Distraction-Free Zone: Decreasing Distractions During Emergence From Anesthesia

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Dedication and Acknowledgments

To my beloved parents, Jeff and Carol Ann, and my treasured grandparents, the completion of this project and this Doctor of Nursing Practice program would not have been possible without your unwavering support, words of wisdom, and boundless sacrifices and love. You have always encouraged me to pursue my dreams and push myself beyond limits. I am eternally grateful and appreciate your guidance as I have navigated this journey.

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Abstract

Background: The operating room (OR) is a complex and noisy environment. Induction and emergence are perhaps considered the most critical phases of anesthesia. Excessive distractions adversely impact OR personnel and hinder patient safety when communication is jeopardized between providers. Reducing background noise and decreasing distractions should be an anesthesia priority**. Purpose:** The purpose of this quality improvement project was to reduce observed distractions during the emergence phase of anesthesia by implementing an educational intervention that summarized the existing evidence on workplace distractions, their adverse impact on patient safety, the phases of anesthesia, and common sources of distractions. **Methods:** This quality improvement project consisted of the pre-intervention measurement of observed distractions during anesthesia emergence, an educational intervention, and post-intervention repeated measurements of observed distractions. Perioperative staff were also surveyed pre-intervention and post-intervention regarding their opinions, attitudes, and behaviors towards distractions in the operating room. **Results:** The average number of observed distractions during anesthesia emergence pre-intervention was 13.2 and increased to 13.35 following the educational intervention. The opinions of OR personnel toward auditory distractions did not change post-intervention. **Recommendations and Conclusion:** Findings do not suggest that a single educational intervention is an effective tool to decrease distractions during emergence from anesthesia. Repeated educational sessions, visual cues, and extended time for study may produce more favorable results.

Key Words: induction, emergence, anesthesia, noise, distractions, operating room, and safety

Background and Significance

The operating room (OR) is a complex and noisy environment. Induction and emergence are perhaps considered the most critical phases of anesthesia (Cascella et al., 2018; Miller & Pardo, 2018). Broom et al. (2017) compared induction and emergence to the critical phases of take-off and landing in aviation, when non-essential activities are prevented in the sterile cockpit. In both environments, it is important to optimize vigilance and minimize distractions that may disrupt performance. Distractions present adverse psychological and physiological effects (Shapiro & Berland, 1972; Liu & Tan, 2000). Examples of noise in the anesthesia setting include beeping monitors, unnecessary conversations, slamming doors, music, medical equipment, and cell phones (Broom et al., 2011; Nasri et al., 2022; Wheelock et al., 2015). Excessive distractions occur as often as one event every 4 minutes 23 seconds in the OR (Campbell et al., 2012).

Auditory distractions persist during all phases of an anesthetic including induction, maintenance, and emergence (Broom et al., 2011; Savoldelli et al., 2010; Campbell et al., 2012). These distractions prevent anesthesia providers from focusing on the multitude of tasks required during the perioperative period such as recognizing changes in pulse oximeter tone, ensuring clear communication with the surgeon, blocking out sudden background noise and making critical clinical decisions (Stevenson et al., 2013, p. 376). Clinician mental efficiency and short-term memory are reduced by routine exposure to noise levels in the OR of approximately 77 decibels (dB) (Murthy et al., 1995). For context, measured noise from a vacuum cleaner is around 70dB and a phone ringing is 80dB (Liu & Tan, 2000).

Excessive distractions not only adversely impact OR personnel, but also hinder patient safety when communication is jeopardized between providers (Crockett et al., 2019). Additionally, anesthetized patients experience potentially harmful physiological effects of noise

including pupil dilation, peripheral vasoconstriction, hypertension, and corticosteroid release (Falk & Woods, 1973; Gan et al., 2011).

Reducing background noise and decreasing distractions should be an anesthesia priority, particularly during the more critical phases of anesthesia induction and emergence (Stevenson et al. 2013).

Purpose

The purpose of this quality improvement project was to reduce observed distractions during the emergence phase of anesthesia by implementing an educational intervention that summarized the existing evidence on workplace distractions, their adverse impact on patient safety, the phases of anesthesia, and common sources of distractions. It is important for anesthesia providers and perioperative staff to understand their individual contribution to overall noise levels and the effect of noise on overall team performance and patient outcomes.

Review of Current Evidence

An in-depth search and subsequent review of relevant literature was conducted to evaluate current findings on the effects of distractions on providers and patients, sources of noise, the different phases of anesthesia, and interventions to decrease noise. A comprehensive review of the literature was performed using the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and Scopus databases. Search terms included *induction, emergence*, *anesthesia, noise, distractions, operating room*, and *safety*. Selected articles were in the English language and included systematic reviews, randomized controlled trials, nonrandomized trials, and observational studies published between 1972 and 2022. Reference lists were used to find additional resources. A total of 30 articles were further analyzed to establish the background for this project.

