

# Real-time observations of stressful events in the operating room

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## ABSTRACT

**Aim:** To identify and quantify factors causing stress in the operating room (OR) and evaluate the relationship between these factors and surgeons' stress level. **Methods:** This is a prospective observational study from 32 elective surgical procedures conducted in the OR of King Khalid University Hospital, Riyadh, Saudi Arabia. Before each operation, each surgeon was asked of stressors. Two interns observed 16 surgeries each, separately. The interns watched and took notes during the entire surgical procedure. During each operation, the observer recorded anxiety-inducing activities and events that occurred in real time by means of a checklist of 8 potential stressors: technical, patient problems, teamwork problems, time and management issues, distractions and interruptions, equipment problems, personal problems, and teaching. After each operation, surgeons were asked to answer the validated State-Trait Anxiety Inventory questionnaire and self-report on their stress level from the 8 sources using a scale of 1–8 (1: stress free, 8: extremely stressful). The observer also recorded perceived stress levels experienced by the surgeons during the operation. **Results:** One hundred ten stressors were identified. Technical problems most frequently caused stress (16.4%) and personal issues the least often (6.4%). Frequently encountered stressors (teaching and distractions/interruptions) caused less stress to the surgeons. Technical factors, teamwork, and equipment problems occurred frequently and were also a major contributor to OR stress. All patients were discharged in good health and within 1 week of surgery. **Conclusion:** Certain stressful factors do occur among surgeons in the OR and can increase the potential for errors. Further research is required to determine the impact of stress on performance and the outcome of surgery.

**Key words:** Operating room, stressful events, surgeon

## INTRODUCTION

Continued advancement and changes to society during the last century, which we loosely refer to as progress, have not come without a price. Individuals including surgeons have had to cope with and adjust to the rapid speed of development. As a result, work-related stress has become an interesting topic for the medical community as well as all other aspects of society.

### Stress in the intraoperative setting

Work-related stress, both psychologic and physical, arises frequently in the operating room (OR).<sup>[1,2]</sup> The nature of

this stress depends on several factors including, but not limited to, the availability of technologies and patient factors.<sup>[3,4]</sup> Acute stress in the OR is now recognized as a significant factor for success in OR events.<sup>[5]</sup> Interpersonal conflicts can be frequent and at times intense.<sup>[6]</sup> Previous studies have disclosed a number of potential stressors that can compromise performance in the OR. The list includes team communication,<sup>[7,8]</sup> noisiness,<sup>[9,10]</sup> technical problems,<sup>[4]</sup> surgeon-related factors, such as fatigue and stress,<sup>[5,7,11]</sup> and institutional problems. For example, OR staff in smaller institutions experience higher rates of anxiety than those in larger clinical settings.<sup>[12]</sup>

### Measuring stress

One can measure stress using the validated State-Trait Anxiety Inventory (STAI) constructed by Charles D. Spielberger, Richard L. Gorsuch, and Robert E. Lushene in 1964.<sup>[13]</sup> This 20-item self-reporting assessment device, which includes separate measures of state and trait anxiety, has been adapted and validated in more than 30 languages.

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It serves to facilitate cross-cultural research and clinical practice.<sup>[5,14-16]</sup> Other methods in use for monitoring stress include the Imperial Stress Assessment Tool (ISAT) for measuring stress during surgery,<sup>[17]</sup> heart rate (HR) variability<sup>[11,16,18]</sup> one-on-one interviews with subjects,<sup>[19,20]</sup> and telemetry monitoring.<sup>[18]</sup>

### Stress and job performance

When stress becomes too high, job performance suffers. Excessive stress interferes with performance by diminishing a person's ability to cope and make correct decisions, and causes inconsistencies in behavior as well as frequent absenteeism. Thus, efforts to optimize physical and mental conditions should be in place to positively influence the performance of individuals.<sup>[21]</sup> The present study verified, identified, and quantified factors causing stress in the OR within our institution and evaluated the relationship between these factors and the surgeons' stress level.

