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Distractions in the operating room: a survey of the healthcare team

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Abstract

Background Distractions during surgical procedures are associated with team inefficiency and medical error. Little is published about the healthcare provider's perception of distraction and its adverse impact in the operating room. We aim to explore the perception of the operating room team on multiple distractions during surgical procedures.

Methods A 26-question survey was administered to surgeons, anesthesia team members, nurses, and scrub technicians at our institution. Respondents were asked to identify and rank multiple distractions and indicate how each distraction might affect the flow of surgery.

Results There was 160 responders for a response rate of 19.18% (160/834), of which 71 (44.1%) male and 82 (50.9%) female, 48 (29.8%) surgeons, 59 (36.6%) anesthesiologists, Certified Registered Nurse Anesthetists (CRNA), and 53 (32.9%) OR nurses and scrub technicians. Responders were classified into a junior group (< 10 years of experience) and a senior group (≥ 10 years). Auditory distraction followed by equipment were the most distracting factors in the operating room. All potential auditory distractions in this survey were associated with higher percentage of certain level of negative impact on the flow of surgery except for music. The top 5 distractors belonged to equipment and environment categories. Phone calls/ pagers/ beepers and case relevant communications were consistently among the top 5 most common distractors. Case relevant communications, music, teaching, and consultation were the top 4 most perceived positive impact on the flow of surgery. Distractors with higher levels of "bothersome" rating appeared to associate with a higher level of perceived negative impact on the flow of surgery. Vision was the least distracting factor and appeared to cause minimal positive impact on the flow of surgery.

Conclusions To our knowledge, this is the first survey studying perception of surgery, anesthesia, and OR staff on various distractions in the operating room. Fewer unnecessary distractions might improve the flow of surgery, improve OR teamwork, and potentially improve patient outcomes.

Keywords Distraction · Perioperative team · Surgeon · Anesthesia team · Auditory distraction

The complex task of surgery requires a high level of concentration and fine-motor skills to attain precision and coordination of decision and hand movements to maneuver instruments. Unfortunately, the reality of the operating room (OR) is that it is full of distractions, which can be broadly grouped into those arising from auditory sources, visual sources, or equipment failure/issues [1]. Recent studies point to distraction in the OR as one of the most important contributing factors in up to 50% of hospital errors [2].

Some suggest that new surgeons need to learn how to focus their attention on the surgery at hand or learn to engage in multitasking that entails the filtering out distractions while maintaining focus and control over the surgical procedure [3]. Limited operative experience from restricted working hours primarily due to concerns over fatigue, or lockdown due to unforeseen events such as recent COVID-19 pandemic has raised the interest in developing other

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mechanisms towards training residents to assuage concerns over surgical proficiency and competency. Specifically, efforts have been made to develop simulator-based training and validated tests of proficiency [4] [5]. However, the development of these training simulators has not replicated the environmental variables of a busy and potentially distracting OR. A deep understanding of multiple distractions faced by surgeons, anesthesia, and OR staffs is mandatory to create a realistic simulator or training environment that replicates the multifaceted nature of a busy and distracting OR.

Personnel working in the operating theater have a variety of ages, academic and professional backgrounds and participate in a diverse range of roles and responsibilities within the team to ensure the best surgical outcomes. It seems unlikely that such a heterogeneous team would have homogenous views on different distractions and how each distraction might affect their performance [6]. Several publications in controlled settings or observational studies have reported undesired impact of distractions on surgical outcomes [7] [8]. However, there is no study investigating the perceptions of medical staffs on multiple distractions in the operating room.

We aim to investigate the perception of healthcare teams that include surgeons, anesthesia team members, and operating room nurses on multiple potential distractions and their subjective evaluation of each distraction on the flow of surgery.

Methods

Following Institutional Review Board approval of our exempt protocol, the survey was distributed, and responses were collected through an online survey and research tool (REDCap). An e-mail was sent that included a brief introduction to the study and a link to the survey. A follow-up e-mail was sent 2 weeks after the initial e-mail. Data were collected between March 1st and March 31st, 2021. The anonymous survey was voluntary and was not compensated. No identifiable data were collected. The participation and completion of the survey implied participant's consent.

Participants included surgeons, anesthesiologists, Certified Registered Nurse Anesthetists (CRNA), mid-level (physician assistants, nurse practitioners), and Operating Room (OR) nurses at a large academic hospital, both in training and in practice. Participant information including gender (male, female, non-binary, prefer not to answer), profession (surgeon, anesthesiologist, CRNA, mid-level, scrub technician, circulating nurse), years of experience (less than 1 year, 1 to 5 years, 5 to 10 years, 10 to 20 years, over 20 years) was collected. Responders were classified into junior group (less than 10 years of experience) and senior group (at least 10 years of experience).