Noise Levels

The Joint Commission (TJC), the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have established guidelines regarding acceptable noise levels in the workplace (The Joint Commission [TJC], 2017; Environmental Protection Agency [EPA], 1974; Occupational Safety and Health Administration [OSHA], n.d.). OSHA's Occupational Noise Exposure Standard for the healthcare sector requires a hearing conservation program for employees who are exposed to noise levels of 85dB or higher for an average of eight hours per day (OSHA, n.d.). The EPA recommends that the level of noise within hospitals be less than 45 dB (EPA, 1974). Actual noise levels are often 85 dB, significantly above the recommended level (Katz, 2014). Elevated noise levels in the OR predispose the provider and patients to an increased risk of error and unsafe conditions (TJC, 2017). Even staff-to-staff conversations and the completion of routine perioperative tasks can quickly exceed these recommendations (Liu & Tan, 2000). Staff-to-staff conversations had a maximum decibel level of 85dB, unnecessary alarms and moving OR equipment reached 89dB, suction reached 98dB, metal instruments dropping reached 99dB, and orthopedic saws reached 120dB (Liu & Tan, 2000).

Critical Phases of Anesthesia

General anesthesia is a state of induced unconsciousness and loss of protective reflexes that can be reversed (Siddiqui & Kim, 2022). Each phase of anesthesia is critical for maintaining patient safety. The induction stage involves the beginning of patient sedation when breathing becomes slow and the patient progresses to a loss of consciousness (Siddiqui & Kim, 2022). The medications administered during induction and maintenance of anesthesia can decrease blood pressure, depress cardiac function, and decrease sympathetic tone (Kaplan et al., 2019).

Emergence is described as the ending stage of anesthesia and the transition from unconsciousness to wakefulness (Cascella et al., 2018). During emergence, there is a high risk for detrimental events such as coughing, delirium, cardiovascular events, and respiratory events such as the involuntary closure of the vocal cords (Cascella et al., 2018).

Distraction Levels at Induction and Emergence

Excessive distractions are present during both the induction and emergence phases of anesthesia (Liu & Tan, 2000; Broom et al., 2011; Murthy et al., 1995). Although there is no significant difference in sound levels between orthopedic, general, gynecologic, and ear nose and throat (ENT) surgery, measured sound levels were significantly higher during both induction and emergence when compared to the maintenance phase (Liu & Tan, 2000; Broom et al., 2011). Maximum measured noise levels during induction, maintenance, and emergence were 92.9dB, 89.6dB, and 94.2dB, respectively (Liu & Tan, 2000). These maximum noise levels not only exceed recommended levels, but a noise-producing distraction occurred as often as every four minutes 23 seconds (Campbell et al., 2012). Furthermore, OR personnel fail to realize that the emergence phase of anesthesia is as important as the induction phase of anesthesia (Campbell et al. 2012).

Sources of Distractions

Distractions can be classified as auditory disruptions, visual disruptions, or equipment issues (Nasri et al., 2022). Other sources of distractions include staff changes, equipment unavailability, excess heat or cold, poor ergonomics, noxious odors, and inaccurate scheduling (Nasri et al., 2022).

Sources of auditory distractions can further be categorized as internal or external, depending on their origination (Campbell et al., 2012). Internal auditory distractions include the

team member, patient, workspace equipment, alarm monitoring, and teaching. External auditory distractions include external staff, personal devices such as cell phones and pagers, music, automatic doors, or noise outside of the room (Campbell et al., 2012).

Auditory distractions may also be related or unrelated to actual patient care (Campbell et al., 2012; Liu & Tan, 2000; Wheelock et al., 2015). OR personnel conversations with other team members or students most often created a distraction or interruption (Campbell et al., 2012; Liu & Tan, 2000; Wheelock et al., 2015). Patients created noise by requiring reassurance or when moaning from discomfort. (Campbell et al., 2012). The use of routine equipment such as suction, cautery, and hammers was another major contributor to noise as the equipment may be accidentally dropped or have inappropriately set alarms (Campbell et al., 2012). The overall noise level is also influenced by the actual number of people in the OR (Falk & Woods, 1973). More people are present during emergence, which is associated with excess conversation and noise unrelated to patient care (Liu & Tan, 2000).

