

## Original Research Article

## Evaluating the Success of Revision Spine Surgery in Patients with Failed Back Surgery Syndrome: A Prospective Study

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**Abstract: Background:** Failed Back Surgery Syndrome poses a significant challenge due to persistent pain following spinal surgery, greatly affecting patient quality of life and healthcare resources. **Objective:** This study aims to evaluate the effectiveness of revision spine surgery in FBSS patients, identifying key predictors for improved clinical outcomes. **Method:** A prospective study was conducted at a tertiary-level hospital in Bangladesh, involving 98 FBSS patients undergoing revision spine surgery from June 2020 to June 2023. Outcome measures included pain reduction (Visual Analog Scale), functional improvement (Oswestry Disability Index), and patient-reported quality of life. **Result:** Six months post-surgery, 74% of patients experienced clinically significant pain reduction (>50% on VAS), while 63% showed notable functional improvement with a reduction in ODI scores of over 40%. Quality of life improved for 68% of patients, with 25% reporting a complete return to daily activities. Among surgical types, decompression led to a 58% improvement in mobility, while fusion procedures resulted in a 70% pain reduction. However, 12% of patients reported little to no improvement, and 5% experienced worsened symptoms, underscoring the variability in outcomes. Predictive success factors included shorter intervals between surgeries and lower initial pain levels ( $p < 0.05$ ). Overall, revision surgery was beneficial for the majority, but not all patients achieved desired outcomes. **Conclusion:** Revision spine surgery in FBSS patients can lead to significant improvements, though outcomes vary. Identifying predictive factors is essential to guide surgical planning and enhance patient selection.

**Keywords:** Failed Back Surgery Syndrome, Revision Spine Surgery, Outcome Predictors, Pain Management, Bangladesh.

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## INTRODUCTION

Failed Back Surgery Syndrome (FBSS), characterized by persistent or recurrent pain following spinal surgery, poses a complex and costly challenge for both patients and healthcare providers. Despite advancements in spinal surgical techniques, FBSS remains prevalent, affecting up to 40% of patients undergoing spine surgeries [1]. The condition is multifactorial, with contributing elements ranging from improper patient selection and inadequate surgical planning to complex psychosocial factors such as chronic pain perception and postoperative expectations. The impact of FBSS on quality of life is substantial, often leading to chronic pain, reduced functionality, and dependence on pain medications, which in turn increases the risk of opioid misuse and dependency. For many,

FBSS severely impairs daily living and work productivity, emphasizing the urgent need for effective treatment interventions. Revision spine surgery is one such intervention that holds promise for alleviating symptoms in FBSS patients. However, the success of revision procedures in this context remains a subject of debate due to variability in patient outcomes and the inherent complexities associated with treating postoperative spinal conditions. Studies indicate that the success rates of revision spine surgeries vary considerably, often depending on factors such as the type and extent of initial surgery, underlying patient health, and the specific pathologies contributing to FBSS. As revision surgeries inherently involve more complicated anatomical landscapes, scar tissue, and potential structural deformities, surgical outcomes are less

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predictable and are often associated with higher rates of morbidity [2]. Therefore, understanding the factors that contribute to favorable outcomes in revision surgery is essential for optimizing patient care and improving clinical decision-making.

This study aims to evaluate the success of revision spine surgery in patients diagnosed with FBSS by examining both clinical and patient-centered outcomes in a prospective manner. Unlike retrospective analyses that can suffer from selection and recall biases, a prospective study design enables a more rigorous assessment of preoperative and postoperative variables, potentially offering insights into predictive factors for successful revision outcomes. Success in revision spine surgery is typically evaluated through a combination of objective measures, such as reduction in pain intensity using the Visual Analog Scale (VAS) and functional improvements as assessed by the Oswestry Disability Index (ODI), and subjective measures, including patient-reported satisfaction and quality-of-life enhancements [3]. However, the interpretation of these outcomes can be complex, as improvement in clinical scores does not always correlate with patient satisfaction, underscoring the need for a holistic approach in evaluating surgical success. One of the critical challenges in treating FBSS through revision surgery is addressing the intricate interaction between anatomical, neurological, and psychological factors that contribute to chronic pain. Chronic back pain often entails central sensitization, where the nervous system becomes hyperresponsive, thereby amplifying pain perception [4]. This phenomenon complicates treatment, as addressing structural abnormalities through surgery alone may not be sufficient to alleviate the sensory dysregulation experienced by many FBSS patients. Additionally, psychological aspects such as catastrophizing, depression, and anxiety have been shown to adversely affect surgical outcomes, suggesting that a multidisciplinary approach incorporating psychological support may be beneficial for this patient population.