After a review of the literature, a list of multiple distractors was created by our research team including surgeons, anesthesiologists, operating room nurses, and research assistants (Online Appendix). We classified potential distractors into five categories: auditory, visual, communication, equipment, and environmental. The survey was based on the perceptions of individual participants. The 26 closed-ended questions aimed to explore subjective responses regarding which distractions were thought to be most distracting during a critical part of their work and solicited opinions on how each distraction affect the flow of surgery. A 5-point Likert scale was used to capture participant's subjective opinions on the frequency and, the level of impact of each distraction. At the end of each category was an open-ended section where participants could share individual opinions or list other potential distractions which were not included in the survey.

For the question "how often do you experience the following in the operating room?", the responses "1. never" and "2. rarely" were aggregated as "not common", and the responses "3. sometimes", "4. very often" and "5. always" were aggregated as "common."

For the question "on a scale from 1 to 5 (1 = not bothersome and 5 = very bothersome), on average, how bothersome do you find the following in the operating room?", the responses 1 and 2 were aggregated as "low level of bothersome," and the responses 3, 4, and 5 were aggregated as "high level of bothersome."

For the question "on a scale from 1 to 5 (1 = negative impact, 2 = somewhat negative, 3 = no impact, 4 = somewhat positive, and 5 = positive impact), on average, how would you rate the impact of the following on the flow of the surgery in the operating room?", the responses 1 and 2 were aggregated as "certain level of negative impact," 3 as no impact, the responses 4 and 5 were aggregated as "certain level of positive impact."

Demographic factors were assessed using descriptive statistics and presented as sample size and percentages. Frequency of individual question responses was also calculated. Chi-square tests were used to examine differences for each survey question by gender, profession, and years of experience. Not all respondents answered those questions; however, the missing data were minimal, with the missing rate ranging from 1 to 5 percent. Therefore, all analyzes were based on completed cases only. Significance level was set at 0.05, and statistical analysis was performed using SPSS 25.0.

Results

There were 160 responses for a response rate of 19.18% (160/834), of which 48 (29.8%) were surgeons, 59 (36.6%) were anesthesia providers, and 53 (32.9%) were OR staff (scrubs nurses, circulating nurses). Total responses were from 59 (36.6%) attending, 37 (23%) in training personnel. Respondents were 71 (44.4%) male, 82 (51.3%) female. There were 96 (59.6%) junior group with less than 10 years of experience and 64 (39.8%) senior group with at least 10 years of experience. There was higher proportion of junior respondents in anesthesia (43, 44.8% vs 16, 25%, $p = 0.035$) but no difference in gender between the two groups.

Among the 5 proposed categories of distraction including auditory, visual, communication, equipment, and environment, auditory distraction followed by equipment were the most distracting during the critical part of the work with no difference in gender, professionals, and years of

Table 1 Ranking of the most distracting category during critical part of the work

	Total N = 160	Male N = 71	Female N = 82	Surgery N = 48	Anesthesia N = 55	OR staff N = 53	< 10 years N = 96	> 10 years N = 64
Auditory (ranking) (n, %)	1 (67, 41.6)	1 (30, 42.3)	1 (36, 43.9)	1 (20, 41.7)	1 (33, 55.9)	1 (14, 26.4)	1 (41, 42.7)	1 (26, 40.6)
Visual (ranking) (n, %)	5 (9, 5.6)	5 (4, 5.6)	5 (5, 6.1)	4 (3, 6.3)	5 (1, 1.17)	5 (5, 9.4)	5 (8, 8.3)	5 (1, 1.6)
Communication (ranking) (n, %)	4 (16, 9.9)	3 (8, 11.3)	4 (7, 8.5)	3 (6, 12.5)	4 (3, 5.1)	4 (7, 13.2)	4 (10, 10.4)	3 (6, 9.4)
Equipment (ranking) (n, %)	2 (34, 21.1)	2 (15, 21.1)	2 (18, 22)	2 (13, 27.1)	2 (8, 13.6)	2 (13, 24.5)	2 (15, 15.6)	2 (19, 29.7)
Environment (ranking) (n, %)	3 (19, 11.8)	3 (8, 11.3)	3 (11, 13.4)	4 (3, 6.3)	2 (8, 13.6)	3 (8, 15.1)	3 (14, 14.6)	4 (5, 7.8)

