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Factors related to teamwork performance and stress of operating room nurses

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Aim: To evaluate operating room nurses' perception of teamwork performance and their level of mental stress and to identify related factors.

Background: Little is known about the factors affecting teamwork and the mental stress of surgical nurses, although the performance of the surgical team is essential for patient safety.

Methods: The questionnaire survey for operation room nurses consisted of simple questions about teamwork performance and mental stress. Multivariate analyses were used to identify factors causing a sense of teamwork performance or mental stress.

Results: A large number of surgical nurses had a sense of teamwork performance, but 30–40% of operation room nurses were mentally stressed during surgery. Neither the patient nor the operation factors were related to the sense of teamwork performance in both types of nurses. Among scrub nurses, endoscopic and abdominal surgery, body mass index, blood loss and the American Society of Anesthesiologists physical status class were related to their mental stress. Conversely, circulating nurses were stressed about teamwork performance.

Conclusions: The factors related to teamwork performance and mental stress during surgery differed between scrub and circulating nurses.

Implications for nursing management: Increased support for operation room nurses is necessary. The increased support leads to safer surgical procedures and better patient outcomes.

KEYWORDS

mental stress, operation room, teamwork performance

1 | INTRODUCTION

The operating room (OR) is a complex high-risk environment, with potential risk for adverse events including serious injury and the death of a patient. The majority of adverse events in hospitals are attributable to surgical care, and about half are preventable (de Vries, Ramrattan, Smorenburg, Gouma, & Boermeester, 2008). The operating room teams consist of several kinds of professionals, including surgeons, anaesthesiologists, nurses and surgical technicians. Nurses working in the operating room include scrub and circulating nurses. The role of the scrub nurse is to provide skilled assistance to the surgeon and to count things used for surgery, including sponges, needles and instruments during and at the end of the surgical procedure. A scrub nurse works with one or more surgeons during the operation. A circulating nurse works outside the sterile field and coordinates the needs of the surgical team by ensuring that all necessary items are delivered aseptically to the sterile surgical field. Since several human and system factors adversely affect surgical events in the operating room, numerous studies have been undertaken to improve operating room team performance (Greenberg et al., 2007; He, Ni, Chen, Jiang, & Zheng, 2014; Mazzocco et al., 2009; Vincent, Moorthy, Sarker, Chang, & Darzi, 2004).

High-quality teamwork among operating room professionals has been suggested to be a key to efficient and safe practice. Team

familiarity in the operating room is built upon mutual understanding, and the stability of dedicated team members may enhance teamwork performance (Gillespie, Chaboyer, & Fairweather, 2012; Gillespie, Chaboyer, Longbottom, & Wallis, 2010). Several authors have reported that training among operating room teams improves operating room efficiency and outcomes, indicating the importance of teamwork in the operating room (Armour Forse, Bramble, & McQuillan, 2011; Mishra, Catchpole, Dale, & McCulloch, 2008; Phitayakorn, Minehart, Hemingway, Pian-Smith, & Petrusa, 2015). Surgical teamwork performance constitutes an important element of patient safety (He et al., 2014; Vincent et al., 2004). To provide the best surgical care for the patient, team members must work together, communicate and coordinate properly. Disruptive behaviour by a member of the surgical team leads to negative patient outcomes. In actual settings, there are some discrepancies between surgeons and operating room nurses with respect to attitudes towards teamwork (Flin, Yule, McKenzie, Paterson-Brown, & Maran, 2006; Prati & Pietrantoni, 2014). Operating room nurses rate teamwork with other nurses higher than with surgeons, while surgeons rate teamwork with each other and with nurses equally high (Carney, West, Neily, Mills, & Bagian, 2010). It is probable that differences between nurses and surgeons with respect to their sense of teamwork may influence several surgical performances. Lack of continuity in the operating room team has the potential to diminish individual and team performance, thus compromising patient safety.