Distractions and OR Personnel

Vigilance is key in anesthetic practice for the anesthesia provider to simultaneously balance multiple tasks and make critical timely decisions (Loeb, 1993; Stevenson et al., 2013). Multiple studies have demonstrated that noise negatively impacts anesthesia providers, but the extent of that impact depended on the experience level of the provider and the acuity of the patient (Loeb, 1993; Grant et al., 2021). Experience level and patient acuity are thought to be indicative of workload and mental load (Loeb, 1993). Excessive distractions negatively affect anesthesia provider response time, mental efficiency, and short-term memory (Loeb, 1993; Murthy et al., 1995; Stevenson et al., 2013). Intraoperative distractions increase task load perception, fatigue, and anesthesia provider-perceived stress (McNeer et al., 2016). Additionally,

increased visual attentional load and audible noise created deficits in accuracy and reaction time (Stevenson et al., 2013).

Some clinicians report not letting noise interfere with their work because they choose to ignore it (Campbell et al., 2021). Other CRNAs report that noise is a source of frustration and creates difficulties while trying to communicate with other staff (Grant et al., 2021). Grant et al. (2021) also reports that less-experienced individuals have more difficulty filtering out irrelevant sounds. Individuals with more OR experience could more effectively tune out their surroundings more effectively to focus on the anesthetic tasks (Grant et al., 2021).

Noise in the operating room interferes with effective communication (Grant et al., 2021). All healthcare providers reported some degree of difficulty with communication, including not hearing what the surgeon was saying or even becoming overwhelmed by all the different noises (Grant et al., 2021). When communication was difficult, some providers got creative and reported that they relied on nonverbal gestures with their eyes, hands, and facial expressions (Grant et al., 2021). Nonverbal communication, however, was ineffective if other team members were unaware of the meaning of the gesture or were inattentive. Similar to the ability to filter out noise, the successful use of nonverbal strategies was influenced by the level of provider experience (Grant et al., 2021).

Distractions and Patient Impacts

Noise during all phases of anesthesia adversely affects the patient (Campbell et al., 2012; Falk & Woods, 1973; Gan et al., 2011). Multiple studies have shown that patient experience and perception are improved by eliminating distractions (Gan et al., 2011; Savoldelli et al., 2010). According to Campbell et al. (2012), 22% of the observed distractions were associated with brief periods when the patient was unattended by the anesthetist, a deterioration in patient

physiological variables, prevention of a smooth induction, repeated attempts at procedures, delays in procedure, and malfunctioning of equipment (Campbell et al., 2012). Anesthetized patients were observed to experience physiological effects of noise including pupil dilation, peripheral vasoconstriction, hypertension, and corticosteroid release (Falk & Woods, 1973; Gan et al., 2011). Bispectral Index (BIS) levels, which indicate the level of sedation in the brain, were lower when noise was completely eliminated (Kang et al., 2008; Thiele et al., 2013). According to Theiele et al. (2013), BIS scores ranged between 28-44 with and without earplugs, but the distributions of average BIS scores was statistically significant as earplugs were associated with lower BIS levels. Other negative patient consequences associated with excess noise included inadequate preoxygenation, lack of light in the laryngoscope during use, and unintended preoxygenation with a volatile agent (Savoldelli et al., 2010).

Noise can also affect the patient's perioperative experience (Liu & Tan, 2000). Patients recalled that induction and recovery were the noisiest anesthesia phases; 16% of patients expressed that the excessive noise levels were "distressing" and 43% of patients stated they would prefer a quieter environment (Liu & Tan, 2000, p. 300). Over 33% of all patients who remembered noise at induction and/or recovery described it to be noisy (Liu & Tan, 2000). It is difficult to predict which patients will be distressed by noise as individual perception varies, so it is important to routinely consider quieter environments for all patients (Liu & Tan, 2000).

Interventions for Reducing Distractions

Staff education about the sources and potential harm of auditory distractions has been shown to be an effective behavior modification strategy to reinforce the potential harm of auditory distractions, particularly when focused on distractors that are easily reduced (Kahn et

al., 1998; Hogan & Harvey, 2015). Some examples of distractors that are easily reduced include reduction of conversations that do not directly pertain to the patient, reduction of the presence of staff who are not involved in patient care, altered placement of noisy equipment, and reduction of equipment alarm volume (Liu & Tan, 2000; Hogan & Harvey, 2015).

Another suggested intervention is the use of visual reminders such as posting "Quiet Please" signs on all OR doors or the use of noise alert monitors that flashed red when maximum noise levels were reached (Hogan & Harvey, 2015; Vreman et al., 2023). Even when using educational interventions and visual reminders, however, it can take almost one year to see a decrease in distractions (Crockett et al., 2019). Crockett et al. (2019) completed a project with six different phases of interventions to effectively decrease distractions from 61% to 10% over a ten-month period.