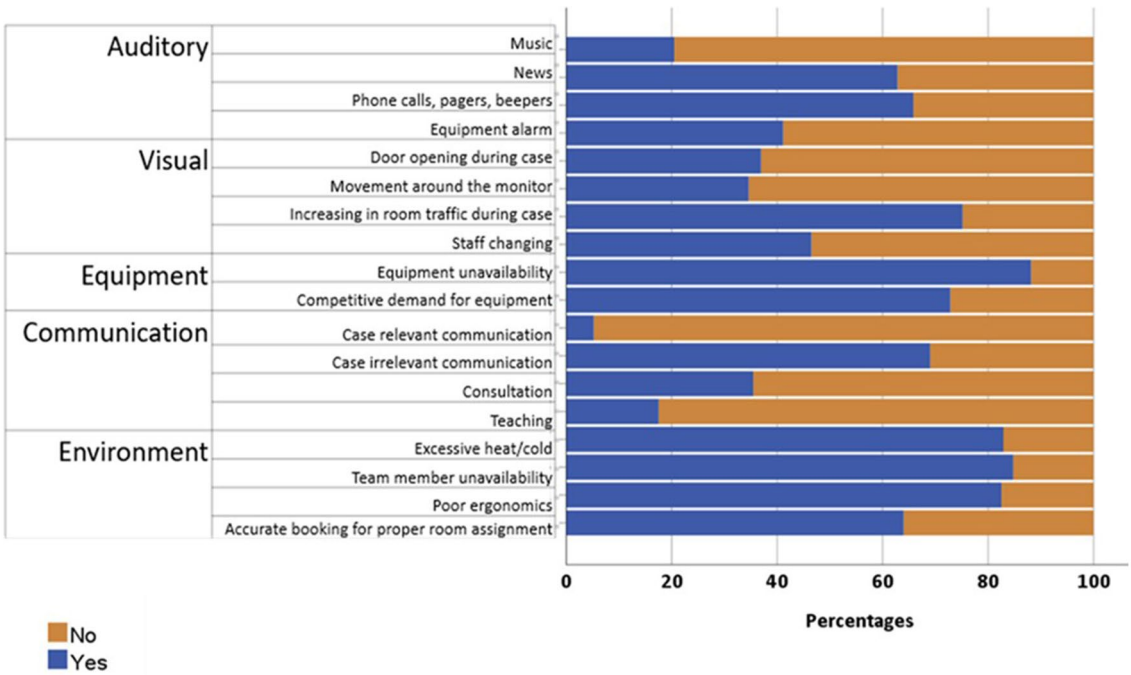

Fig. 1 List of distractors (total cohort)

experience. Communication is the 3rd among the senior group and surgical professionals. It is the 4th among the junior group and other professionals. Vision is the least distracting factor. (Table 1).

Even though auditory was considered the most distracting category during the critical part of the work in the operating room, the top 5 distractors belonged to the equipment and environment categories (Fig. 1). Equipment unavailability, team member unavailability, and poor ergonomics consistently made the top 5 distractors across all groups with slightly different rank order. Case irrelevant communication was among top 5 in anesthesia and senior group, while phone calls/pagers/beepers were included in the top 5 for OR staff (Table 2).

Equipment unavailability, team member unavailability, competitive demand for equipment, excessive heat/cold, poor ergonomics, phone calls/pagers/beepers comprised the top 5 most bothersome distractors with interchangeable rank order. Not surprisingly, equipment unavailability and team members unavailability consistently occupied the top 5 most bothersome distractors in the operating room with no difference in gender, professional and years of experience. OR staff (84.6%) appeared to experience the competitive demand of equipment more commonly than surgery (46.8%) and anesthesia providers (53.7%), $p < 0.0001$. OR staff are also more likely to experience "accurate booking for proper room assignment" as distracting than surgery or anesthesia providers (83.7% vs 39.1% vs 50.9%, $p < 0.0001$). Excessive heat/cold was among the top 5 most bothersome distractors except for OR group. Poor ergonomics appeared to cause high levels of bother for others except for the senior group. Phone calls/pagers/beepers was among the top 5 most bothersome distractors for across all female participants, OR staff, and senior group. (Fig. 2) (Table 3).

Music, phone calls/pagers/beepers, equipment alarm, staff changing, increasing in room traffic during cases, case relevant or irrelevant conversations, and teaching interchangeably occupied the top 5 most common distractors in the operating across the groups with variable rank orders. However, phone calls/pagers/beepers and case relevant communications were consistently among the top 5 most common distractors regardless of gender, profession and years of experience. Music was the 3rd most common distractor in the operating room in general but not among male, surgery, and senior group. Instead, case irrelevant communications were quite common among these three groups. Staff changing was perceived a common event in general cohort, female, and surgery group. (Fig. 3) (Table 4).