Research exploring stress and team performance has typically concentrated on individual members in the operating room (Arora, Sevdalis, et al., 2010; Nyssen, Hansez, Baele, Lamy, & De Keyser, 2003). Poor communication in the operating room leads to an increased risk of death or major complications, and communication failures cause procedural errors and delays (Greenberg et al., 2007; Mazzocco et al., 2009). Stressors in the operating room commonly include technical performance, time pressure, personal relationships and increased workload (Arora, Sevdalis, et al., 2010; Moorthy, Munz, Dosis, Bann, & Darzi, 2003; Wetzel et al., 2010). Stress has been increasingly recognized as a factor implicated in poor operating room teamwork, suggesting that excessive levels of stress are deleterious to team performance (Hull, Arora, Kassab, Kneebone, & Sevdalis, 2011a; Lingard, 2004).

Because stress is often perceived as a sign of weakness or failure of a staff member and because the mental stress of members and teamwork performance in the operating room are difficult to evaluate qualitatively, the surgical community seldom acknowledges that mental stress and teamwork performance in the operating room are associated with surgical performance (Arora, Sevdalis, et al., 2010; Moorthy et al., 2003). However, as noted above, the sense of communication, stress and teamwork performance is related to a safe surgery as well as operating room team performance (Bezemer, Korkiakangas, Weldon, Kress, & Kneebone, 2016; Hull et al., 2011a; Phitayakorn et al., 2015). In addition, distractions in the operating room associated with impaired teamwork, higher mental workload and higher stress is different among physicians and nurses (Wheelock et al., 2015). Since scrub and circulating nurses constitute a component of the operating room team, several roles played by the scrub and circulating nurses may contribute greatly to the overall performance of the surgical team (Kang, Massey, & Gillespie, 2015; Riley, Manias, & Polglase, 2006). Their perceptions of and attitudes toward teamwork performance and stress might also be an indicator of overall performance of the operating room team. Thus, operating room nurses' sense of teamwork performance and level of mental stress on each operation was evaluated in the study. We performed a questionnaire survey on each participated operation to assess the presence of stress and teamwork performance of operating room nurses. In order to assess the stress and teamwork performance of operating room nurses during operation, a questionnaire survey was performed with respect to operating room nurses in each operation. The aims of the present study were as follows:

- evaluate operating room nurses' sense of teamwork performance and level of mental stress on each operation.
- To identify surgical factors related to the sense of teamwork performance and mental stress in operating room nurses.

Thus far, although self-control of mental stress during an operation may affect team performance, the effect of stress on surgical teamwork performance has received little attention within the surgical community. The study findings might be useful in increasing support for operating room nurses and lead to a better and safer patient outcome.

2 | METHODS

2.1 | Settings

A questionnaire survey was conducted at the Fukuoka Sanno Hospital in Fukuoka, Japan. The hospital has 199 beds, 30 medical specialties and 700 employees. Surgical, orthopaedic, gynaecological, otorhinolaryngological, neurosurgical and urological cases are treated in the central operating department, which administers anaesthesia to more than 3000 patients annually. The mean length of hospital stay was 9.8 days, and 625 outpatients presented daily.

2.2 | Study period

This study was conducted from 1 October 2015 to 11 November 2015.

2.3 | Participants

Scrub and circulating nurses who participated in surgical procedures performed by an attending surgeon under a general anaesthetic during the study period were included. Questionnaires were administered to the surgical nurses (i.e., scrub and circulating nurses) immediately after each surgical procedure, and a nurse's perception during the previous operation was measured.

2.4 | Questionnaire

The questionnaire consisted of four simple questions: (1) 'How many years of experience do you have in the operating room', with responses of '1–3 years' or '≥ 4 years'; (2) 'Are you mentally stressed during