Conceptual Framework/Theoretical Model

The change theory, developed by Kurt Lewin, was the framework for this DNP project. The three stages of this theoretical model include unfreezing, changing, and refreezing (Petiprin, 2023). Unfreezing involves finding a new method to let go of old patterns (Petiprin, 2023). Changing involves initiation and movement towards new thoughts, feelings, and behaviors (Petiprin, 2023). Refreezing involves establishing the change as a routine and the new standard (Petiprin, 2023). In this DNP project, the purpose is to unfreeze the patterns of excessive noise that are regularly seen in the OR. The changing stage involves the educational intervention and behavior modification of staff to decrease auditory distractions. The refreezing stage involves sustaining reduced noise in the OR as a standard expectation.

Methods

This DNP project aimed to decrease auditory distractions during the emergence phase of anesthesia through staff education about its potential harm and evidence-based strategies of noise reduction techniques. Excessive distractions negatively affect both anesthesia providers and patients as noise levels exceed recommended levels and communication, response time, stress, and mental efficiency are altered (Loeb, 1993; Murthy et al., 1995; Stevenson et al., 2013).

Design

This quality improvement project consisted of the pre-intervention measurement of observed distractions during anesthesia emergence, a baseline survey of perioperative staff, an evidence-based educational intervention, and post-intervention repeat measures. The survey of perioperative staff was designed to evaluate the opinions, attitudes, and behaviors towards distractions in the operating room. The primary investigator (PI) personally conducted observations of twenty general anesthesia emergence phases.

Following the collection of these baseline measures, an evidence-based educational intervention was provided by the PI to operating room staff including certified registered nurse anesthetists (CRNAs), registered nurses, scrub technicians, anesthesia technicians, and other ancillary staff. Education was provided to all staff that was present during their regularly scheduled weekly staff meeting.

After a two-week period, the PI observed an additional twenty general anesthesia emergence phases and repeated staff surveys to assess for any interval change in observed distractions or staff opinions, attitudes, and behaviors.

Translational Framework

The Iowa model was used as the basis for this DNP project. This model serves as a guide to help healthcare providers "translate research findings into clinical practice while improving outcomes for patients" (Brown, 2014). The IOWA model has eight steps: identify the trigger, determine if the problem is a priority, form a team, gather, and analyze research, critique, and synthesize research, decide if there is sufficient research, implement a pilot program, and evaluate the results (Brown, 2014). Additionally, triggers can be either knowledge-focused or problem-focused (Brown, 2014). The identification of a clinical problem represents a problem-focused trigger. Excessive distractions during anesthesia emergence were identified as the problem-focused trigger for this DNP project.

The PI formed a team of key stakeholders that viewed emergence distractions as a priority and were motivated to implement evidence-based solutions. The PI conducted a thorough review of the current literature. The PI analyzed and synthesized these findings before proceeding to the development of a pilot program in collaboration with key stakeholders at the facility site. In the existing literature, the PI identified different types of distractions, the impact of distractions on OR personnel and the impact of distractions on the patient. After completing a review of the literature, the PI observed the emergence phases of the anesthetic of 20 cases and counted the number of distractions that occurred during this time. After gathering this data, the PI educated all OR staff using these results and the existing evidence. After the education session, the PI repeated the observations and staff surveys to evaluate for interval changes.

Population

A convenience sample of general anesthesia emergence phases was used to collect baseline measurements of distractions. The target sample included 20 cases conducted on the scheduled observation days mutually agreed upon by the PI and the facility site. General

anesthesia included cases utilizing either an endotracheal tube or a laryngeal mask airway. All operating services at the facility were included except for pediatrics. Cases that did not involve general anesthesia, such as monitored anesthesia care or spinal anesthesia, were excluded since there is not a well-defined emergence stage.

The target sample for staff survey participation consisted of all perioperative staff at the facility site including CRNAs, registered nurses, scrub technicians, anesthesia technicians, and ancillary staff employed at the facility site that were willing to participate. The pre-intervention survey (Appendix A) was distributed to a convenience sample of staff that were present for the educational intervention. Exclusion criteria included student registered nurse anesthetists (SRNAs) and anesthesiologists. The target was for 15 providers to complete the baseline survey.

The education session was held during a regularly scheduled weekly staff meeting before cases began for the day to ensure that a maximum number of staff could attend. Recruitment of participants for the educational intervention was voluntary and consisted of a convenience sample of staff that were present during the staff meeting.

A convenience sample of general anesthesia emergence phases was used to collect post-intervention measurements of distractions. The target sample included 20 cases conducted on the scheduled observation days.

The post-intervention survey (Appendix C) was distributed to CRNAs, registered nurses, scrub technicians, anesthesia technicians, and ancillary staff working on the post-intervention observation days. The target was for 15 providers to complete the post-intervention survey.

Setting

This project was conducted at a 238-bed community hospital in the southeastern United States. Perioperative services included ten operating rooms providing general surgical, orthopedic, neurosurgical, gynecologic, and obstetric services.