Case relevant communications, music, and teaching were the top 3 most perceived positive impact on the flow of surgery across all groups. Equipment alarm was the 5th distractor with positive impact across all groups except for OR staff who considered accurate booking for proper room assignment. Not surprisingly, distractors with higher levels of bother appeared to be associated with negative impact on

Table 2 List of distractors

	Total (%)	Male (%)	Female (%)	Surgery (%)	Anesthesia (%)	OR (%)	Junior (%)	Senior (%)
Music	20.5	16.9	23.2	14.6	23.7	22.6	18.8	23.4
News	60.9	52.9	69.1	68.1	62.5	58.5	62.8	62.9
Phone calls, pagers, beepers	65.8	52.1	76.8	75	42.4	83	64.6	67.2
Equipment alarm	40.4	35.2	46.8	50	44.1	30	43.8	37.7
Door opening during case	38.5	33.3	41.5	27.1	32.1	51.9	38	35.9
Movement around the monitor	36.6	27.5	42	37.5	32.1	35.3	37.4	31.3
Increasing in room traffic during case	73.3	66.7	80.5	79.2	69.6	76.9	76.1	73.4
Staff changes	52.2	42	48.8	64.6	39.3	36.5	40.2	54.7
Equipment unavailability	83.2	85.1	91.1	91.3	81.5	92.2	89.8	85.7
Competitive demand for equipment	68.3	71.2	73.4	71.1	63	84.3	75	69.4
Case relevant communication	9.9	7.2	3.8	4.3	3.6	7.8	6.7	3.2
Case irrelevant communication	66.5	66.7	71.3	74.5	70.9	63.5	63.3	78.1
Consultation	37.9	34.8	37.5	44.7	19.6	45.1	36.7	34.4
Teaching	21.1	14.5	19	17	10.7	26	16.9	18.8
Excessive heat/cold	78.3	82.4	84.8	82.6	87	80.4	87.6	77.4
Team member unavailability	79.5	85.1	83.5	89.1	81.5	84	83	87.1
Poor ergonomics	76.4	76.1	87	78.3	83.3	85.4	88.4	74.2
Accurate booking for proper room assignment	59.6	62.1	65.8	63	58.5	70	62.5	65.6

%: percentage of answer "yes" to the question: Do you consider the following distractors in the operating room?

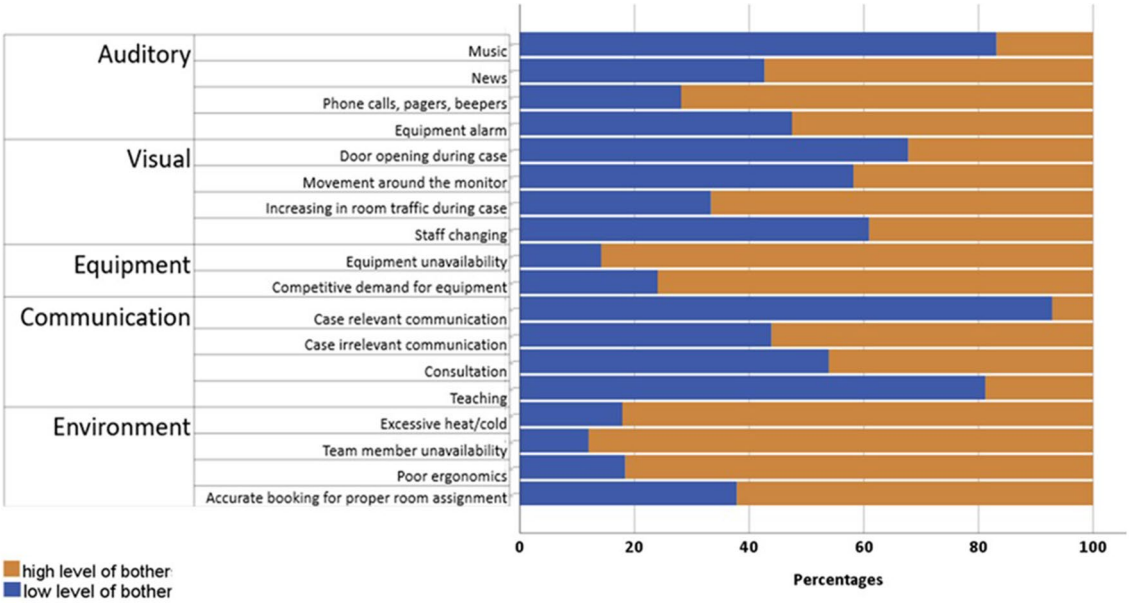

Fig. 2 How bothersome do you find the following in the operating room? (Total cohort)

Table 3 How bothersome do you find the following in the operating room?

