

# The Effects of Stress on Surgeons and Surgical Performance: An Analytical Study

Dr. AbdulHameed AbdulRahman Shehab Ahmed  
Dr. Ahmad Nayef Althaher  
Dr. Sami Ahmad h Alanazi  
Dr. FATIMAH HASAN A ALJANBI  
Dr. Meshael Abdulwahab M. Al-saqqa

## Abstract

This study aimed at exploring the effects of stress on surgeons and surgical performance, as the researchers adopted the methodology of descriptive analytical statistics by conducting a semi structured interviews on fourteen surgeons in Jordan. The aim of this study also was to investigate surgeons' perceptions of surgical stress, highlight key stressors and their impact on performance, and identify coping strategies. Stress poses a serious risk for training surgeons since their performance and well - being is reflected in patients' health. This study focuses on measuring the stress on surgeons and at the same time evaluates prospectively the results of practices that uses alternative techniques to combat the effects of stress. The study concluded that these interviews provided valuable insights into stressors, stress responses, and coping strategies used by surgeons and allowed us to categorize sources of stress. Although surgeons characteristically enjoy the stimulating features of their work, high levels of stress can affect performance adversely.

## Acknowledgement

This research has been prepared through cooperation and concerted efforts of the researchers in collecting and compiling the necessary data; each researcher with a certain role. Hence, this research was conducted with the joint efforts of the researchers; Dr. AbdulHameed AbdulRahman Shehab Ahmed, Dr. Ahmad Nayef Althaher and Dr. Sami Ahmad h Alanazi as main authors, and Dr. FATIMAH HASAN A ALJANBI and Dr. Meshael Abdulwahab M. Al-saqqa as co-authors.

The researchers thank everyone who contributed to providing the data and information that helped to accomplish this research.

## 1.1 Introduction

The operating room can be a highly pressurized environment in which surgeons encounter various stressors, including technical complications, equipment failure, time pressure, distractions, evaluative threat and performance anxiety (Arora, Sevdalis, Nestel, Woloshynowych, Darzi & Kneebone, 2010).

Procedures that are complex or longer in duration are proposed to trigger even greater stress levels because they are more physically and mentally demanding (Berguer, Smith & Chung, 2001).

However, studies examining the effects of acute stress on operating performance have shown considerable variability; from no effect, to either facilitative or debilitating effects (Andreatta, Hillard & Krain, 2010).

This variability is probably caused by the individualistic way in which surgeons respond to stress (*see figure 1*). Whilst some might respond positively and perform well, others respond negatively and perform poorly. One theoretical framework that offers exciting potential for explaining such individual differences in stress response, and which has not previously been investigated in surgery, is the biopsychosocial model (BPSM) of challenge and threat (Poolton, Wilson, Malhotra, Ngo K, & Masters, 2011).

Surgeons in our opinion have always been an example of an individual who is determined, professional, being able to control himself under adverse circumstances and willing to work extra hours, beyond any schedule or program. These characteristics may be true for most surgeons but there is always a price to be paid. The effects of the surgical profession on trainees and consultants have only recently started to be unveiled, following an increased number of studies examining the consequences on other professional groups.