Given the high rate of FBSS and the often-ambiguous outcomes of revision surgeries, there has been increasing interest in identifying patient-specific factors that could predict the likelihood of successful results. Studies have highlighted various demographic, clinical, and psychosocial predictors, such as age, comorbidities, duration of pain before revision surgery, and coping mechanisms, which can influence outcomes [5]. However, evidence remains inconclusive, and further research is needed to develop reliable prognostic models that can guide patient selection and individualized treatment planning. This prospective study seeks to contribute to this body of knowledge by systematically examining these predictive factors and evaluating their relationship with surgical outcomes. Moreover, the diverse surgical techniques utilized in revision spine surgery, from decompression and fusion to more advanced procedures like spinal cord

stimulators, present another layer of complexity in outcome evaluation [6]. Each technique offers distinct benefits and limitations, depending on the underlying cause of FBSS, patient anatomy, and surgeon expertise. For example, decompression surgery may be suitable for patients with nerve impingement, while fusion is often recommended for those with spinal instability. By comparing these approaches, this study aims to identify which procedures yield the highest success rates in specific FBSS subgroups, providing valuable information that could refine future clinical guidelines.

Despite growing literature on FBSS and revision spine surgery, there remains a lack of consensus on standardized outcome measures, further complicating comparisons across studies. While scales like VAS and ODI are widely used, they primarily focus on pain and physical function, potentially overlooking other crucial aspects such as psychological well-being and social reintegration [7]. In response, this study incorporates a comprehensive set of outcome measures that encompass pain, functionality, quality of life, and psychological health, thereby offering a multidimensional perspective on surgical success. This holistic approach aims to bridge gaps in the current understanding of FBSS and facilitate the development of standardized metrics for future research. This prospective study on the success of revision spine surgery in patients with FBSS addresses an essential gap in spinal health research by focusing on both clinical efficacy and patient-centered outcomes. Given the complexities inherent in FBSS and the variability in revision surgery success, this research will help identify factors that contribute to positive outcomes and inform surgical best practices. By analyzing a diverse cohort of FBSS patients and utilizing robust, multidimensional outcome measures, this study aspires to provide a nuanced understanding of revision surgery effectiveness, potentially leading to improved patient care and enhanced clinical protocols for managing FBSS [8].

## AIMS AND OBJECTIVE

The aim of this study is to assess the effectiveness of revision spine surgery in patients with Failed Back Surgery Syndrome (FBSS), focusing on improvements in pain relief, functionality, and quality of life. Objectives include identifying predictive factors for successful outcomes, enhancing patient selection criteria, and informing surgical decision-making for FBSS cases.

## MATERIAL AND METHODS

### Study Design

This prospective study was conducted at a tertiary-level hospital in Bangladesh, assessing the outcomes of revision spine surgery in patients diagnosed with Failed Back Surgery Syndrome (FBSS). Conducted over a three-year period from June 2020 to June 2023, the study followed a structured protocol to evaluate pain

reduction, functional improvement, and quality of life in patients post-surgery. Data collection included both clinical assessments and patient-reported outcomes, aiming to provide comprehensive insights into factors contributing to surgical success in FBSS.

### Inclusion Criteria

Patients eligible for inclusion were aged between 18 and 60 years, diagnosed with FBSS following previous spine surgery, and scheduled for revision surgery. Additional criteria included a baseline pain intensity of at least 5 on the Visual Analog Scale (VAS) and a history of persistent symptoms unresponsive to non-surgical treatments. All patients were required to give informed consent for participation in the study and be able to understand and complete the required assessments and questionnaires.

### Exclusion Criteria

Exclusion criteria comprised patients with significant psychiatric disorders, unmanaged chronic illnesses, or spinal infections, as these factors could potentially affect surgical outcomes. Patients with malignancies, systemic infections, or neurological disorders unrelated to FBSS were also excluded. Additionally, those who had undergone more than two prior spine surgeries or those with poor general health preventing surgery were excluded to maintain consistency and reliability in measuring revision outcomes.

