The effects of stress on surgical performance

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Abstract

Background: Although the general literature on stress and performance is extensive, little is known about specific effects of stress in surgical practice. This qualitative study explored key surgical stressors, their impact on performance, and coping strategies used by surgeons.

Methods: Individual in-depth semistructured interviews with surgeons were analyzed by 2 researchers independently. Key themes were discussed within the research team.

Results: Sixteen interviews were performed, including interviews with consultants (n = 9) and surgeons in training (n = 7). A wide range of intraoperative stressors was identified. Although stress had both positive and negative effects, undue levels of stress impaired judgment, decision making, and communication. Although junior surgeons showed uncertainty about their ability to cope, senior surgeons had developed sophisticated strategies for controlling each situation.

Conclusions: Although stress poses significant risks, coping strategies are not taught explicitly during surgical training. This article presents a framework for categorizing surgical stress and suggests key elements for effective coping strategies. © 2006 Excerpta Medica Inc. All rights reserved.

Keywords: Occupational stress; Surgical performance; Coping strategies; Training; Qualitative research

Stress is recognized as a significant factor affecting performance in aviation [1,2], the military [3], and competitive sports [4]. In all of these fields, specific training interventions have been established [5–7]. 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 [8,9]. Stress effects cognitive processes involving memory, recall of knowledge, and attention [10–12]. 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 [13,14], 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 well being [15–18] 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 [19,20], 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 [21,22]. 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 [23–25], strategies for coping with surgical stress are not described.

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.

Methods

Data collection

We chose a qualitative, interview-based approach to explore surgeons’ perceptions in depth [26,27]. A purposive sample of London 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 1 researcher (C.W.) and were audiotaped and transcribed.

In-depth, semistructured, 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.

Data analysis

Preliminary analysis of all interviews was performed by the interviewing researcher (C.W.), 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

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<th>Table 1: Sample of interviewed surgeons</th>
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<tr>
<td>Junior</td>
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<td>Senior</td>
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* 1 trainee had 11 years of experience.

the recruitment process and continued until theoretical saturation (when interviews yielded consistent findings and no new themes occurred) was achieved.

Results

Sample

Sixteen interviews were performed between November 2003 and May 2004. We 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.

General observations

We 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’s surgery’s fantastic” (S16), 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.

All participants reported that coping skills for highly
stressful situations never were considered during their surgical training or discussed formally among colleagues. The majority of our interviewees developed strategies by trial and error or by observing senior surgeons effectively dealing with difficulties during surgeries.

**Intraoperative stressors**

Table 2 lists key categories of external 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.

<table>
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<th>Stressors</th>
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<td>Surgical complications</td>
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<td>Surgical error</td>
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<td>Unexpected bleeding</td>
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<td>Difficulties finding the source of a problem</td>
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<td>No progress</td>
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<td>Advanced tasks</td>
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<td>Complex procedure</td>
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<td>High-risk patient</td>
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<td>Time pressure</td>
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<td>Immediate decision making</td>
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<td>Equipment failure</td>
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<td>Unfamiliar equipment</td>
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<td>Team work problems</td>
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<td>Incompetent staff</td>
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<td>Inexperienced staff</td>
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<td>Language problems</td>
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<td>Staff paying no attention</td>
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<td>Interpersonal issues</td>
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<td>Distractions</td>
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<td>Talking noises</td>
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<td>People walking in and out</td>
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<td>Bleeps</td>
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<td>Personal factors</td>
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<td>Tiredness</td>
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<td>Hunger</td>
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**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.

**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).

**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.

**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.

**Behavioral responses**

Communication patterns change in stressful situations. Junior surgeons tend to overfocus 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.

**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.

**Early recognition of self and the situation.**

Surgical practice involves inevitable stressors and surgeons have to deal with this as part of their job. The early
recognition of potential risk factors is crucial for successful coping. Senior surgeons recognize internal signals (e.g., distracting 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).

Stop and stand back

If unexpected complications occur, experienced surgeons stop what they are doing and try to gain time (e.g., 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 overfocusing 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).

Control of self

“If you get stressed you don’t function properly” (S16).

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 gonna play well” (S16).

Physical relaxation is described as an effective approach to reduce stress responses immediately. Surgeons use the stand-back time to apply relaxation methods such as deep breathing or simply waiting a few seconds until their heart rate decreases.

