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A Prospective Study on Stress Taken by Surgeon While Operating Cases

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ABSTRACT

Although, a certain level of stress can enhance the process of learning and task execution, an overwhelming amount of stress experienced by surgeons could result in unfavorable patient results. Excessive stress is considered a contributing factor to surgeon burnout and the potential for self-harm, which may manifest through behaviors such as substance misuse and suicide. Before each surgical procedure, every surgeon was queried about the stress factors they were encountering. Two interns, separately, observed a total of 15 surgeries each, diligently documenting their observations throughout the entire surgical process. During each operation, these interns recorded in real-time any activities or events that induced anxiety using a checklist containing eight potential stressors. These stressors included technical challenges, patient issues, teamwork difficulties, time and management concerns, distractions and interruptions, equipment malfunctions, personal matters and teaching-related stressors. In the course of observing 25 operations, a collective count of 78 stress-inducing factors was recorded, equating to an average of approximately 3.12 stressors per operation. Surgeons ranked personal issues as their primary stressors, followed by team-related, technical and equipment problems. In contrast, interns believed that technical problems were the leading cause of stress for surgeons, followed by equipment issues, team dynamics and distractions/interruptions. Observers perceived personal and patient-related concerns as relatively minor sources of distraction, while these factors triggered significant stress levels among the surgeons. The study found that team-building activities, training and regular equipment checks can help to improve teamwork and skills and reduce technical issues. Team-building activities can help surgeons and other surgical team members to work better together. Training and symposia can help surgeons and other surgical team members to improve their skills. Regular equipment checks can help to identify and fix potential problems with equipment. Finally, the study recommends establishing stringent guidelines and protocols to mitigate distractions and interruptions.

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Key Words

General surgeon, stress, the state-trait anxiety inventory (STAI) scale

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INTRODUCTION

Stress is a prevalent phenomenon in various medical domains and healthcare professionals, including physicians, encounter numerous systemic stressors in the workplace[1-3]. Occupational stress is a common experience but its intensity and individual responses vary among individuals. Stress in the field of medicine has consistently been a topic of concern because healthcare providers are entrusted with the lives of others and errors can be costly and sometimes irreversible. The British Medical Association (BMA) has reported that a significant number of doctors suffer from stress, which can have adverse effects on both their well-being and patient care[4]. Although some stressors may affect medical specialties equally, surgeons face unique intraoperative stressors such as bleeding, surgical complications and equipment malfunctions[5]. These factors can induce high levels of physiological and psychological stress[6-8]. Certain personality traits, such as obsessive tendencies, may make individuals more susceptible to emotional distress as they tend to harbor chronic self-doubt. Factors such as long working hours, heavy caseloads, interactions with challenging patients and their families and dealing with issues related to death, dying and suffering, as well as the sacrifice of personal life, are evident sources of stress[9]. Additionally, the lack of autonomy and control, inadequate resources for effective and safe work, unmet career expectations, dysfunctional workplace dynamics, monotonous tasks, remote accommodations, limited recreational facilities and workplace violence can contribute to elevated stress levels among doctors[10]. Doctors experience a higher burden of psychological distress, depression, anxiety, emotional exhaustion and professional burnout than the general population[11,12] Some degree of stress is considered normal and is an inherent aspect of the medical profession[11]. Despite ongoing efforts to mitigate physician stress and burnout variations in workplace stressors may account for the elevated rates of burnout among surgeons compared to non-surgical physicians[13-16]. Acute stress is essential for enhancing task performance and learning; however, excessive or frequent stress can detrimentally impact cognitive functions, including memory and attention, as well as the execution of intricate motor skills[17,18]. These maladaptive responses subsequently jeopardize patient safety and contribute to increased surgeon burnout, turnover, early retirement, depression, substance abuse and even suicide[19]. Recognizing the precise threshold differentiating stress levels that aid or impair surgeons' performance is crucial for initiatives focused on surgeons' well-being. Researchers have explored changes in cortisol levels, urinary interleukins and heart rate as potential indicators of healthcare professionals' responses to their working conditions[20,21]. Such stress levels can have repercussions for hospitals and organizations in terms of decreased productivity and performance. A stressful work environment invariably results in low morale and motivation, ultimately affecting the quality of care provided to patients.