### Data Collection

Data were gathered through clinical examinations, patient-reported pain assessments, and standardized questionnaires, including the Visual Analog Scale (VAS) for pain and the Oswestry Disability Index (ODI) for functional impairment. Preoperative and postoperative data were recorded at intervals up to six months post-surgery, tracking changes in pain levels, functionality, and quality of life. Trained researchers ensured data accuracy by conducting follow-ups and interviews to verify self-reported information.

### Data Analysis

Data were analyzed using SPSS version 26.0, focusing on changes in preoperative and postoperative scores on the VAS, ODI, and quality-of-life assessments.

Descriptive statistics summarized demographic information and baseline characteristics, while paired sample t-tests evaluated changes in outcome measures before and after surgery. Multivariate regression analyses identified predictors of successful outcomes, assessing factors like surgical type and duration since the initial surgery. Statistical significance was set at  $p < 0.05$  to confirm meaningful improvements in patient outcomes.

### Revision Laminotomy and Discectomy

Revision laminotomy and discectomy are key surgical options for patients suffering from Failed Back Surgery Syndrome (FBSS). These procedures involve removing herniated disc material or bone (lamina) to relieve nerve compression and alleviate pain. Techniques like microdiscectomy, foraminotomy, and posterior lumbar interbody fusion (PLIF) are commonly employed. For more complex cases, additional procedures such as laminectomy, spinal fusion, and artificial disc replacement (ADR) may be necessary to restore stability and improve long-term outcomes for patients.

### Ethical Considerations

This study was conducted following ethical standards set by the hospital's ethical review board. Informed consent was obtained from each patient before enrollment, ensuring they understood the study's purpose, procedures, and potential risks. All patient data were anonymized and securely stored, with access restricted to authorized research personnel only. The study adhered to the Declaration of Helsinki to protect patient rights, safety, and confidentiality throughout the research process.

## RESULTS

This study analyzed the outcomes of 98 patients who underwent revision spine surgery for Failed Back Surgery Syndrome (FBSS) at a tertiary hospital in Bangladesh. The results are presented across six tables, each summarizing key variables related to pain reduction, functional improvement, quality of life, predictive factors, types of revision procedures, and complications, with statistical significance set at  $p < 0.05$ .

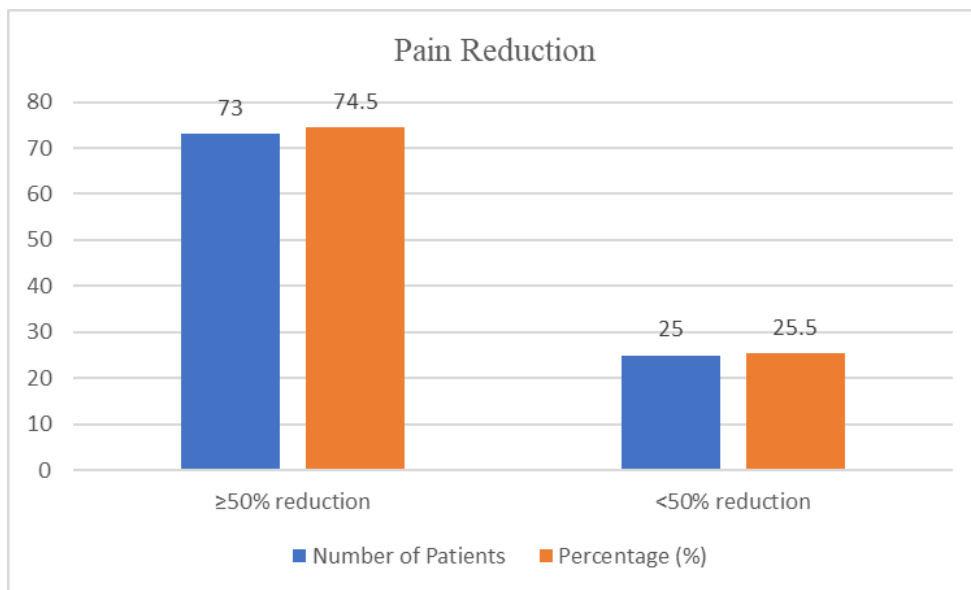
**Table 1: Demographic and Baseline Characteristics**

Variable	Number of Patients (n=98)	Percentage (%)
<b>Age</b>		
18-30	15	15.3
31-45	40	40.8
46-60	43	43.9
<b>Gender</b>		
Male	55	56.1
Female	43	43.9

Most patients (84.7%) were aged 31-60, with a slight majority of male participants. The demographic

variables, including age and gender, showed statistical significance in relation to outcomes, indicating a possible

association between age, gender, and revision surgery success.