surgery?' with responses of 'yes' or 'no'; (3) 'Do you feel a sense of teamwork performance during the operation?' with responses of 'yes' or 'no'; and (4) 'Who was the key person in the operation?' with responses of 'doctor' or 'nurse'; 'doctor' included the primary surgeon, assisting surgeon and anaesthesiologist, and 'nurse' included scrub and circulating nurses. A strong association between one-item stress measure and Zung's Self-rating Depression Scale (SDS) among Japanese citizens was demonstrated (Ajiki & Morimoto, 1991). It was revealed that nurses correctly understood the concept of teamwork performance as early as 2002 (Mitsui et al., 2002). In addition, a report of the Ministry of Health, Labour and Welfare acknowledged that the concept of teamwork performance was well understood in the medical setting in Japan (Nomura, 2010). Thus, we believe the one-item measures for stress and teamwork performance have a high level of validity. As for an item concerning a key person during surgery, this item evaluated the value of a role during surgery. To secure a higher response rate to the survey and to avoid conflict between operating room nurses, questionnaire items concerning the identity of the responders, such as name, sex and age, were not included in the questionnaire.

In addition, information concerning the patient and the operation, such as the patient's age, sex, body mass index (BMI), disease type (benign disease or not), operation starting time (a.m. or p.m.), surgical site (abdomen or not), operative method (endoscopic surgery or not), operation time, anaesthesia time, volume of blood lost, presence of tracheal intubation, and American Society of Anesthesiologists (ASA) physical status class were collected from the patient's operation records.

2.5 | Data analysis

The chi-square test was used to compare the answers to the questionnaire survey between scrub and circulating nurses. Multivariate analyses were used to identify factors causing mental stress or sense of teamwork performance during the surgery. Specifically, we used logistic regression analysis and calculated the odds ratios with 95% confidence intervals, setting the feeling of mental stress ('yes' = 1, 'no' = 0) and sense of teamwork performance ('yes' = 1, 'no' = 0) as dependent variables. A value of $p < .05$ was considered significant. Analyses were performed using JMP Pro11 for Windows software (SAS Institute, Cary, NC, USA).

2.6 | Ethical considerations

This study was approved by the hospital ethics committee (FS-148). Informed consent was obtained from the participating nurses before data collection. The study participants were given written information explaining the aims, procedures and benefits of the study.

3 | RESULTS

In total, 375 questionnaire surveys were returned (183 from scrub nurses and 192 from circulating nurses). The operating room nurses participated in 279 surgical cases across nine surgical specialties performed by an attending surgeon under general anaesthesia from 1 October 2015 to 11 November 2015. We matched the cases by patient identification number and selected 129 cases in which both scrub and circulating nurses answered for the same operation. After excluding five cases due to incomplete operation records (such as blood loss data), 124 cases (44.4%) were used in this study (Figure 1).

With actual rates of mental stress (yes) and teamwork performance (yes) in the scrub and circulating nurses, the samples for each group provided power levels of 0.186 and 0.922, respectively, with a type I error of 5% (Allchin, 2001). Table 1 shows the backgrounds of the operating room nurses, the characteristics of the 124 patients, and the operating procedures included in the analysis. Twenty-five (24 females and one male; mean age, 31.2 ± 8.1 years; range, 21–45 years) nurses participated in this study; the participants had 1–25 years of operating room work experience (1–3 years: 12 nurses, ≥4 years: 13

