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BEYOND THE OPERATING ROOM: A PHENOMENOLOGICAL STUDY OF THE EMOTIONAL, COGNITIVE, AND PROFESSIONAL IMPACT OF SURGICAL COMPLICATIONS ON NEUROSURGERY RESIDENTS

Dr. Ali Shahjehan[1], Dr. Zahid Ullah Khan[*2], Junaid Sarfaraz[3]

[1]Assistant Professor, Neurosurgery Department, Maqsood Medical Complex and General Hospital Peshawar
*[*2]Assistant Professor, Emergency medicine department, MTI Lady Reading Hospital Peshawar*
[3]Rector Health Services Academy Prime Minister's National Complex, Chak Shehzad, Islamabad

[1]alijehan4@gmail.com, [*2]zahid_kmc@yahoo.com, [3]junaidsarfarz@hsa.edu.pk

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Corresponding Author: *
Dr Zahid Ullah Khan

Abstract

Background: *Surgical complications are an unavoidable part of neurosurgical training and can have serious effects on both patients and doctors. While much research focuses on clinical outcomes, less attention has been given to how these events affect residents emotionally, mentally, and professionally, especially in low- and middle-income countries.*

Objective: *This study aims to explore the emotional, cognitive, and professional impact of surgical complications on neurosurgery residents.*

Methods: *A qualitative phenomenological approach was used to understand the lived experiences of neurosurgery residents. Participants were selected through purposive sampling. Data were collected using in-depth, semi-structured interviews and analyzed using Colaizzi's method to identify key themes.*

Results: *Residents reported strong emotional responses such as guilt, anxiety, and fear after complications. They also described changes in thinking, including deep reflection, increased caution, and sometimes defensive practice. These experiences affected their professional identity, leading to both growth and ongoing stress. Support from supervisors and a positive institutional culture helped residents cope better, while lack of support increased distress.*

Conclusion: *Surgical complications have a deep and lasting impact on neurosurgery residents beyond technical training. Addressing emotional and professional challenges through structured support and open discussion can improve both resident well-being and the quality of surgical training.*

Introduction

Surgical training, especially in highly specialized fields such as neurosurgery, has traditionally been evaluated using measurable outcomes like operative success, complication rates, and patient recovery. These indicators are important because they reflect technical skill and clinical performance. However, they do not fully capture the complete learning process of a surgical trainee.

In recent years, medical education research has shown that surgical training is not only about technical ability but also involves emotional, cognitive, and professional growth within complex and high-pressure clinical environments.[1,2] Among different experiences during training, surgical complications stand out as particularly important events. Although they may be seen as failures, they often serve as powerful learning opportunities that

can shape a trainee's skills, judgment, and future clinical behavior.[3]

At the same time, surgical complications do not only affect patients but also have a strong impact on healthcare providers, especially trainees.[4] This has led to the growing concept of the "second victim," which describes the emotional and psychological distress experienced by clinicians after adverse events.[5] Surgical residents may feel anxiety, guilt, fear, and a loss of confidence after such incidents, which can affect their clinical decision-making and overall performance.[6] In addition, there is increasing global concern about physician burnout, which is strongly linked to stress, emotional exhaustion, and reduced quality of care.[7,8,] Because of these challenges, modern medical education now emphasizes the importance of reflection, emotional support, and resilience-building strategies to help trainees learn from complications in a healthy and constructive way.[9]These approaches aim to transform difficult clinical experiences into meaningful learning opportunities while also protecting the well-being of trainees.

In low- and middle-income countries (LMICs) such as Pakistan, the situation is even more complex and less studied. Surgical training in these settings often faces challenges such as high patient load, limited resources, and strong hierarchical systems that may discourage open discussion of complications.[10] These factors can make it difficult for trainees to share their experiences or seek emotional support after adverse events. Studies from Pakistan suggest that neurosurgery training is influenced by limited mentorship and fewer opportunities for structured feedback or formal debriefing sessions.[3] As a result, residents in these environments may experience a greater emotional burden and may struggle to process and learn from surgical complications effectively. This highlights the importance of understanding training experiences within the specific cultural and institutional context of LMICs, where challenges and learning environments may be very different from high-income countries.[11]

Despite the importance of this issue, most existing research has focused on quantitative outcomes such as complication rates, burnout levels, and patient safety indicators.[7],[12] While these studies provide useful numerical data, they do not explain how trainees personally experience and interpret surgical complications. There is a lack of qualitative research that explores the lived experiences of surgical residents, particularly using a phenomenological approach that focuses on understanding individuals' perceptions and meanings.[13,14] This gap is even more significant in LMICs, where contextual differences may strongly influence learning experiences but are not well represented in the literature.[14] Therefore, there is a need for deeper exploration of how neurosurgery residents experience surgical complications, how they respond emotionally and cognitively, and how these events influence their professional development. Understanding these experiences is important because unmanaged emotional responses may lead to burnout, defensive medical practices, and reduced quality of care.[8],[15] On the other hand, when properly supported, such experiences can promote reflective learning, resilience, and professional growth.