MATERIAL AND METHODS

This prospective observational study was conducted in the Department of General Surgery, ESIC Medical College and Hospital, Hyderabad, Institutional Ethical Approval was obtained for this study. In this study, an independent observer collected real-time data during 25 elective surgical procedures performed in the operating room of the ESIC Hospital, Hyderabad. Before each surgical procedure, each surgeon was asked to complete a survey to identify potential stressors that could elevate anxiety levels. The study encompassed a broad spectrum of surgical specialties, including general surgery, plastic surgery, thoracic surgery, colorectal surgery and endocrine surgery. The surgical procedures examined included laparoscopic sigmoid colectomy, hernia repair, hemithyroidectomy, laparoscopic cholecystectomy, orchidopexy, abdominoplasty, lumpectomy, fistulectomy, skin grafting, fistulotomy and liver resection. The duration of each operation ranged from 1-3 hrs, during which the observer observed the entire procedure in the operating room.

Before each observational session, surgeons provided informed consent. Throughout the surgical procedure, an observer documented stress-inducing activities and incidents in real time using a checklist. This checklist comprises eight potential stressors, including technical and equipment-related challenges, personal or patient-related issues, teamwork difficulties, distractions and challenges related to time management. The final stressor, which involved providing on-the-job teaching to a colleague during the operation, also considered the additional distraction caused by explaining the procedure while simultaneously performing it.

The participating surgeons assessed their stress levels before commencing each surgery using the validated STAI questionnaire to record their stress levels. Following completion of the operation, the surgeon also self-evaluated the stress level during the procedure for each of the eight factors considered, utilizing a scale ranging from 1 (stress-free) to 8 (extremely high stress)[22]. Additionally, the observer documented the perceived stress levels experienced by the surgeon during the procedure. Patients underwent postoperative follow-ups for a period of 2 weeks to determine the outcomes of their surgeries. The

frequency of encountering a significant stressor is reported as a percentage of the total number of stressful events. The mean scores for the eight stressors, as perceived by both the surgeon and the observer, were calculated. The ratings for the eight stressors were then combined to create two overall scores: one for the surgeon and one for the observer. To understand if self-reported stress levels were influenced by events occurring in the operating room environment, correlations were established between these global scores, the STAI scores and each other.

RESULTS

In the course of observing 25 operations, a collective count of 78 stress-inducing factors was recorded, equating to an average of approximately 3.12 stressors per operation. Among these, technical factors, equipment issues and team-related elements emerged as the most frequently encountered stressors within the operating room, as depicted in Table 1. In Table 2, it was noted that there were no substantial distinctions in the mean levels of stress as perceived by both surgeons and observers, particularly regarding stress originating from technical factors, patient-related concerns, team dynamics, time management and interruptions/distractions.

The prioritization of stress factors varied between surgeons and observers. Surgeons ranked personal issues as their primary stressors, followed by team-related, technical and equipment problems. In contrast, interns believed that technical problems were the leading cause of stress for surgeons, followed by equipment issues, team dynamics and distractions/interruptions, as shown in Table 2. Observers perceived personal and patient-related concerns as relatively minor sources of distraction, while these factors triggered significant stress levels among the surgeons. Although, teaching challenges and interruptions were frequently encountered, they elicited less stress compared to other factors. Conversely, surgeons consistently reported high-stress levels stemming from technical issues, teamwork dynamics and equipment problems, which they encountered regularly.

Table 1: Assessment of factors causing stress in the operating room

Factors	Frequency	Percentage
Technical factors	12	15.38
Equipment problems	11	14.10
Team factors	10	12.82
Teaching in the operating room	11	14.10
Patient factors	9	11.54
Time management	8	10.26
Personal factors	5	6.41
Distractions/interruptions	12	15.38

Table 2: Comparison of STAI Scores between the Surgeon's rating versus the observer's rating

Factor	Surgeon's mean stress level	Observer's mean stress level	p-value
Technical factors	3.95	3.63	0.847
Patient Factors	2.88	2.94	0.553
Team Factors	3.90	2.87	0.287
Time management	2.84	2.10	0.120
Equipment problems	3.12	1.70	0.041*
Teaching	3.56	1.67	0.012*
Personal issues	3.29	1.57	0.032*
Distractions/interruptions	2.74	1.94	0.475

*Significant

Consistent with the self-reported data, technical factors, team-related issues and equipment problems were frequently observed by observers and were associated with elevated stress levels among surgeons. The correlation between surgeons' STAI scores and the observers' assessment of the surgical environment was notably positive ($r = +0.60$, $p<0.01$. Furthermore, the surgeon's STAI score exhibited a significant and positive correlation with the overall stress rating ($r = +0.881$, $p<0.01$). It's important to note that there were no untoward incidents or complications observed during the follow-up of the patients after surgery and all patients were discharged in good health within 1 week of their surgical procedures.