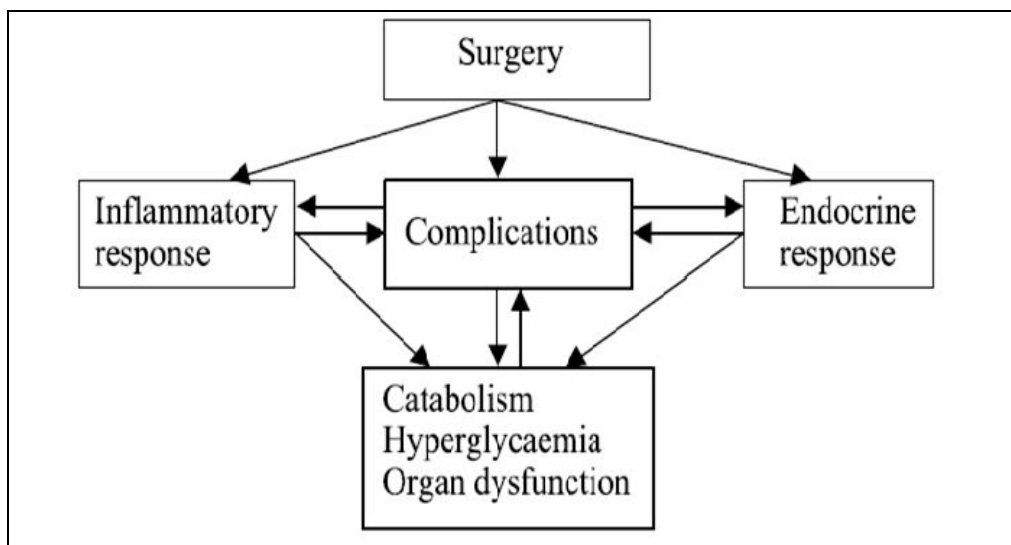


Figure (1): Surgical stress

Stress related problems have been the area of investigation for many scientists but surgeons were one of the last to take this matter seriously. This could explain the scarcity of published studies, even today, concerning the surgical profession and stress. Undoubtedly, stress poses a serious risk for everyone, especially training surgeons since their performance and well-being is reflected in patients' health. Even less attention has been given to programs designed to prevent and decrease the deleterious effects of stress. This study tries to measure the stress of training surgeons and at the same time implements an innovative program to combat its effects (Christakis, Pagkratis, Varvogli, Darviri & Chrousos, 2012).

Stress is recognized as a significant factor affecting performance in aviation, the military, and competitive sports. In all of these fields, specific training interventions have been established (Helmreich, Wilhelm & Klinect, 2001).

Surgery is a safety critical domain in which the surgeon's performance is a crucial determinant of outcome, yet the effects of stress seldom are acknowledged and formal training rarely is offered. Surgical expertise is complex. Research largely has focused on the development and assessment of technical skills. Cognitive performance has received much less attention. However, skills such as judgment and decision making are central components of surgical expertise. Stress effects cognitive processes involving memory, recall of knowledge, and attention (Wolf, 2003).

It follows that the ability to recognize and manage potentially deleterious levels of intraoperative stress is crucial for safe surgical practice. Comparatively little is known about stress as a risk factor in surgical performance. Although there are anecdotal reports, systematic approaches to explore stress in surgeons are lacking. Typical stressors such as the interference of the job with the surgeon's personal life, workload, and wellbeing have been identified. However, the few existing studies have limitations such as only relying on questionnaires to explore the concept of stress in surgery. Other studies have used objective stress measures to investigate autonomic responses of surgeons during surgery and describe physiologic observations, but the implications of these findings have not been explored for surgical practice. There is some evidence that fatigue, a stress related construct, may increase the time required for task completion and the number of errors made during laparoscopic procedures, but findings are contradictory (Jensen, Milner & Fisher, 2004).

However, specific intraoperative stressors have not been explored. Evidence relating stress responses to intraoperative performance is virtually absent. Despite evidence that negative stress responses decrease with experience, strategies for coping with surgical stress are not described. (Wetzel, Kneebone, Woloshynowych, Nestel, Moorthy, Kidd & Darzi, 2006).

## 1.2 Problem Statement

The aim of this study was to investigate surgeons' perceptions of surgical stress, highlight key stressors and their impact on performance, and identify coping strategies. Stress poses a serious risk for training surgeons since their performance and well-being is reflected in patients' health. This study focuses on measuring the stress on surgeons and at the same time evaluates prospectively the results of practices that uses alternative techniques to combat the effects of stress.

### 1.3 Methods and producers

#### 1.3.1 Data collection

The researchers chose a qualitative, interview-based approach to explore surgeons' perceptions in depth (Chrzanowska, 2002).

A purposive sample of Jordanian surgeons was recruited, drawn from both sexes and a range of seniority levels and surgical specialties. All participants were volunteers, and confidentiality and anonymity were ensured. Ethics approval was obtained. Interviews were performed by all researchers and were audiotaped and transcribed. In-depth, semi structured, individual interviews were performed by using a cognitive-behavioral theory-led topic guide to minimize biases by providing a consistent structure across the dataset. Accordingly, interviews addressed perceived stressors (What kind of things cause you stress?); stress responses including cognitions, emotions, behavior, physical, and environmental responses (What is your own stress response?); perceived consequences of stress (How did you feel after the surgery you just described?); and individual coping strategies (How do you cope with it?). Within this overall framework, each participant was invited to respond freely to open questions and identify key issues relating to their practice. This structure enabled all interviewees to explore the same topics. After questions about general stress, each participant was asked to choose an example of a surgery that was perceived as stressful, and to reflect on the stressors, their own stress response, and the strategies they applied to cope with it.

#### 1.3.2 Data analysis

Preliminary analysis of all interviews was performed by the interviewing researchers, identifying and coding key themes and comparing them across the dataset. Each interview then was analyzed independently by a second member of the research team with a background either in surgery, psychology, or sociology. Themes were discussed in detail and areas of agreement formed the basis of our negotiated thematic structure. Thematic analysis informed the recruitment process and continued until theoretical saturation (when interviews yielded consistent findings and no new themes occurred) was achieved.