	Total (%)	Male (%)	Female (%)	Surgery (%)	Anesthesia (%)	OR (%)	Junior (%)	Senior (%)
Music	17.4	11.3	22.2	8.5	16.9	24.5	12.5	23.8
News	55.9	58	55	67.4	57.9	49.1	56.4	59.7
Phone calls, pagers, beepers	71.5	63.4	79	78.7	54.2	84.9	68.8	76.2
Equipment alarm	51.5	43.7	62	59.6	53.4	46.2	53.1	52.5
Door opening during case	34.8	29.9	35.4	26.1	19.6	51.9	29.7	36.5
Movement around the monitor	44.7	41.2	44.3	38.3	38.2	50	41.1	43.5
Increasing in room traffic during case	64.4	54.4	76.8	61.7	57.1	80.8	67	65.6
Staff changes	41	32.4	43.9	48.9	26.8	42.3	31.9	48.4
Equipment unavailability	82.6	86.8	86.4	89.1	76.4	92.5	89	81
Competitive demand for equipment	86.4	73.5	78.8	73.9	63	90.6	77.8	73
Case relevant communication	6.9	4.3	10	6.5	3.6	11.8	6.7	7.9
Case irrelevant communication	54	54.3	58.8	63	51.8	55.8	51.6	63.5
Consultation	48.4	42	50	58.7	30.4	52.9	46.7	46
Teaching	18	10.1	25	13	12.5	31.4	16.7	22.2
Excessive heat/cold	77	76.5	87.2	80	85.7	79.6	84.4	78.3
Team member unavailability	82	85.1	89.7	88.9	83.9	91.7	83.1	95
Poor ergonomics	76.6	75.8	85.5	77.8	80	87	87.4	72.9
Accurate booking for proper room assignment	57.1	56.9	66.7	52.3	54.5	79.2	59.1	66.1

%: percentage of answer "4", or "5 very bothersome" to the question: How bothersome do you find the following in the operating room?

the flow of surgery. Equipment unavailability, competitive demand for equipment, excessive heat/ cold, team members unavailability consistently comprised the top 5 most perceived negative impact on the flow of surgery across all groups. All potential auditory distractions in this survey were associated with higher percentage of a certain level of negative impact on the flow of surgery except for music which had 66.4% of positive impact. None of the listed visual distractors appeared to offer high level of perceived positive impact on the flow of surgery; instead, respondents' answers seemed to divide between negative and no impact. (Fig. 4).

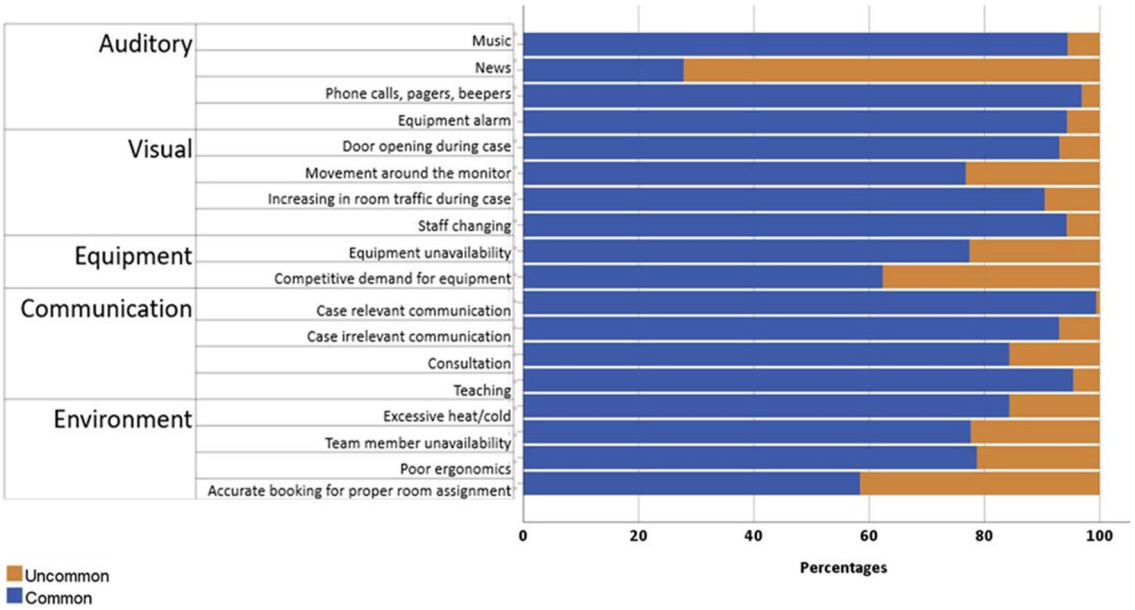

Fig. 3 How often do you experience the following in the operating room? (Total cohort)

Table 4 How often do you experience the following in the operating room?

