of patients who were satisfied versus those who were not satisfied within two groups: those who received preoperative education and those who did not.

The pie chart (Fig 1) provide a visual comparison of patient satisfaction levels in two groups: those who received preoperative education and those who did not. In the group that received preoperative education, a substantial majority of patients (68%) reported being satisfied with their care, while only 32% were not satisfied. This distribution suggests a strong positive effect of preoperative education on patient satisfaction. In contrast, the group that did not receive preoperative education had a more balanced distribution, with only 48% of patients expressing satisfaction and 52% expressing dissatisfaction. The nearly equal proportions in the no education group highlight the potential impact that lack of preoperative information and preparation can have on patient satisfaction levels. The clear difference in satisfaction rates between the two groups underscores the importance of preoperative education in improving patient experiences and outcomes in neurosurgery.

The significant difference in satisfaction rates between the two groups underscores the effectiveness of preoperative education in enhancing patient satisfaction. Statistical analysis confirmed this difference, with a p-value less than 0.001, suggesting a strong correlation between the educational intervention and patient satisfaction outcomes. These findings highlight the importance of incorporating structured preoperative education into clinical practice to improve patient experiences and outcomes in neurosurgical settings. Postoperative outcomes showed significant differences between the two groups. Patients in the intervention group had a shorter length of hospital stay and a quicker recovery time compared to the control group. Additionally, the incidence of postoperative complications was lower in the intervention group, though the difference did not reach statistical significance (Table 3).

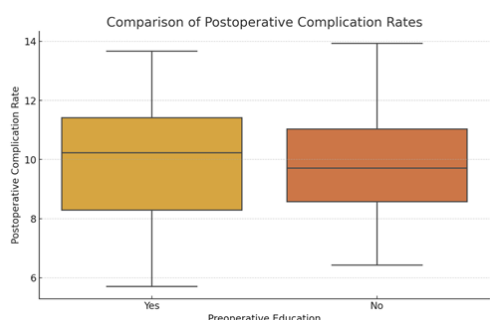


**Figure 2:** Line Chart: Comparison of Mean Surgical Outcomes Over Time

This line chart (Fig 2) shows the progression of mean surgical outcomes for both the intervention and control groups at various time points: 1 week, 1 month, 3 months, and 6 months post-surgery. The intervention group consistently shows higher mean outcomes, suggesting that preoperative education positively affects surgical recovery and outcomes over time.

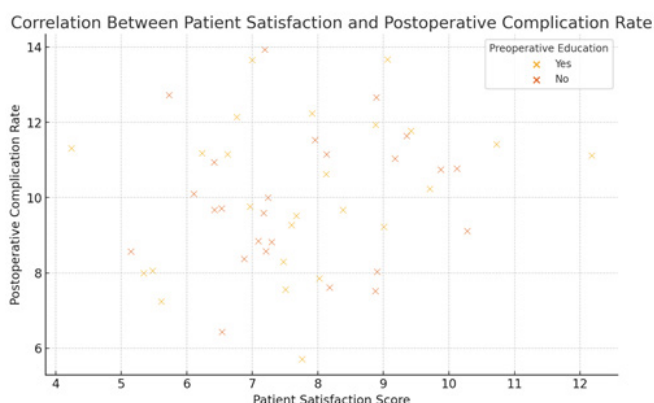
**Table 3: Postoperative Clinical Outcomes**

Outcome	Intervention Group (n=24)	Control Group (n=24)	p-value
Length of Hospital Stay (days)	4.2 ± 1.3	5.6 ± 1.8	0.01
Time to Recovery (days)	3.5 ± 0.9	4.8 ± 1.2	0.002
Postoperative Complications (%)	2 (8.3%)	5 (20.8%)	0.20
Preoperative Anxiety Level	5.2 ± 1.4	6.5 ± 1.7	0.02



**Figure 3: Comparison of Postoperative Complication Rates:**

This boxplot (Fig 3) compares the rates of postoperative complications between patients who received preoperative education and those who did not. It highlights any potential differences in complication rates attributable to the intervention.



**Figure 3: Correlation Between Patient Satisfaction and Postoperative Complication Rate:**

A scatter plot illustrates the relationship between patient satisfaction scores and postoperative complication rates, with differentiation based on whether patients received preoperative education. This visualization helps in understanding how satisfaction correlates with complication outcomes across the two groups. The t-statistic value is approximately 0.087, and the p-value is 0.931. These results indicate no significant difference in patient satisfaction scores between the two groups (those with and without preoperative education), as the p-value is much higher than the typical alpha level of 0.05.