## METHODS

Ethical approval for the study from the Institutional Review Board of the College of Medicine, King Saud University, was obtained. This prospective observational study was carried out by 2 medical interns who collected data in real time from 32 elective surgical procedures conducted in the OR of King Khalid University Hospital, Riyadh, Saudi Arabia. Before each operation, each surgeon was asked to answer a survey on the stressors that each of them may be facing that may cause their anxiety levels to rise. Then, each intern observed 16 OR procedures each. Neither intern participated in the analysis of the data. The study sampled a wide variety of surgical specialties, including general surgery, plastic surgery, thoracic surgery, colorectal surgery, and endocrine surgery. Surgical cases included laparoscopic sigmoid colectomy, hernia repair, hemithyroidectomy, laparoscopic cholecystectomy, orchidopexy, abdominoplasty, lumpectomy, fistulectomy, skin grafting, fistulotomy, and liver resection. Each operation lasted from 1 to 3 h. The interns observed in the OR for the entire length of the operation.

Surgeons provided informed consent prior to each observational session. During the operation, the observer recorded stress-triggering activities and events that occurred in real time by means of a checklist. This document contained 8 potential stressors related to technical/equipment, personal or patient problems, teamwork issues, distractions, and difficulty with time management. The last stressor—teaching a colleague during the operation—took into account added distraction from explaining a procedure while doing the procedure itself. Table 1 provides details concerning the stressors monitored.

Participating surgeons self-reported their level of stress before starting a surgery and used the validated STAI questionnaire to record their stress levels. At the end of the operation, the surgeon self-rated his/her level of stress while performing the procedure for each of the 8 factors considered using a scale of 1–8 (1: stress free, 8: extremely stressful).<sup>[22]</sup> After the operation the observer also documented perceived stress levels experienced by the surgeon during the procedure. Patients were followed up postoperatively for 2 weeks to ascertain the outcome of their operations.

The frequency of experiencing a key stressor was reported as a percentage of the total number of stressful events. Mean scores of the 8 stressors as perceived by the surgeon and by the observer were calculated. The ratings of these 8 stressors were summed up to give 2 global scores, 1 for the surgeon and 1 for the observer. Correlations were made between these global scores and the STAI score and between each other to determine if self-reported stress level was a function of instigating events in the OR environment.

## RESULTS

A total of 110 stressors were documented for all 32 operations observed, which translates to an average of 3.4 stressors per operation. Technical factors, equipment problems, and team factors ranked highest among the most commonly identified stressors in the OR [Table 2]. We did not identify significant differences in the mean

**Table 1: Description of stressors evaluated in the study**

Stressor	Factors considered
Technical problems	Problems with materials, drapes, sterilization, falling of surgical materials, and so on
Patients problems	Patient's vital signs and status while in the operating room
Teamwork problems	Problems with the nurses, technicians, anesthesiologists, and others
Time and management issues	Problems related to time and OR management
Distractions and interruptions	Noises, bleeps, and calls
Equipment problems	Electrical failure and malfunction of equipments
Personal problems	Distraction caused by personal issues
Teaching a colleague during the operation	Presence of observers, students, and other staff where there is a need to explain the procedure while doing the procedure itself
OR - Operating room	

stress levels when comparing surgeons' and observers' perceptions of stress caused by technical factors, patient factors, team factors, time management, and distractions/interruptions [Table 3].

The order of importance given to stress factors differed between surgeons and observers. While surgeons rated personal issues as their highest stressor, followed by team, technical, and equipment problems, the interns thought that technical problems caused the most stress to surgeons followed by equipment, team, and distractions/interruptions [Table 2]. The observers perceived personal and patient issues as minor sources of distractions, whereas these factors initiated high levels of stress in our surgeons. Although encountered frequently, teaching problems and distractions/interruptions caused less stress than other factors. On the contrary, surgeons reported high levels of stress from technical factors, teamwork, and equipment problems and encountered these issues often.

Similar to the self-reported matrix, technical factors, team factors, and equipment problems occurred frequently and caused high levels of stress to surgeons based on observer's notes. There was a significant positive correlation between surgeons' STAI scores and observers' surgical environment assessment ( $r=0.59$ ,  $P<0.01$ ) [Figure 1]. The surgeon STAI score also correlated significantly and positively with the global rating of stress ( $r=0.758$ ,  $P<0.01$ ) [Figure 2]. Neither

untoward incidents nor complications were noted in the followup of the patients after surgery. All patients were discharged in good health within 1 week of surgery.