	Total (%)	Male (%)	Female (%)	Surgery (%)	Anesthesia (%)	OR (%)	Junior (%)	Senior (%)
Music	94.4	91.5	97.6	85.4	96.6	100	95.8	92.2
News	29.2	27.1	27.5	22.9	27.6	31.4	28.4	25.8
Phone calls, pagers, beepers	96.9	97.2	98.8	95.8	98.3	96.2	95.8	98.4
Equipment alarm	93.2	95.8	92.5	91.7	100	90.2	96.8	90.5
Door opening during case	90.7	91.3	95.1	85.4	94.6	98.1	90.2	96.9
Movement around the monitor	73.9	78.3	77.5	79.2	67.9	84	74.4	79.7
Increasing in room traffic during case	88.2	88.4	92.7	89.6	87.5	94.2	89.1	92.2
Staff changes	91.1	91.3	97.6	93.8	96.4	92.3	94.6	93.8
Equipment unavailability	74.5	70.6	82.7	76.6	69.1	86.5	81.3	71.4
Competitive demand for equipment	59.6	52.9	67.5	46.8	53.7	84.6	63.3	60.3
Case relevant communication	95.7	100	100	100	98.2	100	98.9	100
Case irrelevant communication	90	94.3	92.5	93.6	92.6	92.3	90.1	96.9
Consultation	80.1	83.8	87.5	77.8	85.7	88.2	83.3	85.5
Teaching	90.7	92.8	98.7	93.5	98.2	94	95.5	95.2
Excessive heat/cold	80.1	78.3	88.6	65.2	94.6	90	87.8	79
Team member unavailability	73.4	72.1	81	67.4	71.4	93.6	78.7	75.8
Poor ergonomics	73.2	67.2	87.2	69.6	72.7	93.8	81.6	74.2
Accurate booking for proper room assignment	54	45.5	67.9	39.1	50.9	83.7	60.2	55

%: percentage of answer "always" or "very often", or "sometimes" to the question: How often do you experience the following in the operating room?

Female gender was more likely to experience poor ergonomics in the OR (87.2% vs 67.2%, $p=0.009$), and improper room assignments (67.9% vs 45.5%, $p=0.008$). Increasing in room traffic during the case was more likely to cause higher level of bother in female (76.8% vs 54.4% in male, $p=0.014$). A significant higher number of OR staff considered phone calls, beepers during the case a distractor as opposed to other professionals (83% vs 75% in surgery vs 45.8% in anesthesia, $p<0.0001$). Not surprisingly, OR staff rated intraoperative phone calls, and beepers with a

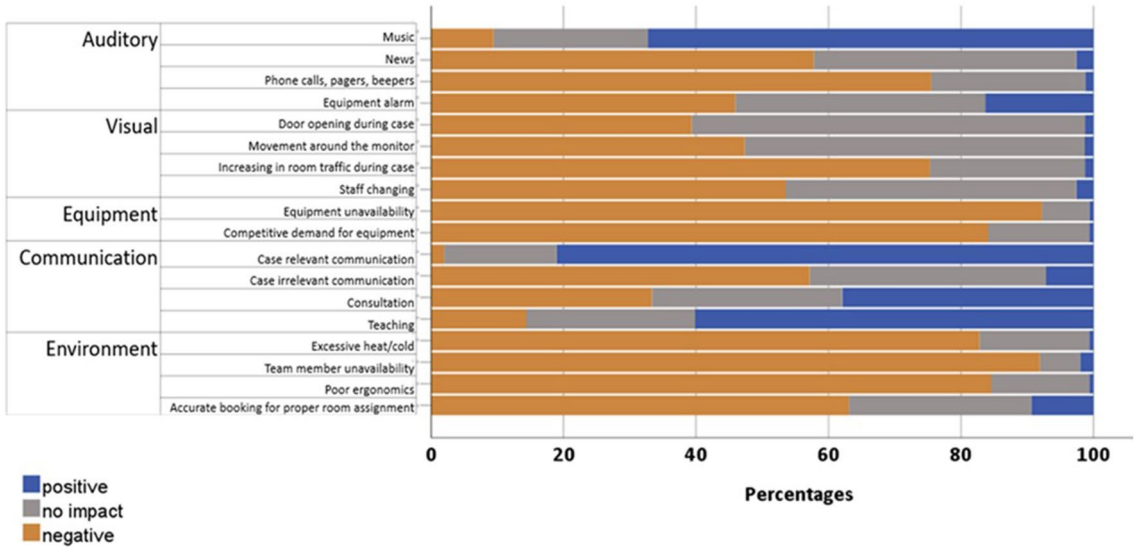

Fig. 4 How would you rate the impact of the following on the flow of surgery in the operating room?

