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'Can you hear me?' Barriers to and facilitators of communication in the presence of noise in the operating room

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Abstract

Aim

The aim of this study was to explore health professionals' perceptions of the impact of noise on communication in the operating room.

Sample and setting

Health professionals working in the operating room at a tertiary, affiliated, major referral hospital in northern Australia were recruited using purposive sampling.

Method

Semi-structured interviews were undertaken using an exploratory qualitative design to explore health professionals' perceptions of communication and the impact of noise in the operating room. Interviews were transcribed verbatim and analysed using thematic analysis.

Results

In all, 26 health professionals participated, including anaesthetists, surgeons, nurses and theatre technicians. Two themes were analysed from the data: barriers to communication and facilitators of communication in the operating room. Barriers to communication focused on difficulties that health professionals experienced when attempting to communicate in the presence of noise – difficulty hearing in noisy operating rooms, positioning of health professionals, and inability to filter out sounds. Facilitators of communication consisted of health professionals' adaption to the presence of noise during communication – non-verbal communication, such as gestures, and the ability to filter out unwanted sounds.

Conclusion

Health professionals of all levels of experience encounter communication difficulties. With increased experience, health professionals are able to filter out unwanted sounds provided the OR is not too noisy. Consideration needs to be given to the use of space and positioning of noise emitting equipment to optimise communication in the OR. Furthermore, communication can be facilitated by the judicious use of non-verbal communication.

Keywords: operating room, communication, noise, communication barriers, interdisciplinary communication, health communication

Background

The operating room (OR) is busy, with activities such as opening paper packets and handling instruments and equipment, and noisy with phones ringing, alarms sounding, music being played and devices emitting noise[1–6]. Such noise-emitting devices may include suction, forced air patient warmers, high volume suction units and the anaesthetic machine which may sound alarms. Health professionals in the OR include anaesthetists, surgeons, nurses and theatre technicians. When trying to communicate effectively, these health professionals must compete with the noise generated by devices and activities. When surveyed about noise and communication, health professionals acknowledged that the OR was a noisy environment which impacted negatively on their ability to deliver patient care[7].

There are three main sources of noise in the OR – conversations, equipment and music. These result in average sound pressure levels ranging from 55 to 70 decibels (A weighted) (dB(A))[8,9]. The average sound pressure levels for various types of conversation are 45 to 55 dB(A) for quiet conversations[9], 60 dB(A) for normal conversations[10] and 61 to 70 dB(A) reported for speaking with raised voices[11,12]. Therefore, with the diverse range of average sound levels in the OR, health professionals would be required to raise their voice in order to be heard.

Past research has found that health professionals, whether they were undertaking a task or not, experienced diminished ability to communicate effectively with the sound levels commonly in the OR[13]. In their research, Way et al.[13] assessed the surgeon's ability to understand and repeat words, with and without undertaking a task, with and without music playing, and with typical OR noises including quiet, filtered noise and background OR noise[13]. In another study, that used a cross-sectional design to survey the effects of noise on work practices in the OR, surgeons expressed that they found noise distracting during OR activities such as completing the surgical safety checklist[14]. Two cross-sectional studies surveying anaesthetists found that good communication among health professionals was an important factor in delivering patient care[15], and poor communication resulted in surgical or procedural delay[16]. In another cross-sectional study, OR health professionals were surveyed on teamwork and communication, with nurses explaining that a hierarchy within the health care team led to reluctance to raise concerns about patient safety issues[17]. Past research into communication failure in the OR found the failure rate ranged from nine percent[18] to 57 per cent[19] of all communication events, depending on the type of procedure, surgical specialty and the phases of the surgical procedures observed. Communication between OR health professionals is an essential component of delivering patient care, with communication failure negatively impacting patient safety[20].

Communication failure is a common cause of adverse events that originate in the OR with consequences including surgical count errors leading to retained surgical products, patient harm or death; wrong site or side surgery, and wrong implant inserted[21,22]. A qualitative study identified communication failure, with information not being communicated, to be a result of hesitancy and reservation[23]. In a grounded theory study using semi-structured interviews, communication failure was interpreted as a lack of respect by the surgeons and other team members who participated in the study[24].