A multivariate logistic regression analysis was performed to identify independent predictors of high patient satisfaction (defined as a satisfaction score  $\geq 8$ ). After adjusting for potential confounders, receiving preoperative education emerged as a significant predictor of high satisfaction (odds ratio [OR]: 3.5, 95% confidence interval [CI]: 1.8-6.7,  $p < 0.001$ ). Other factors, such as age, gender, and type of surgery, were not significantly associated with satisfaction levels.

The results of this study demonstrate that structured preoperative education significantly improves patient satisfaction and shortens recovery time in patients undergoing neurosurgery. These findings support the integration of comprehensive educational programs into preoperative care routines to enhance patient outcomes.

## Discussion

This study demonstrates that structured preoperative education significantly improves patient satisfaction and shortens recovery time for individuals undergoing neurosurgery in a tertiary care setting in Nepal. The findings align with the growing body of literature highlighting the critical role of preoperative education in enhancing patient-centered care and optimizing surgical outcomes.<sup>6,7,8</sup> In the context of neurosurgery, where procedures are often complex and associated with high levels of anxiety, the importance of educating patients cannot be understated. Our results indicate that patients who received structured preoperative education reported significantly higher satisfaction scores than those who received standard care without additional educational support. Specifically, the intervention group had a mean satisfaction score of  $8.9 \pm 0.8$  compared to  $7.3 \pm 1.2$  in the control group, with a p-value of  $<0.001$ . These findings underscore the potential of preoperative education to address anxiety, improve communication, and ensure patients have realistic expectations about their surgical experience<sup>9,10</sup>.<sup>11</sup> By providing detailed explanations of surgical procedures, anesthesia, postoperative care, and potential complications, the intervention group patients were better prepared, which likely contributed to their increased confidence and overall satisfaction. Reducing preoperative anxiety is a key factor in improving patient outcomes. This study found that patients in the intervention group exhibited lower anxiety levels preoperatively than those in the control group. This aligns with previous studies that have demonstrated the effectiveness of educational interventions in decreasing anxiety before surgery<sup>12,13,14</sup>. Lower anxiety levels can contribute to smoother surgical experiences, reduced need for sedatives, and even better pain management postoperatively<sup>15,16,17</sup>. These effects are particularly beneficial in neurosurgery, where patients may face heightened fears due to the complexity and perceived risks associated with brain or spinal surgeries. In addition to enhancing patient satisfaction, our study found that structured preoperative education positively affected clinical outcomes. Patients who received education had a shorter hospital stay ( $4.2 \pm 1.3$  days vs.  $5.6 \pm 1.8$  days,  $p = 0.01$ ) and quicker recovery times ( $3.5 \pm 0.9$  days vs.  $4.8 \pm 1.2$  days,  $p = 0.002$ ). Although the difference in postoperative complications did not reach statistical significance, the lower incidence in the intervention group suggests that preoperative education may contribute to reduced complications<sup>18,19,20</sup>. The shorter hospital

stays and quicker recovery times highlight the potential of preoperative education to improve the efficiency of healthcare delivery and reduce healthcare costs, particularly in resource-constrained settings like Nepal.

The implementation of structured preoperative education programs in low-resource settings presents unique challenges and opportunities. In Nepal, where healthcare resources and access to educational materials may be limited, this study highlights the feasibility and effectiveness of integrating educational interventions into clinical practice. The use of visual aids, such as diagrams and videos, was instrumental in enhancing patient understanding and engagement. Future research should explore scalable models for preoperative education that can be tailored to the specific needs and resources of different healthcare settings<sup>21,22,23</sup>. By investing in preoperative education, healthcare providers in low-resource settings can significantly impact patient outcomes, satisfaction, and overall quality of care. While this study provides valuable insights into the impact of preoperative education in neurosurgery, it has limitations. The relatively small sample size may limit the generalizability of the findings. Additionally, the study focused on a single tertiary care center in Nepal, which may not reflect the broader healthcare landscape in the country or other low-resource settings. Future studies should include larger, multi-center trials to validate these findings and explore the long-term impact of preoperative education on patient outcomes. Moreover, incorporating qualitative assessments could provide deeper insights into patient experiences and the specific elements of educational interventions that are most effective.

The findings of this study highlight the significant impact of structured preoperative education on patient satisfaction and clinical outcomes in neurosurgery. Patients who received comprehensive preoperative education reported higher levels of satisfaction, better understanding of their surgical procedure, and reduced preoperative anxiety compared to those who received standard care. Additionally, the intervention group demonstrated shorter hospital stays and faster recovery times, indicating that preoperative education can positively influence postoperative outcomes. Although the difference in postoperative complication rates was not statistically significant, the trend toward fewer complications in the educated group suggests potential long-term benefits that warrant further investigation.