high level of bother (84.9% vs 37.7% in surgery vs 54.2% in anesthesia, $p=0.001$). OR staff also perceived an increase in room traffic during the case to be associated with high level of bother (80.8% vs 61.7% in surgery vs 57.1% in anesthesia). Similarly, door opening during the case was associated with high level of bother for OR staff (84.9% vs 78.7% in surgery vs 54.2% in anesthesia. OR staffs were more likely to experience competitive demand for equipment (84.6% vs 46.8% in surgery vs 53.7% in anesthesia, $p<0.0001$), which also was associated with a high level of bother (90.6% vs 73.9% in surgery vs 63% in anesthesia, $p=0.004$). Anesthesia team and OR staff were more likely to experience extreme heat or cold in the operating room than surgery (94.6% in anesthesia vs 90% in OR staff vs 65.2% in surgery, $p<0.0001$). OR staff perceived team member unavailability to be a common distraction (93.8% vs 69.6% in surgery vs 72.7% in anesthesia). Slightly higher portion of junior group perceived music as a positive impact compared to senior group (77.7% junior vs 53.1% senior, $p=0.003$). Team member unavailability caused high level of bother in senior group (95% vs 83.1% in junior, $p=0.029$). Junior group considered poor ergonomics to be associated with a high level of bother (87.4% vs 72.9%, $p=0.027$) and a negative impact on the flow of surgery (94.3% vs 70.5% in senior, $p<0.0001$).

Discussion

The motivation for conducting a survey of perceived distraction among healthcare staff in the operating room is to portray the view of not only surgeons but also of anesthesia providers and OR staff as a complete surgical team from their own perspectives on multiple potential distractions. We also aimed to raise the discussion on how to implement distractions into developing a realistic simulation that can replicate the actual OR environment for comprehensive training for surgical teams. From this survey, one can gain an understanding of multiple types of distractions faced by surgical teams and how distractions potentially impact the flow of surgery.

Our study found that auditory was the most distracting category in the operating room during critical parts of the work. Of concern is that the operating room, the area where concentration and effective communication should be paramount, was thought to be the noisiest area within the operating room complex including operating room, recovery area, waiting area [9]. Analysis of free text comment confirmed that noise was distracting, particularly during critical parts of the work such as timeout, intubation, critical surgical dissection. This survey did not specifically investigate the level of noise pollution in the operating room. However, most listed in the comments, are loud noises including chatting, music, sudden noises from dropping instruments, or slamming and banging sounds when setting up/ breaking down trays. The World Health Organization (WHO) recommends that noise in operating rooms should not exceed 30 dB (A), equivalent to whispering quietly in the library [10], but this may not be practically achievable in most theaters. Many studies have found that average noise levels can range from 55 to 80 dB SPL [11]. In simulated settings, surgeons faced with auditory distractions exhibited lower surgical skill proficiency, speed, and accuracy [12].

All potential auditory distractors in this survey were associated with higher percentage of respondents who perceived

them as having a certain level of negative impact on the flow of surgery except for music which had 66.4% of respondents what perceived it as a positive impact. Majority of respondents in this survey did not consider music a distractor. Music as a unique type of noise could be a double-edged sword. One limitation of this survey is we did not specifically investigate the volume, intensity and choice of music which were reported to variably improve or diminish the performance of surgeons and anesthesiologists [13]. It may also have a calming effect on teamwork and patients [14]. Respondents in our survey raised several important issues which should be considered when deciding on the musical environment in the operating room. Specifically, music played at anything other than a low volume may interfere with their ability to hear and respond to monitor alarms. The respondents were also anxious that music should not obstruct effective verbal communication between members of the surgical team.

Phone calls, pagers or beepers were among the top 5 most common auditory distractors with no differences in gender, profession, and years of experience. A major concern with phones and pagers is that they occur at unexpected times regardless of the clinical workload, whereas case-irrelevant conversations in the OR usually occur during periods of low workload. Avidan et al. reported that none of incoming calls, pagers observed during 52 surgical procedures were related to the current anesthetized patients, while 63.6% of these calls were work-related, 15.5% were related to private matters [15]. Zheng et al. found that pager and telephone interruptions occurred 4 times per hour, making up 3% of disruptions and not affecting surgical workflow [16]. Sulka et al. conducted a simulated laparoscopic cholecystectomy in surgical residents at a single institution to determine if pager interruptions affect operative time, safety, or complications during surgical procedures. They found that pager interruptions did not affect operative time, safety, or complications during the simulated procedure. However, there were significant failures in the evaluations and management of pager issues [17]. An in vitro study by Hsu et al. proved that the performance of experienced surgeons, in contrast to that of novices, was not affected by distraction [18]. This suggests that training technical skills to a high level of performance outside the OR could minimize the effect of distraction on performance during real-time surgery.

Our survey showed that even though auditory distraction was considered the most distracting category during critical parts of the work, the top 5 recognized distractors actually belonged to equipment and environment categories regardless of gender, profession, or years of experience. We also found that equipment unavailability, competitive demand for equipment, excessive heat/ cold, and team members unavailability consistently comprised the top 5 most perceived negative impacts on the flow of surgery across all groups. Wheelock et al. also demonstrated that device-related interruptions were associated with high levels of stress among the OR team members [19]. In their study, the rate of equipment distractions during the observed procedures, most of which were missing, wrong equipment or equipment failure, was not negligible- approximately one equipment-related distraction every 90 min of a procedure. Although this may not be particularly high, when they occur, equipment problems can be frustrating and a significant source of delay. Recognition of equipment-related distraction can help guide future safety interventions. An implementation of a preoperative checklist for devices that were frequently missing produced a 53% reduction in device-related interruption [20]. Moreover, OR staffs seemed to experience competitive demands for equipment and accurate booking for proper room assignments more commonly than other professionals. These findings are not surprising, given that equipment preparation, and management as well as OR scheduling and room setting fall directly within the OR nurses' professional role and responsibilities. This is an example of a problem, which could be addressed with adequate preoperative planning and communication, including a preoperative briefing.