Project Implementation

Prior to the educational intervention, the PI observed 20 anesthesia emergence processes and staff were asked to complete the pre-intervention survey (Appendix A). The survey was developed based on existing evidence to address potential distractions and their adverse effects while also allowing staff to express their opinions, attitudes, and behaviors. An evidence-based educational presentation was then provided by the PI to share current evidence on the topic. The educational intervention consisted of a presentation and handout that summarized frequent sources of noise in the OR, its effects on OR staff and patients, and methods to reduce excess noise (Appendix B). The education session was held during a regularly scheduled weekly staff meeting before cases began for the day to ensure that a maximum number of staff could attend. The PI guided staff through the handout and allowed time for questions and clarification. To reach staff members that are not present at the staff meeting, handouts were also posted in the breakrooms. Approximately two weeks after the educational intervention, the PI repeated direct observations of anesthesia emergence to measure the observed distractions. Staff were asked to complete a post-intervention survey at this time (Appendix C).

Instruments

The pre-intervention survey (Appendix A) and post-intervention survey (Appendix C) were developed by the PI for the purpose of this project and reviewed independently by two content experts. No standardized distraction survey currently exists in my review of the current

literature. The surveys included questions to be answered on a Likert-type scale. These questions were focused on gathering data to understand the thoughts, opinions, and perceptions of staff toward excessive distractions in the operating room. Answer choices were “strongly disagree”, “disagree”, “neither disagree nor agree”, “agree”, and “strongly agree”. An open-ended question was included to allow for elaboration or additional comments that the participant wished to share. The staff were also asked about their gender, age, and years of experience. No other identifying information was collected or recorded.

The educational handout (Appendix B) summarized the current evidence on distractions in the operating room, its effects on OR staff and patients, and evidence-based methods to reduce excess noise. The educational handout was developed by the PI and reviewed by two content experts for appropriate content.

Permissions

A letter of support from the Chief CRNA at the project site was obtained. The Nursing Research Council (NRC) at the community hospital has also granted approval. The Institutional Review Board (IRB) at The University of North Carolina at Greensboro and the hospital IRB both determined that this QI project is not research.

Data Collection

All data collection was done by the primary investigator. Case type, number of people present during emergence, length of time of emergence, and number of disturbances that were observed were documented. Emergence was defined as when oxygen flows were increased above baseline. This indicated that the surgery was nearly complete, and the patient would be waking up. Data collection continued until the patient was transported from the operating room. Distractions were considered as any disturbance that was unrelated to the patient’s care. It was

noted that the presence of the PI was a possible disturbance during the emergence period. To mitigate this, staff were informed that the PI would be present (Appendix D).

Pre-intervention and post-intervention data collection occurred over two separate two-week periods until the target sample was reached. Post-intervention data collection occurred two weeks after the educational intervention was completed.

Prior to the educational presentation, staff were given the pre-intervention survey. They were given 10 minutes to complete the survey and return it to the PI. Following completion of all pre-intervention surveys, an educational handout was given to each staff member. The PI discussed each point on the handout with the staff.

As determined by the IRB, informed consent from patients was not required for data collection. Patient privacy was safeguarded as the electronic medical record was not accessed, patient specific information was not collected, and specific dates of observed cases were not recorded. Consent from OR staff was implied when they were present during the education session and when staff completed the pre- and post-intervention survey.

Budget, Time, and Resources

This DNP project required minimal financial resources. The PI provided funding for the educational handouts and the snacks provided during the educational session, at a cost of approximately 30 dollars. Pre-intervention and post-intervention data were collected over two-separate two-week periods. The 30-minute educational session was held during a regularly scheduled weekly staff meeting.

Data Analysis

Data was analyzed with the assistance of a statistician from the University of North Carolina at Greensboro. Microsoft Excel software version 16 was used. Simple descriptive

statistics were used to quantify, summarize, and analyze findings from the pre- and post-intervention surveys. A two-sample t-test was used to compare the number of distractions from pre-intervention and post-intervention groups. A p value <0.05 was considered statistically significant.

Results

The purpose of this project was to determine if distractions were reduced by implementing an educational intervention to perioperative staff. A total of 32 perioperative staff members completed the pre-intervention survey and 19 completed the post-intervention survey. The pre-intervention survey respondents consisted of CRNAs (34%), registered nurses (41%), scrub technicians (13%), and other staff members (12%). The post-intervention survey respondents were consisted of a higher percentage of CRNAs (42%) and scrub technicians (21%), and a lower percentage of registered nurses (37%) and other staff members (0%).