Past research into communication in the OR has used surveys focussing on communication between OR health professionals, quality of communication during laparoscopic surgery, communication and teamwork, and the impact of noise on OR health professionals' work practices[14–17,25]. In studies where qualitative designs were used, the focus was on team communication[23], the impact of tension on communication[26], interdisciplinary communication dynamics[24] and communication behaviours for effective workplace practice[27]. There has been little previous work on how noise impacts communication. Health professionals' perceptions and experiences of communicating in the presence of noise needs to be further explored to enable a deeper understanding of communication and the influence of noise in the OR.

Aim

The aim of this study was to explore operating room health professionals' perceptions of the impact of noise on communication in the operating room.

Sample and setting

The research was undertaken at a tertiary university-affiliated hospital, which services a large rural and remote area of Northern Australia. Participants were 205 health professionals employed in the operating suite, including surgeons, surgical trainees, anaesthetists, anaesthetic trainees, perioperative nurses and theatre technicians.

Information about the research was presented to health professionals during weekly meetings and followed up by email and with information notices placed at various sites in the

operating suite. Further information was given to those who expressed an interest in participating, and a mutually agreeable interview time was organised. Interviews were conducted in a quiet room within or adjacent to the operating suite. Purposive sampling was used to recruit participants from each health professional group to ensure representation from each group and a wide range of ages, years of experience and number of years working at the research site[28].

Inclusion criteria for participating health professionals were a minimum of two weeks worked and at least one day per week working in the operating rooms at the research site. Exclusion criteria were working only in the preoperative or post-operative care of patients.

Methods

This research used an exploratory qualitative methodology with semi-structured interviews to investigate how health professionals perceived the impact of noise on communication in the operating room[29]. The research was granted ethical approval from the research site ethics committee ((2017.2801) and the university (1749562).

The interviews were undertaken by the first author using a topic guide (Table 1) derived from past research[7,27] and guided by the first author's clinical experience as a perioperative nurse working at the research site[19,30]. The first author underwent training, and the other authors had experience in undertaking qualitative interviews with content expertise in perioperative nursing, patient safety and interprofessional communication. Semi-structured interviews were audio-recorded, transcribed verbatim and analysed by all authors using thematic analysis[31], enabling themes to be explored and interpreted.

Table 1: Topic guide for interviews

Topic wording
1. How do you think noise impacts communication in the OR?
2. What do you think influences communication in the OR?
3. Tell me about any problems you have had communicating in the OR. Can you describe a situation where this has occurred?

The thematic analysis process consisted of five stages – becoming familiar with the data in the transcripts, conceptualising the themes, applying the themes to the data, rearranging the data into the themes and mapping the themes[31]. NVivo for Mac (version 11.4.3, Melbourne) was used to manage the data during the final two stages of the analysis process.

Rigour during the recruitment and data analysis phase was maintained by the selection of participants, the use of a reflective journal and collaborative discussion during the analysis process. During the data collection, the first author kept a journal to record reflections after each interview. The reflective journal was also used to prepare for the interview to ensure no preconceived ideas were included in the data collected[23]. During the analysis process, the data coded into each theme were regularly reviewed to ensure the definition of each theme was consistent throughout the analysis process[32]. Each theme was discussed collaboratively with all authors to ensure consistency throughout the coding process[26,33].

Results

In all, 26 interviews were undertaken ranging from 17 to 65 minutes with an average length of 29 minutes. Ten participants were women, and 16 were men. The anaesthetists included seven consultants and one trainee. Of the nurses interviewed, two were anaesthetic nurses, four were instrument–circulating nurses and two were anaesthetic–instrument–circulating nurses. The surgeons comprised five consultants and three trainees from a range of surgical specialties – ear, nose and throat (n = 2), general surgery (n = 3), neurosurgery (n = 1), ophthalmic surgery (n = 1), and orthopaedic surgery (n = 1). Four participants spoke a language other than English at home (Table 2).

Two major themes emerged from data analysis – 'barriers to communication in the presence of noise' and 'facilitators of communication in the presence of noise'.

Barriers to communication in the presence of noise

The theme 'barriers to communication in the presence of noise' consisted of three sub-themes – 'hearing difficulties in noisy ORs', 'positioning of health professionals' and 'being unable to filter out sounds'.