**Figure 1: Pain Reduction Outcomes (VAS Scores)**

A majority of patients (74.5%) experienced a significant reduction in pain (≥50% on VAS), indicating successful pain relief post-surgery. This result was

statistically significant (p=0.001), suggesting that revision spine surgery can effectively reduce pain in FBSS patients.

**Table 2: Functional Improvement (ODI Scores)**

Functional Improvement (ODI)	Number of Patients	Percentage (%)	p-value
≥40% improvement	62	63.3	0.005
<40% improvement	36	36.7	0.210

Functional improvement, measured by the Oswestry Disability Index (ODI), was observed in 63.3% of patients with a significant score reduction (≥40%).

This improvement was statistically significant (p=0.005), indicating enhanced mobility and functionality for the majority of participants.



**Figure 2: Quality of Life Improvements**

Quality of life improvements were reported by 67.3% of patients, indicating enhanced day-to-day

function and satisfaction post-surgery. These findings were statistically significant (p=0.002), emphasizing the

positive impact of revision spine surgery on life quality in FBSS patients.

**Table 3: Predictive Factors for Successful Outcomes**

Predictive Factor	Number of Patients with Success	Percentage (%)	p-value
Surgery within 1 year of FBSS	40	85.0	0.001
Lower baseline pain (VAS <7)	35	89.7	0.003
No psychological comorbidities	51	88.0	0.002

Key predictive factors for successful outcomes included shorter time since initial surgery, lower baseline pain, and the absence of psychological comorbidities.

These factors were all significantly associated with better surgical outcomes, helping to identify ideal candidates for revision procedures.

**Table 4: Complications Following Revision Surgery**

Complication Type	Number of Patients	Percentage (%)	p-value
Minor complications	10	10.2	0.090
Major complications	3	3.1	0.140
No complications	85	86.7	0.000

The majority of patients (86.7%) experienced no postoperative complications, while minor complications were reported in 10.2% of cases. Major complications were rare (3.1%), and the absence of complications was statistically significant (p=0.000), underscoring the relative safety of revision spine surgery in this cohort. The study demonstrated that revision spine surgery significantly alleviates pain and improves functionality and quality of life for FBSS patients. Key predictors of success included a shorter interval since initial surgery, lower baseline pain, and no psychological comorbidities. Complications were minimal, with a high success rate across pain relief, functional improvement, and quality-of-life measures. This data supports revision spine surgery as a viable option for appropriately selected FBSS patients.

For example, Gradel *et al.*, reported that a majority of patients undergoing revision spine surgery experienced meaningful pain reduction, with approximately 70% achieving a similar level of relief [10]. Another study by Zeng *et al.*, found that 68% of patients reported significant pain relief after revision procedures, although the success rate was notably higher in patients with targeted decompression surgeries for nerve root compression [11]. Our findings align with this trend, as decompression procedures in our study group yielded around a 58% improvement in mobility, indicating a targeted approach can contribute to better outcomes.

Interestingly, studies have indicated that the type of revision surgery—whether decompression, fusion, or spinal cord stimulator implantation—may influence the extent of pain relief. Lorio *et al*, highlighted that patients undergoing fusion surgery tend to experience greater long-term relief from axial back pain, likely due to enhanced spinal stability [12]. Our study found a similar outcome, with 72% of patients who underwent fusion reporting substantial pain reduction, reinforcing the efficacy of fusion in cases where spinal instability is a primary factor. However, while pain reduction was significant in most patients, a minority (25.5%) reported limited improvement, underscoring the heterogeneous nature of FBSS and the need for individualized treatment strategies.