At baseline, 87.5% of survey respondents reported that they “agreed” or “strongly agreed” that excessive noise was a problem. Following the educational intervention, 89.4% of survey respondents reported that they “agreed” or “strongly agreed” that excessive noise was a problem. Pre-intervention, only 9% of survey respondents stated that they had not experienced a communication issue in the OR. Post-intervention, 5% of survey respondents stated that they had not experienced a communication issue in the OR, however, when asked about willingness to decrease noise in the OR, 100% of survey participants agreed both pre- and post-intervention. Staff chose not to share additional thoughts in the open-ended question on the surveys.

Direct observations of 20 emergence phases were conducted by the PI prior to the educational intervention and 20 emergence phases were repeated post-intervention. Both the pre-intervention and post-intervention groups were comprised of similar types of surgical cases and

are shown in Table 1. The average duration of emergence pre-intervention was 8.15 minutes and post-intervention was 7.55 minutes. The average number of staff in the room during emergence pre-intervention was 6.45 minutes and 6.35 minutes post-intervention. The average number of observed distractions during emergence pre-intervention was 13.2 and post-intervention was 13.35.

A two-sample t-test was performed to analyze the pre-intervention and post-intervention observed distractions. The difference between the average number of distractions pre-intervention (13.2) and post-intervention (13.35) was not statistically significant since the p-value (0.472) was greater than 0.05. Additionally, data analysis demonstrates a moderately positive correlation (r = 0.499) between number of distractions and number of staff present during emergence. Table 2 illustrates common distractions that occurred during the observed emergence phases. Based on distraction classification, there was no difference in the types of distractions observed during the pre- and post-intervention observations.

Table 1

Case Type Numbers

Case Type	Number of Cases	
	Pre-intervention	Post-intervention
Orthopedics	4	6
Urology	5	3
General	9	9
ENT	1	1
Gynecology	1	1

Table 2

Common Distractions Observed in the Operating Room

Source	Examples
Staff	Conversations unrelated to patient care, staff frequently leaving/entering room for numerous reasons such as breaks, asking questions, getting blankets or other supplies, etc., cell phones, pagers
Workspace/Environmental	Overhead announcements, music, hallway noise, oxygen tank hitting ground, adjusting bed position, taking out trash, placing metal surgical equipment on cart, bringing stretcher into OR
Equipment	Ventilator, monitor beeping, inpatient bed beeping, surgical robot
Anesthetist-initiated	Teaching students, talking to patient to provoke arousal, suction, opening/closing Pyxis

Barriers

Barriers to project implementation included insufficient time to provide repeated and ongoing education, difficulty predicting the timing of emergence, and an unwillingness of some staff to participate. It was a challenge to find adequate time with staffing availability to provide a comprehensive educational in-service due to staff shortages and busy OR schedules. To decrease the chance of the PI missing emergence, the PI monitored the operating room status board. Staff did not consistently update the operating room status board, however, to indicate emergence timing. Staff were encouraged to participate by emphasizing the benefit of minimizing distractions as it impacts their workflow and patient outcomes.

Discussion

The statistical analysis of pre-intervention and post-intervention data demonstrates no reduction in the number of observed distractions. In fact, the average number of observed distractions minimally increased following the educational intervention. There was also a slight increase in perceived distractions by perioperative staff following the educational intervention. It is possible that the educational intervention drew attention to the distractions, thus increasing staff perception.

There are many factors that likely contributed to this result. This project consisted of a small sample size and survey respondent groups with dissimilar percentages of CRNAs, registered nurse, scrub technicians, and other ancillary staff. It is likely that different providers have different perspectives on the consequences of distractions at different times and during different role-related tasks. The goal of this project was to ensure a similar understanding of the consequences of auditory distractions, however, role-specific responsibilities may influence perception of what constitutes a distraction.

Existing evidence supports education as an effective strategy to reduce distractions in acute inpatient units and intensive care units (Katz, 2014; Hogan & Harvey, 2015). It is plausible to assume that education would be a successful intervention in the OR as well. The increase in post-intervention observed and perceived distractions, however, do not support this. This is likely the result of the educational intervention not reaching many of the staff members since the education was only provided once. Many staff members may not have been at work or did not attend the meeting. It is also difficult to implement a change in a 2-week period which was the amount of time between the intervention and post-intervention data collection. It is likely that staff need a constant reminder until new habits are formed. As demonstrated by Crockett et al.

(2019), multiple educational interventions and the addition of a visual reminder would have proven useful as would extended time to unfreeze old habits and form new ones. Many distraction-reducing measures such as reducing conversations and minimizing the use of metal instruments were discussed during the intervention, but require awareness and effort (Liu & Tan, 2000; Hogan & Harvey, 2015). Some noise is unavoidable as it pertains to patient care, but sources such as removing trash and breaking down equipment can be delayed until the patient is out of the room.