While environmental distraction was the 3rd most distracting factor in the operating room, it was the least distracting factor in the surgical group, and 4th in the senior group. A study by Hsu et al. showed that the performance of experienced surgeons, in contrast to that of novices, was not affected by distraction [18]. This suggests that training technical skills to a high level of performance outside the OR could minimize the effect of distraction on performance during real-time surgery. Healey et al. found that equipment and environmental events were less frequent than noise from pagers, phone calls, or beepers, conversations among personnel, but they often involved several team members, mostly the surgeons and sterile/scrub technicians. Equipment and work environment problems were more frequent in laparoscopic operations, contributing to significantly higher interference for laparoscopic operations compared to open surgery [21]. We did not address how subspecialty affects individual perspectives on distractions; hence, it is an area for further evaluation.

In this survey, visual distraction was the least distracting category, while its effect on the flow of surgery was either negative or no impact. In the free comment section, respondents raised the concern for surgical site infection associated with door opening during cases, staff changing or increasing room traffic during cases. Similarly, Jung et al. reported that door opening may be linked to increased risk of surgical site infections, as it increases the inflow of larger particles, which were more likely to be microorganisms [22]. A majority of those surveyed considered staff changing a common distractor with no impact on the flow of surgery. Staff changing was a distractor for surgery team and senior group and associated with certain level of negative impact.

In a retrospective review of 814 patients who underwent minimally invasive sacrocolpolexy by Giugale et al., staff changes were not associated with major complications or prolapse recurrence but did increase OR time [23]. Talsma et al. performed a cross-sectional cohort study of over 900 general surgery procedures and demonstrated a nonsignificant trend toward having major postoperative complications when there was a higher number of nursing personnel involved in a procedure ($p = 0.08$; odds ratio [OR], 1.226; 95% confidence interval [CI], 0.98- 154) [24]. More recently, a retrospective study of 579 major gynecologic and gynecologic oncology procedures showed that scrub tech handoffs were significantly associated with having any postoperative complications (OR, 2.12; 95% CI, 1.00- 4.47), of which infection was the most common [25].

Limitations

When interpreting these results, it should be borne in mind that they are opinions collected from individual team members, not the opinion of the team as a whole. The performance of the team may be considered to be paramount importance with respect to patient care. Therefore, avoidance of a detrimental effect on just one member of the team that might outweigh any small, positive effect on the performance of the team should be taken into consideration. There were potential limitations to our study. We did not look at outcomes or cases related distractions in this survey. The goal of this survey is to investigate how stakeholders in the OR perceive different types of distraction in general regardless of the types of surgeries or their subspecialities. Categorization of distractions was based on an extensive literature search and developed by our research team including surgeons, anesthesiologists and OR staffs. As such, ambiguous distractions might be grouped in certain category based on the research teams' majority opinion. In order to address for this limitation, we offered a free comment option for respondents. However, the perception of distraction is a complex construct, and the validity evidence for using our questionnaire to measure this construct is still preliminary. Even though we had 160 respondents with equal distribution among profession, gender, and years of experience, it only represented 18% of the potential sample. Survey distribution utilizing not only email invitation but also paper, and mail-in options might have increased the response rate for future studies. The survey was conducted at a single large academic institution which might limit generalizability of our results. Following this exploratory phase, to validate the clinical impact of distractions, future large-scale studies should investigate the correlation between perceived distractions of healthcare staffs in the operating room and measurable surgical outcomes such as operative time, cost, and perioperative outcomes.

Conclusions

This is the first survey on perception of healthcare staffs in the operating room inclusive of surgeons, anesthesia providers, and OR staffs on multiple distractions in the operating room. Even though auditory distraction was considered the most distracting category during the critical part of the work, the top 5 distractors belonged to equipment and environment categories. Distractors with higher levels of bothersome appeared to associate with a perceived negative impact on the flow of surgery. Reduction of distractions might have an impact on the flow of surgery.

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Declarations

Disclosures Dr Bao-Ngoc Nasri, Dr John D. Mitchell, Dr Cullen Jackson, Dr Keitaro Nakamoto, RN Charlotte Guglielmi, Dr Daniel B. Jones have no relevant conflicts of interest or financial ties to disclose.

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