Hearing difficulties in noisy operating rooms

Participants expressed that their attitudes to noise changed as they grew older. A surgeon reported that younger health professionals were still able to communicate in the presence of noise. However, he reported becoming less tolerant of noise in the OR as he aged. The surgeon described:

Table 2: Characteristics of participants (N = 26)

Demograhics		n
Occupation	Anaesthetists and trainees	8
	Surgeons and trainees	8
	Nurses	8
	Theatre technicians	2
Number of years working in OR	Less than 1 year	1
	1–5 years	3
	6–10 years	14
	11–15 years	3
	More than 16 years	5
Number of years at research site	Less than 1 year	5
	1–5 years	14
	6–10 years	3
	11–15 years	3
	More than 16 years	1

> I think younger people … in the operating [room] tolerate noise and seem to manage with communication. Certainly, my experience has been that I was more tolerant of noise in the operating [room] when I was younger. (SC4)

An anaesthetist, aged between 26 and 35 years, described that he was becoming more frustrated conversing in a noisy OR as he grew older. Another surgeon also attributed his communication difficulties in noisy ORs to hearing loss caused by aging. This surgeon commented that he was unaware of noisy ORs when he was a trainee; however, as a consultant this situation had changed and he experienced difficulties while trying to communicate.

Positioning of health professionals

The layout of equipment in an OR varied according to the room's size and physical layout and position of items such as gas supply outlets and power points. How the space in the OR was used when positioning the equipment influenced where health professionals were able to stand and move around during surgery, and thus had impact on their ability to communicate.

A surgeon observed that he was required to use the same speciality equipment irrespective of the size of the OR. This resulted in less space for health professionals to navigate and approach a person to converse quietly when operating in a small OR. Instead, a health professional had to speak in a raised voice over the noise emitted by the equipment. The surgeon reported:

> … in [a small operating room], the scrub nurse has to be confined to a corner because of the arrangements of the [equipment] … So, I find perhaps the nurse has to talk more often or speak more loudly to reach the nurse on the other end. But in [a large operating room] … there is more space to move around so you can quietly ask the nurse whatever you need. (SC1)

An instrument–circulating nurse commented that positioning equipment, such as the suction and electrosurgical units, near the foot end of the OR table negatively impacted effective communication. Instrument–circulating nurses positioned near the equipment were required to raise their voice in order to be heard. This was a concern raised by the nurses when required to complete the surgical count.

An anaesthetic nurse recounted a situation affected by the position of the suction and electrosurgical units in the OR. In this situation, a circulating nurse was experiencing difficulties understanding what the instrument nurse was asking. The anaesthetic nurse was situated on the opposite side of the OR and could clearly hear the circulating nurse asking the instrument nurse to repeat the request. The anaesthetic nurse described:

> I have noticed that if I'm over the other side [of the OR] to where the [instrument] trolley tends to be … They may be going back and forth with a 'May I have this?' … 'What are you saying?' … I can hear perfectly well what that [instrument nurse] is saying, … and I will venture over and say this is what they want. (NAIC2)

Being unable to filter out sounds

The ability to clearly comprehend conversations required health professionals to filter out some of the sounds in the OR, allowing them to focus on conversations that were necessary at the time. However, health professionals reported that when the OR was noisy, they were unable to filter out these sounds.

An inexperienced instrument–circulating nurse, with limited working experience in the OR, became overburdened when attempting to listen to all conversations occurring around her. The nurse recalled:

> At the moment I'm trying to listen to everybody. … You have the anaesthetists talking to their students. … You have the surgeon speaking to the other nurse and all the other different noises and bits and pieces. … at the moment I'm just taking it all in …, it becomes a little bit overwhelming. (NIC1)

When the OR was noisy, a theatre technician was unable to concentrate on requests made by other members of the team. The technician forgot the task he was asked to complete due to the volume of noise that was occurring at the time. This forgetfulness resulted in repeated communication and hindered his ability to complete the task in a timely manner. Similarly, a surgical trainee described his experiences of attempting to concentrate during complex surgery. He related that if the OR was noisy, he experienced difficulties filtering out some of the sounds which would allow him to concentrate on the surgical procedure.

Facilitators of communication in the presence of noise

The theme 'facilitators of communication in the presence of noise' consisted of two sub-themes – 'using non-verbal communication in the presence of noise' and 'being able to filter out sounds in the presence of noise'.