### 1.4 Results and discussion

#### 1.4.1 The study sample

fourteen interviews were performed between April 2017 and June 2017. The researchers differentiated between trainee consultant surgeons (Table 1). In the following section, verbatim quotes are given as evidence and examples for clarification of the selected key themes. The quotes are marked with either "J" or "S," indicating a junior or senior surgeon, respectively; the number after each abbreviation references the subject code.

Table (1): Sample of interviewed surgeons

Category	Male	Female	Position expertise	Years in surgery
Junior	3	1	Trainees	3–5
Senior	6	4	Consultants	12–35

#### 1.4.2 General observations

THE Researchers noted a widespread initial tendency for surgeons to emphasize the positively challenging characteristics of their profession and to aver that stress was not a problem for them, "There is no such thing as stress in surgery . . . it[surgery]'s fantastic" (S14), especially when they were very experienced. On further exploration (eg, "How do you manage to stay calm during emergencies or surgical complication?") it became obvious that there are stressors, but experienced surgeons cope effectively and do not regard potential stressors as problematic. However, virtually all surgeons acknowledged that stress was a key factor in their practice (to date or during their training) and many showed great awareness of their inner states during stressful situations. Although stress can be beneficial, with many surgeons enjoying the challenges of their work, excessive levels of stress can be unhelpful and may lead to error. Interviews elucidated many sources of stress in surgical practice. Seniors showed high awareness of their actions and were able to describe their coping strategies with great clarity, although most emphasized that they apply such strategies unconsciously, "by automatic pilot" (S4), and therefore often do not perceive stressors as detrimental factors to their performance. Junior surgeons reported similar intraoperative stressors, but expressed uncertainty and described fragmented rather than sophisticated and complete coping strategies.

#### 1.4.3 Intraoperative stressors

Unexpected surgical complications and emergency cases were perceived as highly stressful and most likely to reach unhelpful levels of stress. Although advanced tasks (complex procedures or performing surgery on high-risk patients) were described as challenging rather than stressful, the combination of several stressors could lead to extremely high levels of stress.

#### 1.4.4 Stress responses

Stress can help to improve performance by enhancing alertness, concentration, focus, or efficiency of actions. However, when stress is too high it is perceived as unhelpful and detrimental to various aspects of surgical performance. Indicators of stress include the following.

#### **1.4.5 Physical responses**

Surgeons reported “feeling the adrenaline rush” (S4), heart pounding, sweating, headache, and physical tension while performing surgery. Effects on technical performance included feeling shaky, clumsy, less dexterous, and making small mistakes during the surgery such as “badly placed stitches” (S11).

#### **1.4.6 Emotional responses**

All surgeons described a variety of emotional responses to high stress such as anxiety, anger, frustration, and irritation. “You are doing the best for your patients and you are trying and keep a clear mind . . . but in yourself you feel anxious, yeah, that’s very difficult to describe” (S4). Feelings of high urgency to think, to decide and act, high pressure, and a tendency to rush were characteristic of junior surgeons.

#### **1.4.7 Cognitive stress responses**

Surgeons identified that stress influenced cognitive performance such as judgment and decision making. Most surgeons had experienced situations in which they were unable to think clearly. They perceived difficulties analyzing surgical problems logically and making decisions about the next steps. Straightforward actions could be perceived as difficult: “When it [stress] clouds your judgment . . . you feel you can’t make a decision . . . you can’t think objectively and stress combined with tiredness which often go hand in hand . . . you can’t make a decision on simple, simple things” (S3). Surgeons reported doubting earlier decisions or oscillating between 2 strategies: “You start doubting the diagnoses and thought ‘doubts, doubts, doubts, doubts’ and start spiraling downhill” (J6). Distractive thoughts were more likely to affect them such as worries about justifications after the surgery, their professional reputation, or medicolegal considerations. Junior surgeons reported difficulties in judging their own surgical competence and uncertainty regarding when to call for help in highly stressful situations.

#### **1.4.8 Behavioral responses**

Communication patterns change in stressful situations. Junior surgeons tend to over focus on the technical problem and reduce the exchange of information with the team “to a minimum” (S5). Some surgeons report that they become short tempered.

#### **1.4.9 Surgical coping strategies**

The following section summarizes coping strategies used by the surgeons in this sample. Key elements are recognition of stress as a risk factor and of problems when they arise; and control over self and the situation.