DISCUSSIONS

Performing surgery places a significant burden of stress on the surgeon and the degree of stress varies based on factors such as the surgeon's level of experience, personal coping mechanisms, the specific procedure being performed and the working conditions[23,24]. Occupational stress can have adverse effects on overall well-being[25]. Furthermore, stress has the potential to jeopardize the quality of the surgical procedure, thereby reducing patient safety[26]. Understanding how to evaluate stress in surgeons and strategically targeting interventions to reduce this stress is crucial for maintaining a healthy workforce. Stress response serves as a mechanism designed to protect individuals by triggering the release of catecholamines and engaging in immunological functions. Prolonged or repetitive stress, even when experienced for less than 2 hrs, has the potential to alter cognitive functions[27,28] and impact the immune system and cardiac health, potentially leading to conditions such as hypertension, arrhythmia, oxidation of low-density lipoproteins osteoporosis, arthritis and type 2 diabetes[27,29,30]. Excessive levels of acute stress can negatively affect surgeons' fine motor skills, coordination, dexterity and decision-making abilities and recurrent instances of such stress can contribute to higher rates of burnout[27,31].

This study revealed that surgeons experience stress during their time in the operating room (OR) due to various factors. There were slight discrepancies between what the observers perceived and what the surgeons self-reported as stressors. Technical issues, team dynamics and equipment problems have emerged as the primary reasons for surgeons experiencing high levels of stress. The alignment

between the ratings provided by the observers and those provided by the surgeons suggests that the observers accurately gauged the levels of stress that the surgeons were undergoing. Notably, in our study, observers identified disruptions and interruptions as frequent culprits for high-stress levels, whereas surgeons themselves reported a lesser impact of these factors. Aurora *et al*.[32] showed how mental stress negatively affected the performance of novice surgeons in a laparoscopic simulator scenario. To assess stress levels, the authors employed The Imperial Stress Assessment Tool, which incorporates the State-Trait Anxiety Inventory questionnaires, salivary cortisol measurements and maximum heart rate as stress indicators. They observed that both objective and subjective stress markers were associated with reduced motion efficiency, prolonged task completion times and an elevated frequency of errors. However, it is worth noting that these observations were made within the controlled environment of a simulator, devoid of the additional stressors typically encountered in a real operating room, such as ambient noise, collaborative teamwork and actual patients. The elevated S-anxiety score reflects the immediate anxiety levels experienced by the surgeon. Anxiety experienced on-site may be indicative of the surgeon's level of expertise and training; less experienced or less highly trained surgeons may experience more anxiety when performing complex procedures. Conversely, a high T-anxiety score reflects a surgeon's overall general level of anxiety. The observation of high scores in both S-anxiety and T-anxiety in our study suggests that surgeons typically contend with significant stress but often conceal or manage this anxiety due to their authoritative role in the operating room. The surgeon's demeanor plays a crucial role in instilling confidence and assurance among the other members of the surgical team.

In essence, this study yielded a positive overall outcome despite minor discrepancies in stressor importance ratings. Consequently, the stress matrix can serve as a valuable tool for minimizing potential sources of stress when implementing new programs in hospital practices. Engaging in team-building activities aimed at enhancing interpersonal skills and communication can be a valuable means of improving teamwork among surgeons and other surgical team members. In addition, surgeons and team members can undergo training and participate in symposia to refine their skill sets. To reduce the occurrence of technical and equipment issues, it is essential to conduct regular and efficient equipment checks and provide ample preparation time before the commencement of surgery. Furthermore, the establishment of stringent guidelines and protocols specific to the operating room can help mitigate distractions and interruptions. By incorporating these measures, a well-structured and systematic approach to conducting procedures in the operating room can be established.

CONCLUSION

This study found that the stress matrix is a valuable tool for minimizing potential stress sources when implementing new programs in hospital practices. The stress matrix can be used to identify and assess potential stressors. By identifying potential stressors, hospitals can take steps to minimize their impact. The study also found that team-building activities, training and regular equipment checks can help improve teamwork and skills and reduce technical issues. Team-building activities can help surgeons and other surgical team members to work better together. Training and symposia can help surgeons and other surgical team members to improve their skills. Regular equipment checks can help identify and fix potential problems with equipment. Finally, this study recommends establishing stringent guidelines and protocols to mitigate distractions and interruptions. Stringent guidelines and protocols can help to create a more organized and predictable environment in the operating room. This can help reduce distractions and interruptions, leading to stress and mistakes. In addition to the measures mentioned in the study, other things that can be done to minimize stress in the operating room include: Providing adequate staffing levels, Creating a supportive and positive work environment, Addressing individual stressors, such as workload or personal problems and Offering counseling or other support services. By taking these steps, hospitals can help to create a more stress-free environment for surgeons and other surgical team members. This can lead to improved patient care and safety.

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