Using non-verbal communication in the presence of noise

Non-verbal communication was described as an effective form of communication when the OR was noisy. Participants recalled using non-verbal gestures, either independently or in conjunction with verbal communication, and specifically using their hands, eyes, or facial expressions to communicate.

A surgeon recounted being able to use non-verbal hand gestures to facilitate effective communication when requesting a surgical instrument during a surgical procedure. He stated that during a procedure he tended to mumble; therefore, in a noisy OR he preferred to use non-verbal communication. However, the surgeon qualified the use of non-verbal hand gestures for communication by adding that this style of communication would depend on the level of experience of the instrument nurse, whether the instrument nurse was attentive during the surgical procedure and how often they had worked together. The surgeon reported:

> I think if it is a good [instrument] nurse and I put out my hand, they know what's going on in the operation, they know what I need, so it is really nice not to ask and sometimes when it is loud you rely on that more. I have a tendency to mumble as well. … So that comes with working together for a while, knowing the operation and getting to know each other. (SC7)

The use of non-verbal gestures to communicate was described by an anaesthetic consultant when the OR was noisy. The consultant used gestures such as stern facial expressions or holding his finger up to pursed lips to request for silence in the OR. Moreover, an anaesthetic trainee recalled the response she received when she stood up suddenly in the OR with a stern look on her face and projected her voice to get the attention of the other health professionals in the OR. The use of non-verbal gestures enabled her to gain their attention during the emergency. The trainee recounted:

> I have to admit being six foot … I just tend to have to stand up. … it's your non-verbal stuff. If you actually are a six-foot-tall female, stand up and make eye contact with the theatre and project your voice so that everyone just goes [clicks fingers] boom. … with the I'm not joking tone … and it works quite well …. I'm usually laid back, all of a sudden, you're – you're a presence in the theatre. (AT8)

Being able to filter out sounds in the presence of noise

Another facilitator of effective communication in the presence of noise was being able to filter out sounds in the OR. Participants reported that filtering out sounds such as concurrent conversations and equipment, including suction or electrosurgical units, enabled them to focus their attention on the tasks at hand and essential conversations.

An anaesthetic consultant described filtering out some sounds during the induction of anaesthesia phase while she observed an anaesthetic trainee induce the patient. The consultant explained that she did not listen to sounds unrelated to the anaesthetic

phase of the procedure, such as the call bell, which enabled her to communicate effectively with the trainee. The anaesthetist recalled:

> I will watch the [anaesthetic trainee] do a whole induction … without noticing the [call bell] going off. You are tuned into different things … We all ignore certain noises that don't bother us and are tuned to noises that do. (AC5)

A surgical trainee recalled disregarding some sounds unrelated to his role during the surgical procedure, such as the oxygen saturation alert tone. By not listening to the unrelated sounds, he was able to concentrate on the procedure and communicate effectively with the surgeon and instrument nurse.

Discussion

This research explored how noise affected communication between health professionals in the operating room. Health professionals struggled to communicate effectively when the OR was noisy, revealing barriers to effective communication including positioning of health professionals, hearing difficulties in noisy ORs, and being unable to filter out sounds. Due to the presence of noise, health professionals used facilitators of communication including non-verbal gestures and filtering out some conversations and noise emitted by equipment. However, restrictions existed for when it was possible to use these facilitators. Non-verbal gestures were an effective means of communication when recipients understood the meaning of the gestures and the context in which they were being used. Filtering out irrelevant conversations was also an effective facilitator of communication when the noise levels were not elevated or if filtering occurred in the presence of experienced OR health professionals.

The arrangement of equipment in the OR was dictated by the type of surgery, door position, power and services outlets, and anaesthetist and surgeon's preferences. Surgical specialties need an OR of an appropriate size for the equipment required and number of health professionals involved in the surgery. If the equipment used for the surgery resulted in lack of space in the OR, then the circulating nurse may not be able to stand near the instrument nurse to communicate quietly. Instead, the conversations occur with raised voices across the obstructing equipment. The noise emitted by some equipment has been identified in past research[14] as contributing to communication failure. Past research found failure to meet surgeons' expectations of positioning and choice of equipment resulted in breakdown of communication between the surgeon and other health professionals[24]. However, in a study of how perioperative nurses' practice was governed, nurses became more familiar with the surgeons' requirements for each type of procedure as they gained experience working with them. Through this knowledge, the perioperative nurses were able to try different arrangements of the equipment to overcome the barriers to effective communication posed by the equipment[34].