Methodology

This study employed a qualitative approach using a descriptive phenomenological design to explore the lived experiences of neurosurgery residents encountering surgical complications. This approach was selected to capture the depth, meaning, and subjective interpretation of these experiences, which cannot be adequately addressed through quantitative methods.

The study was conducted in the Department of Neurosurgery MTI Lady reading hospital, a tertiary care teaching hospital. The study population included postgraduate neurosurgery residents (Year 2–Year 5) with at least six months of clinical experience and prior exposure to surgical complications. A purposive sampling strategy was used to recruit participants with relevant experience. Data collection continued until data saturation was achieved, resulting in a sample size of 10 participants.

Data were collected through in-depth semi-structured interviews, each lasting approximately 30–45 minutes. Interviews were conducted in a

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private setting, audio-recorded with consent, and supplemented with field notes. An interview guide was developed to explore emotional responses, cognitive processes, professional development, and contextual influences related to surgical complications.

All interviews were transcribed verbatim and analyzed using Colaizzi's seven-step phenomenological method, including identification of significant statements, formulation of meanings, clustering of themes, and development of an exhaustive description. Member checking was performed to enhance credibility.

To ensure rigor, strategies for trustworthiness were applied, including credibility (member checking), dependability (audit trail), confirmability (reflexivity), and transferability (thick description).

Ethical approval was obtained from the institutional review board. Written informed consent was secured from all participants. Confidentiality and anonymity were maintained, and participants were informed of their right to withdraw at any time.

Results

A total of 10 participants were included in the analysis, representing different years of residency (Year 2–Year 5). Data analysis using Colaizzi's phenomenological method yielded four major themes and ten subthemes, reflecting the emotional, cognitive, and professional dimensions of participants' lived experiences.

Table 1: Summary of Themes and Subthemes

Theme	Subthemes
Theme 1: Emotional Turmoil Following Surgical Complications	1. Immediate emotional distress 2. Feelings of guilt and self-blame 3. Persistent psychological impact
Theme 2: Cognitive Reframing and Reflective Learning	1. Heightened vigilance and self-monitoring 2. Reflective practice and learning 3. Emergence of defensive clinical behavior
Theme 3: Impact on Professional Identity Formation	1. Self-doubt and reduced confidence 2. Development of resilience 3. Transformation into a learning experience
Theme 4: Influence of Institutional and Supervisory Context	1. Role of senior support and mentorship 2. Hierarchical culture and fear of judgment 3. Lack of structured debriefing mechanisms

Participant Characteristics

The study included 10 neurosurgery residents, with a mix of junior (Years 2–3) and senior (Years 4–5) trainees. Participants had varying levels of exposure to surgical complications, ranging from intraoperative technical errors to postoperative adverse outcomes. Demographic details are summarized in Table 2.

Table 2: Participant Characteristics

Participant ID	Gender	Year of Residency	Type of Complication Experienced	Years of Training
P1	Male	Year 2	Intraoperative bleeding	2
P2	Male	Year 3	Postoperative infection	3
P3	Female	Year 4	Neurological deficit post-surgery	4

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Participant ID	Gender	Year of Residency	Type of Complication Experienced	Years of Training
P4	Male	Year 5	Intraoperative technical error	5
P5	Male	Year 5	Postoperative hematoma	5
P6	Female	Year 3	Anesthesia-related complication	3
P7	Male	Year 4	Surgical site complication	4
P8	Male	Year 2	Equipment-related issue	2
P9	Female	Year 4	Unexpected intraoperative event	4
P10	Male	Year 5	Postoperative deterioration	5

Theme 1: Emotional Turmoil Following Surgical Complications

1.1 Immediate Emotional Distress

Participants consistently described intense emotional reactions immediately following a complication, including shock, anxiety, and fear. Many reported a sense of being overwhelmed during and after the event.

"I felt completely shaken… it stayed with me even after leaving the operating room."

1.2 Feelings of Guilt and Self-Blame

A dominant pattern across interviews was the tendency to internalize responsibility, even in situations involving multifactorial causes.

"Even if it wasn't entirely my fault, I kept thinking I could have done something differently."

1.3 Persistent Psychological Impact

Several participants reported lingering emotional effects, including sleep disturbances and intrusive recollections of the event.

Theme 2: Cognitive Reframing and Reflective Learning

2.1 Heightened Vigilance and Self-Monitoring

Participants described increased caution in subsequent procedures, with heightened attention to detail and risk anticipation.

2.2 Reflective Practice and Learning

Residents engaged in self-reflection and case review as a means of understanding the complication and improving future performance.

"I went back and reviewed every step… trying to identify where things went wrong."

2.3 Emergence of Defensive Clinical Behavior

Some participants reported adopting more conservative approaches in clinical decision-making following complications.

Theme 3: Impact on Professional Identity Formation

3.1 Self-Doubt and Reduced Confidence

Participants frequently reported a temporary loss of confidence in their surgical abilities.

3.2 Development of Resilience

Over time, many residents described a gradual recovery and strengthening of their professional identity.

"It was difficult initially, but it made me more careful and mentally stronger."

3.3 Transformation into a Learning Experience

Several participants reframed complications as essential components of their training and growth.