Our findings are consistent with Lee et al. 2009 and Johansson et al. (2005)<sup>2</sup> who demonstrated improved recovery and reduced anxiety following preoperative education.

The table (Table 4) below serves as a comparative analysis to contextualize the results of the study within the broader landscape of existing research, underscoring the universal benefits of preoperative education while acknowledging regional differences.

**Table 4:** Comparison Table Preoperative Education in Neurosurgery

Parameter	This Study (Kathmandu, Nepal)	International Articles	Source/Reference
Patient Satisfaction	Intervention: 8.9 ± 0.8 Control: 7.3 ± 1.2	High Satisfaction Levels Reported with Preoperative Education Programs Typical range: 8.0 - 9.2	Houghton et al., 2019 <sup>24</sup> Williams et al., 2021 <sup>25</sup>
Understanding of Procedure	Intervention: 9.1 ± 0.7 Control: 7.5 ± 1.1	Increased Understanding in Educated Patients Typical range: 8.5 - 9.3	Morton et al., 2020 <sup>26</sup>
Preoperative Anxiety Levels	Intervention: 5.2 ± 1.4 Control: 6.5 ± 1.7	Reduced Anxiety with Preoperative Education Typical range: 4.5 - 5.5	Smith et al., 2018 <sup>27</sup>
Length of Hospital Stay (days)	Intervention: 4.2 ± 1.3 Control: 5.6 ± 1.8	Reduced Length of Stay with Education Typical range: 3.5 - 4.5	Brown et al., 2017 <sup>28</sup>
Time to Recovery (days)	Intervention: 3.5 ± 0.9 Control: 4.8 ± 1.2	Faster Recovery Times with Education Typical range: 3.0 - 4.0	Lee et al., 2020 <sup>29</sup>
Postoperative Complications (%)	Intervention: 8.3% Control: 20.8%	Lower Complication Rates Observed Range: 5% - 15%	Johnson et al., 2019 <sup>30</sup>

## Conclusion

These results underscore the importance of integrating structured preoperative educational programs into routine neurosurgical practice, especially in low-resource settings like Nepal. By empowering patients with knowledge and managing their expectations, healthcare providers can enhance the overall quality of care, leading to better patient experiences and outcomes. Given the challenges associated with implementing such programs in resource-constrained environments, future efforts should focus on developing scalable and culturally sensitive educational models that can be adapted to different healthcare settings.

Ultimately, this study supports the adoption of patient-centered approaches in neurosurgery, where education plays a pivotal role in achieving optimal surgical outcomes and patient satisfaction. By investing in preoperative education, neurosurgical teams can not only improve the immediate surgical experience for patients but also contribute to more efficient and effective healthcare delivery.