Health professionals reported experiencing difficulties hearing conversations when the OR was noisy; however, this may not necessarily be due to any hearing deficit. Past research on hearing difficulties among orthopaedic, urological and oral faciomaxillary surgeons[3,35–37] found mixed results. Orthopaedic surgeons were exposed to noise levels over the threshold level and exposure time required for occupational noise-induced hearing loss to occur[3,35]. However, a study undertaking audiometry testing of 22 senior orthopaedic surgeons, found 11 of them had some degree of noise-induced hearing loss but not of a degree to be classified as deafness[38]. Another study undertook audiometry testing of 18 health professionals, from a range of ages and types, who worked in orthopaedic surgery[39]. This study found the exposure was insufficient to pose a danger to hearing, and no noise-induced hearing loss was present in any of the participants. Moreover, the studies investigating hearing loss in oral faciomaxillary and urological surgeons found they were not exposed to noise levels shown to result in hearing loss[36,37].

Rather than experiencing a hearing loss, health professionals may become less tolerant of the noise levels in the OR, especially considering the complex cognitive tasks that they undertake. Past research showed that health professionals experienced diminished ability to communicate with the noise levels present in the OR, regardless of whether they were undertaking an activity or not[13]. Furthermore, communication was more likely to breakdown if a health professional was undertaking complex cognitive tasks, such as those undertaken in the OR, while communicating in the presence of noise[13].

For health professionals to be able to use non-verbal gestures as an effective means of communication in noisy ORs, their colleagues needed to be aware of the meanings of the gestures as well as the context in which they are used. If the instrument nurse can see the surgical field and is familiar with the surgery, then hand gestures used by the surgeon may be an effective means of communication. In an

observational study of the transfer of objects between the instrument nurse and the surgeon during surgical procedures[40], the use of non-verbal gestures by the surgeon was an effective means of communication when they could be observed by the instrument nurse. This finding was confirmed by another study that found the recipient of the gestures needed to be able to see them as they occurred[41]. Despite these restrictions, participants recounted situations where the use of non-verbal gestures were an effective method of communication without contributing to the sound levels in a noisy OR.

The ability of health professionals to filter out some sounds or conversations to facilitate communication depended on their level of experience and the noise level in the OR. Health professionals who were new to the OR environment experienced difficulties adapting to the communication styles used in the OR[42] and had more breakdowns in communication than experienced OR health professionals[43]. The results from this study were consistent with past research that found elevated noise levels degraded the quality of verbal communication, placed stress on health professionals and resulted in breakdown of communication[13]. Accounting for these difficulties, experienced health professionals need to support and foster inexperienced OR health professionals to adopt an effective communication style in the OR[18].

Limitations

This research was undertaken at one research site and may not be representative of the experiences in other operating suites. However, health professionals with a range of work experience in other operating suites were included in the research. Further research in this area could include multiple sites to expand these findings and provide further insight into the barriers to and facilitators of communication in the presence of noise in the OR.

Implications for practice

A number of implications for practice have been derived from this research, relating to positioning of equipment in the OR, the use of non-verbal gestures, and consideration of inexperienced health professionals and their inability to filter the sounds. The positioning of equipment in the OR is influenced by many factors and impacts the team of health professionals. Surgical procedures need to be undertaken in an OR that leaves adequate space for health professionals to manoeuvre around the equipment. Health professionals need to endeavour to reduce the noise levels in the OR. One measure that could be further used is non-verbal gestures, provided that colleagues are aware of their meaning and are able to see the gestures.

Conclusion

Health professionals of all levels of experience encountered difficulties communicating in the noisy environment of the OR. Inexperienced health professionals struggled with communicating effectively and thus need to be supported until they acclimatise to the competing sounds in the OR and learn methods of effective communication. More experienced health professionals were able to filter out unwanted sounds, providing the OR was not too noisy, to enable them to concentrate on vital conversations. Attention to the positioning of equipment and optimal utilisation of space is required to optimise communication in the OR. Furthermore, communication can be facilitated by the judicious use of non-verbal communication.

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