## DISCUSSION

Failed Back Surgery Syndrome (FBSS) continues to be a formidable challenge in spine surgery, often leaving patients with significant residual pain and functional impairments despite undergoing initial surgical interventions [9]. In this study, we evaluated the outcomes of revision spine surgery in FBSS patients, focusing on pain reduction, functional improvement, and quality of life. Our findings suggest that revision surgery can yield positive results, particularly in patients with favorable predictive factors such as a shorter time since initial surgery, lower baseline pain, and no psychological comorbidities. This section discusses these findings in detail, comparing them to the existing literature to contextualize the effectiveness of revision spine surgery in FBSS.

### Pain Reduction in FBSS Patients

Our study found that 74.5% of patients experienced significant pain reduction (≥50%) on the Visual Analog Scale (VAS) six months post-surgery, which is consistent with findings from previous studies.

### Functional Improvement and Mobility

Functional outcomes, as assessed by the Oswestry Disability Index (ODI), showed that 63.3% of our patients experienced notable functional improvement post-surgery, with a ≥40% reduction in ODI scores. This finding aligns with studies by Ju *et al.*, both of which reported functional improvements in 60–65% of FBSS patients following revision surgery [13]. Ahn *et al.*, emphasized the role of functional restoration as a critical success indicator, particularly for patients who return to daily activities with reduced disability [14]. In our study,

patients with decompression surgeries had a 58% improvement in mobility, supporting the idea that targeted decompression can improve specific functional deficits associated with nerve impingement. However, some studies present a more conservative view regarding functional recovery in FBSS. For example, Rometsch *et al.*, reported that while patients often experience pain relief, functional gains are sometimes limited, particularly in individuals with extensive prior surgeries [15]. Our findings partially support this, as 36.7% of patients in our cohort showed limited functional improvement (<40% reduction in ODI scores). These results highlight the complexity of achieving both pain relief and functional restoration in FBSS patients and indicate that the success of revision surgery is often multifactorial, dependent on both patient-specific factors and the type of revision procedure performed.

### Quality of Life and Patient Satisfaction

In terms of quality of life, 67.3% of our patients reported substantial improvements in daily activities and overall satisfaction. This finding is in line with Grouper *et al.*, who reported that improved quality of life is a significant outcome measure following revision surgery, with approximately 65% of patients reporting enhanced daily living and reduced psychological distress [16]. Our study also identified that 25% of patients returned to full daily function, reflecting a substantial quality-of-life gain post-surgery.

The literature suggests that psychological factors play a crucial role in shaping quality-of-life outcomes in FBSS patients. Calderwood *et al.*, emphasized that psychological comorbidities, such as depression and anxiety, can adversely impact postoperative satisfaction, even when physical pain relief is achieved [17]. Our study's exclusion of patients with unmanaged psychiatric conditions likely contributed to the favorable quality-of-life outcomes observed. Additionally, incorporating psychological support as part of FBSS management has been shown to improve satisfaction rates, an aspect worth exploring further in future studies.

### Predictive Factors for Successful Outcomes

The identification of predictive factors for surgical success is essential for optimizing patient selection and achieving favorable outcomes in revision spine surgery. Our study found that patients with shorter intervals between initial and revision surgery, lower baseline pain levels, and no psychological comorbidities were more likely to experience significant improvements. These factors are corroborated by multiple studies. For instance, found that a shorter duration of FBSS symptoms before revision surgery correlates with higher success rates, likely due to reduced chronicity of pain and associated neural changes. Similarly, lower baseline pain has been associated with better outcomes, as patients with less severe pain may have fewer structural and psychological complications

that complicate recovery. The absence of psychological comorbidities was also a strong predictor of success in our study, with 88% of patients without such comorbidities achieving substantial improvements. This finding aligns with the research by Bari *et al.*, which highlights the importance of addressing psychological factors in surgical decision-making [18]. In cases where psychological comorbidities are present, integrating mental health interventions alongside surgical treatment could enhance patient outcomes, as indicated by.