#### **1.4.10 Early recognition of risks**

Surgical practice involves inevitable stressors and surgeons have to deal with this as part of their job. The early Table 2 Intraoperative stressors Emergency cases Surgical complications Surgical error Unexpected bleeding Difficulties finding the source of a problem No progress Advanced tasks Complex procedure High-risk patient Multitasking Time pressure Immediate decision making Equipment problems Missing equipment Equipment failure Unfamiliar equipment Team work problems Incompetent staff Inexperienced staff Language problems Staff paying no attention Interpersonal issues Distractions Talking noises People walking in and out Bleeps Phone calls Personal factors Tiredness Hunger Illness Physical discomfort Personal problems C.M. Wetzel et al. / The American Journal of Surgery 191 (2006) 5–10 7 recognition of potential risk factors is crucial for successful coping. Senior surgeons recognize internal signals (eg, distractive thoughts, heart pounding, or clouded judgment) as indicators for stress in themselves. In contrast, junior surgeons did not consider or recognize their own stress or its detrimental effect on their performance: “Every minute counts . . . When it is finished you realize ‘Oh my God I’m shaking . . . but you might not have realized that that’s what happened to you at the time. But you do come out some situations thinking ‘Oh my God, I’m shaking’ ” (J13).

#### **1.4.11 Stop and stand back**

If unexpected complications occur, experienced surgeons stop what they are doing and try to gain time (eg, by putting pressure on bleeding). They stand-back mentally and regain self-control, then reassess the situation, make a decision, and prepare for the next stage. A guiding principle was to avoid over focusing on the task and break the vicious circle of anxiety and time pressure leading to clouded judgment and decision-making problems: “A good surgeon will actually stand back and probably what he is doing while he is standing back, putting pressure on it [the bleeding], is actually not just getting the right things to do the job properly but is also probably to reduce stress in himself” (S11).

#### **1.4.12 Control of self**

If you get stressed you don’t function properly” (S14). Senior surgeons recognize the importance of providing effective leadership of the surgical team. In stressful conditions, they first ensure that they are in control of themselves. Our respondents described in detail the process of getting back to an appropriate physical, cognitive, and emotional state. Key strategies are physical relaxation methods, distancing techniques, and self-talk. Physical relaxation. “You have to be relaxed. It’s like playing football. If you are not relaxed you are not going to play well” (S14).

### 1.5 Conclusion

This study draws on rich qualitative data to investigate the perceptions of a sample of surgeons. Individual interviews allowed us to explore these perceptions in depth, within a confidential and supportive environment, and in a way that lies beyond the scope of questionnaires. Interviewees were frank in acknowledging personal vulnerability and addressing uncomfortable issues, although there often was some initial reticence.

This openness suggests that a qualitative methodology was appropriate and that our interviewing standard was acceptable despite most interviewees being unfamiliar with this research method. This study confirms that surgery is a highly pressured field with specific demands.

These interviews provided valuable insights into stressors, stress responses, and coping strategies used by surgeons and allowed us to categorize sources of stress. Although surgeons characteristically enjoy the stimulating features of their work, high levels of stress can affect performance adversely.

### References

- Andreatta PB, Hillard M, Krain LP. The impact of stress factors in simulationbased laparoscopic training . *Surgery* 2010 ; 147 : 631 – 9.
- Arora S, Sevdalis N, Nestel D, Woloshynowych M, Darzi A, Kneebone R. The impact of stress on surgical performance: a systematic review of the literature . *Surgery* 2010 ; 147 : 318 – 30.
- Berguer R, Smith WD, Chung YH. Performing laparoscopic surgery is significantly more stressful for the surgeon than open surgery . *Surg Endosc* 2001; 15 : 1204 – 7.
- Blascovich J. *Surgical Challenge and Threat* . New York : Psychology Press, 2008.
- Christakis, I., Pagkratis, M. T., Varvogli, L., Darviri, C., & Chroussos, G. (2012). Measuring the stress of the surgeons in training and use of a novel interventional program to combat it. *Journal of the Korean Surgical Society*, 82(5), 312-316.
- Chrzanowska J. *Interviewing Groups and Individuals in Qualitative Market Research*. London: Sage; 2002.
- Helmreich RL, Wilhelm JA, Klinect JR, et al. Culture, error, and crew resource management. In: Salas E, Bowers CA, eds. *Improving Teamwork in Organizations: Applications of Resource Management Training*. Mahwah, NJ: Lawrence Erlbaum Associates; 2001:305–31.
- Jensen A, Milner R, Fisher C, et al. Short-term sleep deficits do not adversely affect acquisition of laparoscopic skills in a laboratory setting. *Surg Endosc* 2004;18:948–53.
- Poolton JM, Wilson MR, Malhotra N, Ngo K, Masters RSW. A comparison of evaluation, time pressure, and multitasking as stressors of psychomotor operative performance . *Surgery* 2011 ; 149 : 776 – 82.
- Wetzel, C. M., Kneebone, R. L., Woloshynowych, M., Nestel, D., Moorthy, K., Kidd, J., & Darzi, A. (2006). The effects of stress on surgical performance. *The American Journal of Surgery*, 191(1), 5-10.
- Wolf OT. HPA axis and memory. *Best Pract Res Clin Endocrinol Metab* 2003;17:287–99.