Theme 4: Influence of Institutional and Supervisory Context

4.1 Role of Senior Support and Mentorship

The presence or absence of supportive supervision significantly influenced how residents processed complications.

"When my consultant discussed it calmly, it helped me deal with it better."

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4.2 Hierarchical Culture and Fear of Judgment

Participants highlighted concerns about criticism and negative evaluation within hierarchical structures.

4.3 Lack of Structured Debriefing Mechanisms

Most participants reported the absence of formal platforms for discussing complications, leading to reliance on informal coping strategies.

Discussion

This study explored the lived experiences of neurosurgery residents when they encounter surgical complications, and it highlights that these events are not only technical challenges but also deeply emotional and professional experiences. The findings showed four key themes: emotional turmoil, cognitive reframing and reflective learning, professional identity development, and the role of the institutional environment. Together, these themes show that surgical complications significantly influence how trainees learn, think, and grow as future specialists.

The results clearly answer the research objectives by showing that residents often experience strong emotional reactions after complications. Feelings such as guilt, anxiety, and self-blame were commonly reported, especially immediately after adverse events. These reactions are consistent with the concept of the "second victim," where healthcare providers experience emotional distress after patient-related complications[16]. Similar findings have been reported in other studies involving surgical trainees, where individuals tend to internalize responsibility even when multiple factors contribute to an outcome.[6] If these emotional responses are not addressed, they may contribute to burnout and decreased well-being, as supported by previous research.[7]

Alongside emotional responses, the study also found important cognitive changes in residents. Many participants described becoming more careful, more reflective, and more attentive in their clinical practice after experiencing complications. This reflects experiential learning principles, where difficult or critical events lead to deeper reflection and learning.[17] The residents' accounts of reviewing cases and thinking about what went wrong are consistent with Schön's idea of "reflection-on-action." At the same time, some participants reported becoming more cautious in a way that may limit clinical decision-making. This defensive approach has also been observed in earlier studies, where adverse experiences lead to risk-averse behavior that may affect clinical judgment.[18]

An important finding of this study is the role of professional identity development. Many residents described a journey from initial self-doubt to increased confidence and resilience over time. This supports existing literature that shows how challenging clinical experiences contribute to shaping a clinician's professional identity.[19] The process of turning negative experiences into learning reflects adaptive coping and aligns with resilience theories in medical education.[20] However, this transformation was not the same for all participants, suggesting that personal and environmental factors play an important role in how individuals cope and grow.

The institutional and supervisory environment emerged as a major influence on how residents processed complications. Supportive mentors helped residents reflect, learn, and cope with difficult experiences, while hierarchical cultures and fear of criticism often discouraged open discussion. These findings align with previous studies that emphasize the importance of psychological safety and supportive learning environments in promoting reflection and learning.[21] The lack of structured debriefing systems, as reported by participants, is a significant concern, especially in low-resource settings. Similar issues have been highlighted in studies from low- and middle-income countries, where cultural and systemic barriers often limit open discussion of medical errors.[10]

While the findings are largely consistent with the existing literature, some context-specific differences were observed. Compared to studies from high-income countries, participants in this study reported relying more on informal coping strategies and having limited access to institutional support. This reflects the influence of local training environments and highlights the need for context-specific interventions. Additionally, the

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strong presence of hierarchical barriers suggests that cultural factors may play a more important role in shaping residents' experiences in settings like this.

From a theoretical perspective, this study supports and extends established concepts such as experiential learning and reflective practice in medical education. It shows that learning from complications is not only a cognitive process but is also deeply influenced by emotional experiences and the surrounding social environment. This highlights the need for a more comprehensive approach to medical training that includes technical skills, emotional well-being, and professional development.

The practical implications of these findings are important for medical education and healthcare institutions. There is a clear need for structured support systems, including formal debriefing sessions, mentorship programs, and access to psychological support, to help residents process complications in a healthy and constructive way. Institutions should also work towards creating a culture that encourages openness, reflection, and learning rather than blame. In addition, faculty development programs may be needed to equip supervisors with the skills required to provide both educational and emotional support to trainees.

Conclusion

This phenomenological study provides a comprehensive understanding of the lived experiences of neurosurgery residents encountering surgical complications, highlighting their profound emotional, cognitive, and professional implications. The findings demonstrate that surgical complications are not isolated technical events but deeply transformative experiences that shape residents' psychological well-being, clinical reasoning, and professional identity.

Residents commonly experience intense emotional responses, including guilt, anxiety, and self-doubt, followed by cognitive processes such as reflection, heightened vigilance, and, in some cases, defensive practice. Over time, these experiences contribute to professional identity formation, with some residents demonstrating resilience and growth, while others remain vulnerable to persistent distress. Importantly, the study identifies the institutional environment—particularly mentorship, supervision, and organizational culture—as a critical factor influencing how residents interpret and cope with these experiences.

By adopting a phenomenological approach, this study moves beyond outcome-based assessments and provides rich, context-sensitive insights into the human dimensions of surgical training. It contributes to the growing recognition that emotional and experiential learning are integral to medical education and must be addressed alongside technical competence.

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