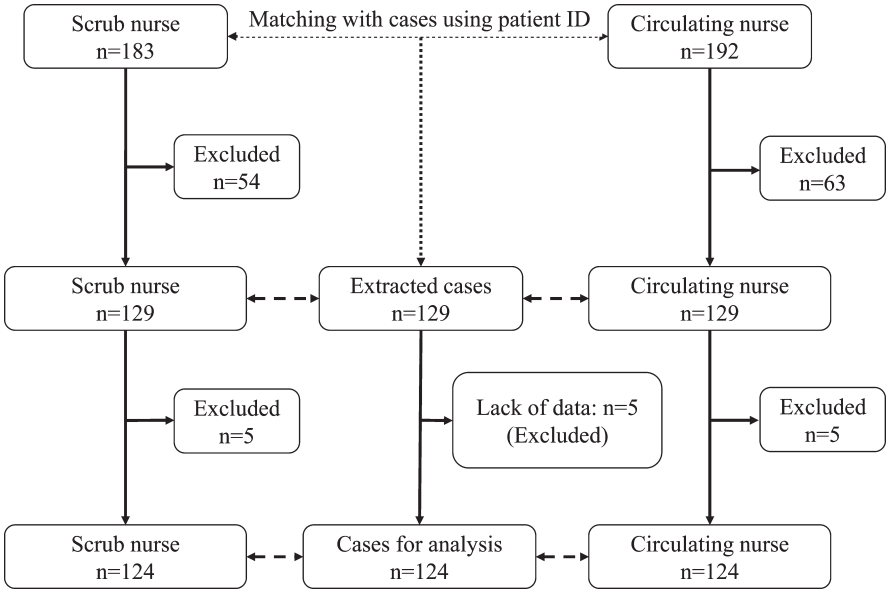

FIGURE 1 Selection of the study participants

TABLE 1 Background of the operating room (OR) nurses and the characteristics of the patients and surgical procedures

Background of operating room nurses (*n* = 25)	
OR nurses	
Age (years) mean ± SD	31.2 ± 8.1
Gender (female), *n* (%)	24 (96.0)
Years of experience: ≥4 years, *n* (%)	13 (52.0)
Characteristics of cases (*n* = 124)	
Patient	
1. Age (years), mean ± SD	45.6 ± 15.9
2. Gender (female), *n* (%)	96 (77.4)
3. BMI (kg/m^2), mean ± SD	21.6 ± 3.3
4. Disease (benign), *n* (%)	113 (91.1)
Operation	
5. Start time, a.m., *n* (%)	61 (49.1)
6. Surgical site, abdomen, *n* (%)	59 (47.6)
7. Endoscopic surgery, *n* (%)	71 (57.2)
8. Operation time, (min), median (range)	62 (2–384)
9. Anaesthesia time (min), median (range)	94 (11–520)
10. Blood loss (ml), median (range)	10 (0–850)
11. Tracheal intubation, *n* (%)	105 (84.7)
12. ASA class (≥2), *n* (%)	42 (33.9)

BMI, body mass index; ASA, American Society of Anesthesiologists.

TABLE 2 Numbers and percentages of cases among the nine surgical specialties at the hospital

	All cases, *n* (%)	Cases for analysis, *n* (%)
Gynaecology	149 (53.4)	68 (54.8)
General surgery	31 (11.1)	20 (16.1)
Orthopaedic surgery	54 (19.4)	13 (10.5)
Neurosurgery	24 (8.6)	9 (7.3)
Plastic surgery	8 (2.9)	7 (5.6)
Otolaryngology	8 (2.9)	3 (2.4)
Urology	2 (0.7)	2 (1.6)
Dermatology	2 (0.7)	1 (0.8)
Ophthalmology	1 (0.4)	1 (0.8)
Sum	279 (100)	124 (100)

nurses). Table 2 shows the numbers and percentages of the nine surgical specialties among the 124 cases. Gynaecological operations comprised the most cases for analysis (54.8%). The majority of the patients were females with benign disease (such as ovarian cysts and uterine myoma). More than half the surgical procedures were endoscopic surgery (57.2%), including laparoscopic, arthroscopic and neuroscopic surgery.

Table 3 presents the results of the operating room nurse questionnaire survey (*n* = 124). Significantly more scrub nurses than circulating nurse were inexperienced (1–3 years). Most of the operating room nurses answered 'yes' to a sense of teamwork performance. Scrub nurses felt a significantly greater sense of teamwork performance in the operating room compared with that of circulating nurses, but the presence of mental stress and the key person involved in the surgery were not different between the nurse types. Most answers to the key person were the primary surgeon and one of the nurse types (scrub nurse: 53.2%, circulating nurse: 53.2%).

The results of the multivariate analysis for factors affecting mental stress (yes) and sense of teamwork performance (yes) in the two nurse types are shown in Tables 4 and 5, respectively. Body mass index, blood loss, ASA physical status class, and doctor as the key person were significantly associated with scrub nurses feeling mental stress. Surgical site, endoscopic surgery and a sense of teamwork performance were significantly associated with circulating nurses feeling mental stress. No patient- or operation-related factors differed between scrub and circulating nurses.