## DISCUSSION

The present study shows that surgeons feel stressed while in the OR for a variety of reasons. Although we noted slight difference in the perceived (observers') and self-reported (surgeons') reporting of stressors, technical problems, team factors, and equipment problems resounded as the most frequent reasons behind high levels of stress felt by surgeons. Agreement between the observer and the surgeon ratings suggests that the observers accurately assessed the amount of stress experienced by the surgeons. In our study, only disruptions/interruptions were remarked by observers as frequent causes of high levels of stress, whereas self-reporting by surgeons indicated a lower impact.

The high S-anxiety score mirrors a level of anxiety that the surgeon was feeling "right now." Onsite anxiety may reflect the level of expertise and training of the surgeon—a less experienced surgeon or one who is not highly trained will feel more anxiety when performing more complicated types of operations. The high T-anxiety score reflects how the surgeon generally feels. The high S- and the high T-anxiety scores seen in our study suggest that surgeons

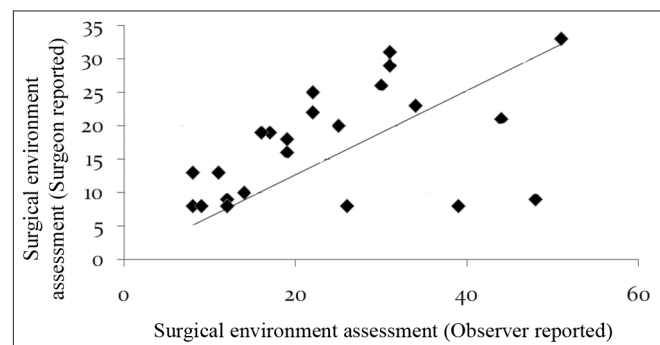
**Table 2: Factors causing stress in the operating room**

Factors	n (%)
Technical factors	18 (16.4)
Equipment problems	17 (15.5)
Team factors	17 (15.5)
Distractions/interruptions	15 (13.6)
Teaching in the operating room	15 (13.6)
Patient problems/factors	11 (10.0)
Time and management	10 (9.1)
Personal factors	7 (6.4)

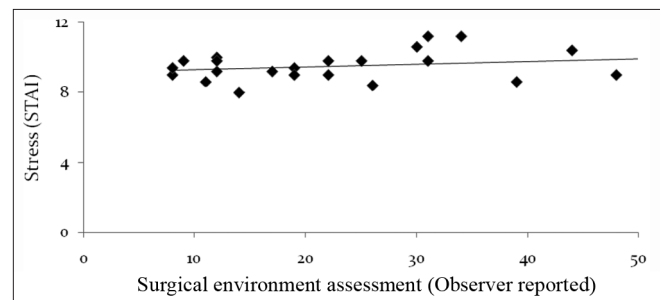
**Table 3: Factors ratings<sup>a</sup> (surgeons' vs observer's)**

Factors	Surgeon's mean stress level	Observer's mean stress level	P value
Technical factors	3.39	3.22	0.738
Patient factors	2.57	2.83	0.620
Team factors	3.57	2.65	0.162
Time management	2.35	2.09	0.530
Distractions / interruptions	2.00	1.78	0.478
Equipment problems	2.78	1.09	0.015
Teaching	3.35	1.48	0.001
Personal issues	3.65	1.78	0.013

<sup>a</sup>1=Less stress to 10=severe stress



**Figure 1:** Relationship between surgeons and observer's assessment of the Surgical Environment Score (Global stress indicator). ( $r=0.59$ ,  $P<0.01$ )



**Figure 2:** Relation between the State-Trait Anxiety Inventory and global rating of stress. ( $r=0.758$ ,  $P<0.01$ )

generally feel stressed but they tend to hide/mask their level of anxiety because of their leadership status in the OR. The surgeon's demeanor reinforces confidence and a certain degree of assurance to other members of the surgical team.

The study yielded a positive outcome overall despite encountering minor variations regarding importance ratings for stressors. The stress matrix can therefore serve as a guide to minimize potential sources of stress when introducing new programs into the hospital practice. Team-building exercises to improve interpersonal skills and communication can enhance teamwork. Surgeons and members of the surgical team can receive training and attend symposia to further hone their skills. Taking regular and efficient inventory of equipments and providing ample preparation time prior to actual conduct of surgery can help minimize technical and equipment problems. The implementation of a strict OR guideline and protocol may minimize distractions and interruptions. All of these factors can be modified into a well-controlled and systematic flow of conduct in the OR.

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