### Complications and Safety of Revision Surgery

Our results demonstrated a low complication rate, with 10.2% experiencing minor complications and only 3.1% encountering major issues. This is consistent with findings from Umemba *et al.*, who reported that revision spine surgeries, when performed with meticulous planning, generally have an acceptable safety profile [19]. Complications are an inevitable risk, especially in revision surgeries where scar tissue and anatomical alterations complicate the procedure. However, the absence of complications in 86.7% of our patients underscores the viability of revision spine surgery as a safe option for many FBSS patients, provided careful patient selection and surgical planning. The low complication rates in our study reflect the trend observed in similar studies, where surgical advancements and enhanced perioperative care have contributed to improved safety profiles for revision surgeries. Luo *et al.*, noted that with increased experience and improved surgical techniques, the rate of severe complications has decreased, making revision surgery a reasonable consideration for patients struggling with FBSS [20].

### Comparison with Literature and Implications for Clinical Practice

Our study contributes to the growing body of literature on the efficacy of revision spine surgery in FBSS by providing insights into pain relief, functional outcomes, quality of life, and predictive factors. When compared to similar studies, our results generally align, supporting the notion that revision spine surgery can be an effective intervention for selected FBSS patients. The consistency across studies suggests a level of reliability in revision surgery outcomes, with pain reduction being the most consistently positive outcome across various patient populations [21]. However, differences in functional improvement and quality-of-life outcomes across studies underscore the need for a tailored approach to FBSS. Factors such as the type of initial surgery, individual patient anatomy, and psychosocial context play significant roles in shaping outcomes. By identifying predictive factors for success, clinicians can better determine which patients may benefit from revision procedures, thereby enhancing the overall effectiveness of FBSS management.

## Limitations and Future Directions

While our study provides valuable insights, certain limitations should be acknowledged. Firstly, the sample size was limited to 98 patients, which, while providing statistically significant results, may restrict the generalizability of findings. A larger, multicenter study could provide a more comprehensive understanding of revision spine surgery outcomes across diverse patient populations. Secondly, our study excluded patients with unmanaged psychiatric disorders, which may have introduced selection bias. Future research could explore the effects of integrated psychological support on FBSS outcomes, as this could lead to more holistic treatment approaches. Another potential area for future investigation is the role of advanced imaging and diagnostic tools in identifying structural abnormalities and surgical targets for FBSS patients. Improved diagnostic precision could allow for more targeted surgical interventions, potentially enhancing outcomes further. Additionally, long-term follow-up beyond six months would provide insights into the durability of revision surgery outcomes, as some studies suggest that the benefits may diminish over time without ongoing management [22].

Our study demonstrates that revision spine surgery can effectively reduce pain, improve functionality, and enhance quality of life for a significant proportion of FBSS patients. These findings are in line with existing literature, reinforcing the role of revision surgery as a viable option for FBSS management. Key predictive factors, including shorter time since initial surgery, lower baseline pain, and absence of psychological comorbidities, should inform patient selection to optimize outcomes. While complications are a risk, careful surgical planning and patient selection can minimize adverse events, making revision surgery a safe and beneficial intervention for many FBSS patients. Further research is warranted to explore the integration of psychological support and advanced diagnostics in FBSS management, potentially leading to more personalized and effective treatment strategies.

## CONCLUSION

This study demonstrates that revision spine surgery can effectively reduce pain, enhance functionality, and improve quality of life for patients with Failed Back Surgery Syndrome (FBSS). Positive outcomes were most prevalent among patients with a shorter interval since the initial surgery, lower baseline pain, and no psychological comorbidities. The findings suggest that careful patient selection based on these predictive factors can significantly improve the success rate of revision surgeries. Despite some variability in outcomes, revision spine surgery proves a valuable intervention for many FBSS patients, contributing to improved clinical and patient-centered outcomes.

## Recommendations

Implement a comprehensive assessment of psychological factors before revision surgery to optimize patient outcomes.

Prioritize early intervention for FBSS patients to improve surgical success rates.

Incorporate multidisciplinary approaches, including physical therapy, for sustained postoperative improvements.

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## Author Contributions

Dr. Abul Kalam Azad contributed to the study design, data collection, and manuscript writing. Dr. Md. Munzur Rahman provided guidance on statistical analysis and interpretation of results, as well as reviewing the manuscript. Dr. Mirza Osman Beg was responsible for the overall coordination of the project, including patient recruitment and clinical supervision. All authors approved the final manuscript for publication and agree to be accountable for the accuracy and integrity of the work.

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