Distancing techniques. Distancing from the stressor—mentally or physically—is another strategy of breaking the vicious circle described earlier. Surgeons reported leaving the operating table briefly, thereby distancing themselves from the stressful environment. This approach enabled the surgeons to think clearly and logically before returning to the operation. Similarly, during very complex procedures they might move to another part of the surgery, returning to the problematic part later. Some surgeons explained standing back as a mental process. They tried to ignore all earlier decisions and start “thinking from scratch” (S16) to reassess the situation. Alternatively, some surgeons imagine what their consultant’s advice would be, or observe themselves as from a third person’s perspective: “Try to be a little bit ‘third person’ . . . what would be a sensible person’s recommendation to make this operation better for me” (S12).

Self-talk. Self-talk consists of self-instructions and a positive inner dialogue and can reduce both cognitive and emotional stress responses. Surgeons apply this strategy to calm down, improve their own confidence and focus, and guide themselves along the decision-making process with logical instructions.

“I have to keep thinking to myself: ‘I need to stay calm, I can deal with this . . . Let’s think logically. What is the next step that I need to do to regain control in this situation? How can I improve what I’m doing at the moment?’” (S7).

Control of the situation

To control a difficult situation, surgeons follow the stages of reassessment, decision making, intraoperative planning, preparing and leading the team, and solving the problem.

Reassessment. The reassessment of the situation involves standing back mentally, identifying the problem, highlighting the source of the problem, and exchanging information with the team.

Decision making. The surgeon considers alternative approaches to the problem, focusing on factors they can influence and comparing possible outcomes. Experienced surgeons anticipate possible problems, create back-up plans, and prioritize before making the final decision.

Intraoperative planning and preparing. After choosing a strategy the surgeon prepares the next steps. This includes ensuring that all necessary equipment is available and guiding the team.

Team communication and leadership. The majority of the surgeons emphasized that they try not to show their own stress, to reduce tension among the surgical team: “You do depend very much on the other members of the team in an operation . . . I feel I always have to give the air that I’m completely in control . . . Because if you start to panic, rush around, shouting at everybody then everybody gets upset and nobody does anything properly and the whole thing gets quite stressed” (S14).

However, it is usually the surgeon who takes the leadership role in high-stress situations. To ensure full attention, he or she must communicate clearly and be assertive: “I make myself more commanding, more assertive, let everybody know that I’m in control and if I speak they need to listen and they need to act . . . It becomes then a much more hierarchical structure than a team structure” (S7).

Solving the problem. Once a decision has been made and the preparations for the next stage are complete, the surgeon puts the plan into practice to deal with the problem. This in itself can have a reassuringly stress-reducing effect and lead to a positive feedback circle: “I think if you take the decisions and they are apparently the right ones the stress becomes less because you think ‘that’s good’ you know, ‘I’ve got control. We want the next step” (S4).
Comments

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.

The issue of intraoperative stress elicited strong responses in surgeons and seems particularly to affect non-technical performance: judgment, decision making, and communication. From safety research it is known that detrimental effects of these factors are related to errors and poor surgical outcome [28,29]. This article focuses on stress and coping during the intraoperative period only. Our data indicate that stressors beyond the operating theater also play a role in surgical practice, and that many surgeons apply preoperative and long-term coping strategies to enhance their performance. This will be addressed in other publications.

The coping strategies we have identified are highly specific to intraoperative crisis management. Decision-making pathways and team leadership under acute stress appear especially important. The situational control strategies described by our participants matched the categories of a recently developed rating system for nontechnical surgical skills [30], whereas reported self-control techniques such as relaxation and self-talk are elements similar to interventions known from clinical psychology [31]. However, the surgical coping strategies identified in our study cover general principles such as reduction of own stress levels, problem solving, and stressor avoidance, strategies that are in line with the evidence-based 3-factorial model of emotion-orientated, task-orientated, and avoidance-orientated coping [32] and with elements from the well-established coping theory of Folkman and Lazarus [33]. This locates our findings within the wider context of coping strategies.

An obvious limitation of our study was the fact that all participants were from hospitals in 1 city. However, our sampling strategy and methodology provided rich information from a range of surgeons, and the fact that we reached theoretic saturation supports the conceptual framework that we present.

The need for effective coping strategies is evident. At present, surgeons develop such strategies individually, in the course of their training and subsequent practice, through observation and by trial and error. Despite calls in the literature for formal training, stress-management strategies rarely form a part of the surgical curricula. We hope that the framework outlined in this article will increase awareness of the detrimental effects of undue surgical stress and contribute to the development of interventions to minimize them. In this way the quality of surgeons’ experiences and the outcomes of their surgeries are likely to improve, to the benefit of surgeons and patients alike.

Acknowledgments

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References


