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# Assessment of stress and teamwork in the operating room: an exploratory study

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## Abstract

**BACKGROUND:** Although effective teamwork is fundamental to patient safety in the operating room (OR), acute stress increasingly is recognized as detrimental for teamwork. This study concurrently assessed teamwork and stress levels experienced by OR team members.

**METHODS:** Data were collected in real time in 20 elective surgical cases. The validated Observational Teamwork Assessment for Surgery was used to assess teamwork, whereas stress was assessed using the validated State-Trait Anxiety Inventory.

**RESULTS:** Teamwork was overall above the scale midpoint, with higher scores preoperatively than in subsequent phases of the procedure, and also higher ratings for anesthetic subteams compared with surgical and nursing subteams (all  $P < .01$ ). Overall stress levels were low. Qualitative analyses revealed differences across team members: circulating staff preoperatively and assistant surgeons intraoperatively and postoperatively were most likely to be stressed.

**CONCLUSIONS:** The study offers a feasible method for concurrently assessing stress and teamwork in the OR and reveals differences across team members' stress levels as surgery unfolds. This methodology can be used to increase understanding of the impact of stress on team performance in the OR.

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Effective teamwork is fundamental to patient safety in the operating room (OR) with suboptimal team behaviors frequently lying at the heart of adverse events or near misses.<sup>1,2</sup> Understanding team dynamics in the OR, the way teams function, and the factors that facilitate or impede teamwork is critical to the achievement of high-quality care. Acute stress increasingly is recognized as a factor implicated in poor OR teamwork. Evidence outside health care

suggests that excessive levels of stress are deleterious to team performance.<sup>3–5</sup> The cognitive and behavioral mechanisms by which this occurs have been attributed to a restriction of attentional focus affecting information processing capabilities and shared mental models among team members.<sup>3–5</sup> For example, stress causes a shift in team members' perspective from a team-level focus to a narrowed self-focus that excludes other members of the team, often resulting in loss of team cohesion and support, and eventually poor outcomes for the team as a whole.<sup>5</sup>

Within surgery, the OR is a team environment, in which teams consisting of professionals with different training and backgrounds are expected to function opti-

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mally in a high-risk environment that is littered with an array of potential stressors. These stressors often arise concurrently: the ever-present time pressure often is paired with inexperience in some team members, unavailable equipment, and distraction to the operating surgeon.<sup>6–8</sup> Taken together, such stressors can threaten both team function and patient safety, especially when technical problems also are present, including patients with multiple comorbidities or difficult anatomy.<sup>6–8</sup> To date, however, the effect of stress on surgical team performance has received little attention. Research exploring stress and performance typically has concentrated on individual members of the OR, such as surgeons<sup>9</sup> or anesthesiologists.<sup>10</sup> How stressful events are perceived by the entire OR team and how such events impact on team performance remain largely unexplored in surgery.

Evidence outside surgery shows that stress potentially can affect everyone within a team.<sup>11</sup> Importantly, teams that are successful in managing high-demand, high-stress situations have been found to have a “shared mental model”<sup>12</sup> among team members. A shared mental model means that the team members (in the case of the OR, surgeons, anesthesiologists, and nurses) have similar perceptions of their stressful environment, its requirements, and how best to cope with them.<sup>13</sup> How stress affects different OR team members and how surgeons’, anesthesiologists’, and nursing staff’s perceptions of a stressful situation in the OR compare is an important question. It is plausible, for example, that dealing with difficult anatomy while at the same time multiple distractions are present in the OR is stressful for the surgeon, but goes unnoticed by nursing staff. Optimal teamwork in the OR would mean that in such a case the nursing staff should strive to minimize distraction so the surgeon can focus on the task and perform it safely.

The aim of this study was to address this lacuna in the evidence base. Primarily, we sought to explore the feasibility of concurrently assessing the quality of teamwork in the OR and the levels of stress experienced by individual team members (surgeons, anesthesiologists, and nurses). Recently developed, validated metrics of teamwork and stress were used for these assessments. Moreover, we sought to provide a detailed, robust exploration of patterns of stress and OR teamwork performance across subteams (surgeons, anesthesiologists, and nurses) and surgical phase (preoperative, intraoperative, and postoperative). The questions of interest were as follows: (1) is the concurrent assessment of teamwork performance and stress patterns in OR teams feasible? (2) Are different patterns of stress and teamwork performance across OR subteams (surgeons, anesthesiologists, and nurses) and surgical phase (preoperative, intraoperative, postoperative) evident in the OR?

Clear and comprehensive understanding of the feasibility of concurrent assessment of teamwork performance and stress in the OR will allow robust assessment as to whether increased levels of stress in OR teams are associated with poorer teamwork performance and outcomes.

## Methods

### Design and participants

This was a prospective, cross-sectional study conducted in the OR of a university teaching hospital. Twenty general surgical teams each consisting of 6 team members (primary operating surgeon, surgical assistant, anesthesiologist, anesthetic assistant, scrub nurse, and circulating nurse) were recruited using convenience sampling. Data were collected in real time from 20 elective surgical cases (including hernia repairs, laparoscopic cholecystectomies, laparoscopic Nissen funduplications, and laparoscopic/open hemicolectomies). All patients had an American Society of Anesthesiologists grade of I to II. All cases were performed by an attending surgeon under general anesthetic. Ethical approval and informed consent were obtained before data collection.

### Outcome measures

**Teamwork.** Teamwork of the OR team was assessed using the Observational Teamwork Assessment for Surgery (OTAS) tool. OTAS is a validated measure<sup>14</sup> that assesses 5 teamwork-related behaviors: communication, leadership, cooperation, coordination, and monitoring. Each behavior is scored on a 7-point scale with clearly defined anchors. Different scores are provided for each subteam in the OR (surgical, anesthetic, and nursing) and across the different phases of surgery (preoperative, intraoperative, and postoperative). Thus, for each procedure, OTAS generates 45 scores (5 behaviors  $\times$  3 subteams  $\times$  3 phases), thus providing a comprehensive measure of teamwork (the intraoperative OTAS form is provided in the Appendix).

**Stress.** Stress was assessed for each OR member separately using the validated short-form of the State-Trait Anxiety Inventory (STAI) questionnaire.<sup>15</sup> The tool consists of 6 items that quantify the physical, cognitive, and emotional aspects of stress by asking participants to respond to statements referring to feeling calm, tense, upset, relaxed, content, and worried. Each adjective is scored on a scale of 1 to 4 (the positive items are reverse-scored), thus yielding a total score ranging from 6 to 24 per team member. Higher scores indicate greater stress. The STAI has shown strong concurrent validity with objective indexes of stress, including heart rate and salivary cortisol, and has shown very good sensitivity and specificity in capturing OR stress.<sup>16</sup>

### Procedure

An observer (L.H.) with a background in psychology and significant experience with surgical observations (100+ cases at the time of the study) assessed teamwork behaviors in real time in the OR using OTAS. A subset of cases ( $n = 9$ ) also were rated by a second, blinded observer (E.K.) to

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