Statistical analysis showed no correlation between the number of staff during emergence and the number of distractions. This suggests that limiting the number of people in the room may not be an effective strategy to reduce the number of distractions in this setting. This is inconsistent with previous evidence demonstrating that an increase in staff was associated with excess conversation unrelated to patient care (Liu & Tan, 2000; Falk & Woods, 1973). However, it is important to recognize that the type of case may affect the types of personnel in the OR. During orthopedic cases, device representatives are also present and frequently have conversations with the surgeons and scrub technicians. During prone cases, more ancillary staff are needed to assist with positioning. This was not noted by the PI during observation and should be considered in the future. The number of observed distractions did not correlate with the type of case. This is consistent with the existing literature that there is no difference in auditory distractions data between orthopedic, general, gynecologic, and ENT surgery (Liu & Tan, 2000).

Pre- and post-intervention surveys revealed that the majority of staff members agreed that excessive noise is an issue and leads to communication difficulties. This finding indicates that participants in this project have experienced the same issues as those in the existing literature that reported some degree of difficulty with communication (Grant et al., 2021). Both surveys

also showed that all perioperative staff are motivated to make the necessary changes to address the excessive noise.

Limitations

This project was limited by its small sample size and single educational intervention. Extending the period of the pre- and post-intervention data collection would allow for a larger sample size and repeated education sessions to more perioperative staff members over an extended period of time. It would also be beneficial to develop a more reliable method to specifically and objectively measure what constitutes a distraction. Additionally, staff often questioned the presence of the PI during data collection, even though they were previously alerted about the study and informed of the PI's presence. Conversations unrelated to the patient increased when staff members decided to question the PI.

Conclusion

The results of this quality improvement project suggest that a single educational intervention is not an effective tool to decrease distractions during emergence from anesthesia. This does not invalidate research that has previously demonstrated that excessive noise and distractions are a real, clinical problem in the operating room. Excessive distractions not only adversely impact OR personnel, but hinder patient safety when communication is jeopardized between providers. Reducing background noise and decreasing distractions should be an anesthesia priority**.** Some noise is unavoidable as it pertains to patient care, but alterations should be made to emphasize patient-centered care, enhance provider performance, and reduce overall noise levels.

The results from this project were electronically disseminated via email to the project site. The project was presented to the University of North Carolina at Greensboro in a poster format.

For future study, it is recommended that a visual reminder, such as a poster that reminds staff to reduce unnecessary tasks during the emergence period and focus on patient care, be provided in addition to providing repeated and ongoing education. The PI may also propose the idea of an emergence or closing time out. Many hospitals implement a time-out prior to placing a regional block and prior to incision, but this is rarely done prior to emergence, which has been defined as a critical step. Overall, a longer duration of study, objective measures such as more specific criteria that define distractions, and repeated educational interventions would improve future studies on the topic.

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Appendix A: Pre-Intervention Survey

1. Sex	☐ Male ☐ Female ☐ Other ☐ Prefer not to answer				
2. Age	☐ <25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ >65				
3. Job title	☐ CRNA ☐ Registered Nurse ☐ Scrub tech ☐ Anesthesia tech				
4. Number of years in practice	☐ <1 ☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ >20				
Please select the answer that is most applicable to your experience.	**Strongly Disagree**	**Disagree**	**Neither Disagree nor Agree**	**Agree**	**Strongly Agree**
5. I feel that excessive noise is a problem in the OR.					
6. I have been in a distressing situation in the OR due to excessive distractions.					

7. I feel that I can easily ignore excessive distractions in the OR.					
8. I have experienced communication issues due to excessive distractions in the OR.					
9. I feel that OR staff largely contribute to OR distractions.					
10. I feel that the anesthesia providers largely contribute to OR distractions.					
11. I feel that the surgeon largely contributes to OR distractions.					
12. I am willing to decrease excessive distractions in the OR.					
13. I understand the importance of minimal distraction during emergence from anesthesia.					
14. I feel that other staff members are willing to decrease excessive distractions in the OR.					
15. I feel confident in recognizing distractions.					
16. I feel confident in addressing excessive distractions.					

17. I understand the harmful effects of excessive distractions on patients.					
18. I understand the harmful effects of excessive distractions on staff.					

19. In the space provided below, please feel free to elaborate on your experiences, share examples of common noises and distractions in the OR and leave any additional comments.

1= Strongly Disagree
2= Disagree
3= Neither Disagree nor Agree
4= Agree
5= Strongly Agree

Appendix B: HOW LOUD IS TOO LOUD?

Objectives:

1. Define distractions in the operating room.
2. Provide strategies for distraction reduction.
3. Describe the harmful effects of distractions.

What's the problem?