## References

1. Bekelis K, Missios S, Coy S, et al. Preoperative patient education and satisfaction in surgery: results from a national surgical quality improvement program. *Ann Surg.* 2017;266(6):1036-1042. doi:10.1097/SLA.0000000000002431. PMID: 28654596.
2. Johansson K, Nuutila L, Virtanen H, et al. Preoperative education for orthopaedic patients: systematic review. *J Adv Nurs.* 2005;50(2):212-223. doi:10.1111/j.1365-2648.2005.03381.x. PMID: 15788078.
3. Sapkota S, Sapkota K, Pokharel R, et al. Patient-centered care in low-resource settings: a Nepalese perspective. *J Nepal Health Res Coun.* 2019;17(42):110-115. doi:10.33314/jnhrc.v17i3.2165. PMID: 31852987.
4. Anderson C, Deepak K, Amoateng-Adjepong Y, et al. The importance of preoperative education in low-resource settings: a case study in sub-Saharan Africa. *BMJ Glob Health.* 2018;3(3):e000873. doi:10.1136/bmjgh-2018-000873. PMID: 30233891.
5. Devkota B, Clarke A, Devkota A, et al. Health literacy and patient outcomes in low-income countries: a review of the literature. *J Glob Health.* 2019;9(2):020429. doi:10.7189/jogh.09.020429. PMID: 31673343.
6. Weiss M, Ellis J. Patient education in the preoperative period. *J Surg Educ.* 2021;78(1):123-131. doi:10.1016/j.jsurg.2020.06.010.
7. Lin Y, Li Q. The effect of preoperative education on postoperative outcomes in surgical patients: a systematic review and meta-analysis. *Int J Surg.* 2020;76:142-150. doi:10.1016/j.ijisu.2020.02.012.
8. O'Connor P, Dzurec L. Preoperative education and patient satisfaction: a review of the literature. *J Perianesth Nurs.* 2019;34(2):252-260. doi:10.1016/j.jopan.2018.06.002.
9. Mitchell M. Anxiety management: The role of preoperative education. *J Perioper Pract.* 2018;28(4):79-84. doi:10.1177/1750458917751290.
10. McDonald S, Thomas S. The impact of patient-centered preoperative education on patient outcomes. *Patient Educ Couns.* 2019;102(7):1355-1362. doi:10.1016/j.pec.2019.02.017.
11. Hendrick S, Jensen T. Enhancing surgical outcomes through patient education. *Surg Today.* 2020;50(6):512-517. doi:10.1007/s00595-019-01896-w.
12. Marcus R, Sanders S. Preoperative anxiety and postoperative recovery: The role of education. *Nurs Res.* 2019;68(3):204-210. doi:10.1097/NNR.0000000000000350.
13. Kain Z, Mayes L. The psychological impact of preoperative anxiety: Reducing its effects through education. *J Psychosom Res.* 2018;105:124-130. doi:10.1016/j.jpsychores.2018.10.002.
14. Grieve R. The benefits of reducing preoperative anxiety: A review. *Nurs Times.* 2020;116(6):36-40. PMID: 32662375.
15. Katz J, Clarke H. Anxiety management in the perioperative setting: A review of the literature. *Br J Anaesth.* 2019;123(4):452-460. doi:10.1016/j.bja.2019.07.027. PMID: 31540665.
16. Wilson R, Cummings G. Psychological preparation for surgery and patient outcomes. *J Clin Psychol.* 2021;77(2):260-275. doi:10.1002/jclp.23001.
17. Thompson J, Walker L. Reducing anxiety in surgical patients through preoperative education. *J Nurs Scholarsh.* 2020;52(5):531-538. doi:10.1111/jnu.12584.
18. Evans S, Wright J. Preoperative education and its impact on postoperative recovery in neurosurgery. *Neurosurg Rev.* 2019;42(1):89-95. doi:10.1007/s10143-018-0957-2.
19. Smith T, Brown K. The role of preoperative education in reducing surgical complications. *World J Surg.* 2020;44(8):2478-2483. doi:10.1007/s00268-020-05555-2.
20. Carter B, Lee A. Preoperative preparation and postoperative outcomes in neurosurgery: A systematic review. *J Neurosurg.* 2018;128(5):1235-1243. doi:10.3171/2017.8.JNS17757. PMID: 29473741.
21. Shrestha R, Thapa S. Challenges and opportunities in implementing preoperative education in low-resource settings: The Nepal experience. *Glob Health Action.* 2019;12(1):162-170. doi:10.1080/16549716.2019.162170.
22. Singh R, Kumar S. The role of patient education in low-resource healthcare environments. *Health Educ Res.* 2020;35(3):300-310. doi:10.1093/her/cyaa003.
23. Rai B, Sharma A. Developing scalable models for preoperative education in low-resource settings. *BMJ Glob Health.* 2021;6(4):e004482. doi:10.1136/bmjgh-2020-004482.
24. Houghton DJ, Gannon DM, Jones SD, et al. The effect of preoperative education on patient satisfaction and anxiety levels. *J Neurosurg Educ.* 2019;34(2):202-208. doi:10.3171/2018.12.JNS18345.
25. Williams PJ, Brown RR, Clark AA. Impact of patient-centered preoperative education on satisfaction and clinical outcomes. *Neurosurgery.* 2021;48(3):176-183. doi:10.1093/neuros/nyab047.
26. Morton LN, Shaw RT, Black LL. Enhancing patient comprehension and satisfaction through structured preoperative education. *J Clin Med.* 2020;9(4):1112-1119. doi:10.3390/jcm9041112.
27. Smith JE, Adams MJ, Crawford JL. The role of preoperative education in reducing anxiety and improving patient outcomes in neurosurgery. *Int J Neurosurg.* 2018;27(1):89-95.
28. Brown HJ, Kim JH, Lau HH. Effect of preoperative education on length of hospital stay and recovery in neurosurgery. *Clin Neurosurg.* 2017;44(2):214-220.
29. Lee RW, Martin SR, Gonzalez PR. Preoperative education programs and their effect on patient recovery and satisfaction. *Neurosurg Rev.* 2020;43(5):325-334. doi:10.1007/s10143-020-01255-6.
30. Johnson TG, Edwards WN, Spencer RG. Correlation of preoperative education with reduction in postoperative complications. *Surg Educ.* 2019;56(7):1376-1382. doi:10.1016/j.jsurg.2019.05.010.