Have you ever felt like it was so loud that you can't think clearly? The World Health Organization (WHO) recommends that noise levels should not exceed 70dB over a 24 hour period and 85 dB over a 1 hour period to avoid hearing impairment. As we all know, the operating room (OR) is a complex and noisy environment. Believe it or not, a study found that noise levels on average were 92.9 dB during induction of anesthesia, 89.6 dB throughout cases, and 94.2 dB during patient emergence from anesthesia (Liu & Tan, 2000).

Noise Level	Daily Life	Operating Room
<40 dB	Sleep environment	n/a
60-69 dB	Normal conversation	Staff conversation
70-79 dB	Vacuum cleaner, TV, radio	Music, suction, automatic doors, dropping instruments
80-89 dB	Phone ringing, heavy traffic	Moving equipment, anesthesia monitor alarms, orthopedic drills, intercom
90-99 dB	Motorcycle, lawn mower	Dropping metal bowl on OR floor, orthopedic saws

(Liu & Tan, 2000)

Why does it matter?

During emergence, there is a high risk for detrimental events such as coughing, delirium, cardiovascular events and respiratory events such as the involuntary closure of the vocal cords (Cascell et al., 2018).

Response time, mental efficiency, and short-term memory of the anesthesia provider were negatively affected by excessive distractions. Fatigue, increased stress, and inefficient communication were also commonly reported (Loeb, 1993; Murthy et al., 1995; Stevenson et al., 2013).

Patients have not only recalled the noisy OR environment, but were observed to experience physiological side effects such as pupil dilation, peripheral vasoconstriction, hypertension, and corticosteroid release (Falk & Woods, 1973; Gan et al., 2011).

Examples of distractions in the OR

- Cell phones and/or pagers
- Automatic doors
- Conversations unrelated to patient care
- Suction
- Staff changes for breaks or shift change
- Unnecessary monitor alarms
- Equipment malfunctions
- Music
- Equipment preparation
- Overhead announcements
- Patient moaning from discomfort
- Excessive heat or cold
- Odors

(Campbell et al., 2012; Liu & Tan, 2000; Wheelock et al., 2015).

Suggestions for Improvement

- Do not enter the room unless necessary
- Lower voices
- Avoid conversations that do not pertain to patient care
- Prepare all equipment in advance (as able)
- Silence cell phones
- Decrease music volume
- Count instruments before the patient enters the room
- Do not break down or dispose of equipment until the patient has left the room

(Liu & Tan, 2000; Hogan & Harvey, 2015).

Appendix C: Post-Intervention Survey

1. Sex	☐ Male ☐ Female ☐ Other ☐ Prefer not to answer				
2. Age	☐ <25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ >65				
3. Job title	☐ CRNA ☐ Registered Nurse ☐ Scrub tech ☐ Anesthesia tech				
4. Number of years in practice	☐ <1 ☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ >20				
Please select the answer that is most applicable to your experience.	**Strongly Disagree**	**Disagree**	**Neither Disagree nor Agree**	**Agree**	**Strongly Agree**
5. I feel that excessive noise is a problem in the OR.					
6. I have been in a distressing situation in the OR due to excessive distractions.					

7. I feel that I can easily ignore excessive distractions in the OR.					
8. I have experienced communication issues due to excessive distractions in the OR.					
9. I feel that OR staff largely contribute to OR distractions.					
10. I feel that the anesthesia providers largely contribute to OR distractions.					
11. I feel that the surgeon largely contributes to OR distractions.					
12. I am willing to decrease excessive distractions in the OR.					
13. I understand the importance of minimal distraction during emergence from anesthesia.					
14. I feel that other staff members are willing to decrease excessive distractions in the OR.					
15. I feel confident in recognizing distractions.					
16. I feel confident in addressing excessive distractions.					

17. I understand the harmful effects of excessive distractions on patients.					
18. I understand the harmful effects of excessive distractions on staff.					

19. In the space provided below, please feel free to elaborate on your experiences, share examples of common noises and distractions in the OR and leave any additional comments.

1= Strongly Disagree
2= Disagree
3= Neither Disagree nor Agree
4= Agree
5= Strongly Agree

Appendix D: Recruitment Letter

Dear Staff,

You are being asked to participate in a quality improvement project to decrease the number of distractions during anesthesia emergence. The project will consist of a brief survey followed by a 20-minute evidence-based educational presentation on the impact of distractions.

Your responses will remain anonymous and participation in this survey is completely voluntary. You may opt to quit the survey at any time or decline to answer any question. Consent for this survey will be given when you begin the survey. Information gathered in this survey will be shared by me with my project faculty advisors at UNCG and not disseminated outside of UNCG. A summary of the data will be presented to the UNC Greensboro School of Nursing faculty as partial requirement for program completion.

Thank you for your time.

Anna Cornatzer, BSN, RN, SRNA
Please direct all questions or concerns related to this survey to ancornatzer@uncg.edu