ANESTHESIA PROVIDERS' PERCEIVED DISTRACTIONS IN THE OPERATING ROOM DURING INDUCTION AT AN AMBULATORY SURGERY CENTER

by

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ABSTRACT

CHRISTIN BAILEY COGGINS. Anesthesia Providers' Perceived Distractions in the Operating Room During Induction at an Ambulatory Surgery Center. (Under the direction of DR. DAVID LANGFORD)

There are a variety of distractions that can occur in the operating room during the induction of anesthesia. A review of the literature revealed that common distractions include: noise, music, cell phones and pagers, production pressure, and unnecessary conversations. This project is part of a larger quality improvement project investigating anesthesia providers' perceptions of the frequencies and types of distractions occurring during induction at three different sites: an ambulatory surgery center, a mid-sized, suburban hospital, and a level one trauma center. This project focuses on identifying distraction severity and frequency at an ambulatory surgery center. An anonymous, electronic survey was distributed to physician anesthesiologists, certified registered nurse anesthetists (CRNAs), and student registered nurse anesthetists (SRNAs), at these three different clinical locations within a large healthcare system. The survey asked providers to rate perceived frequency and severity of selected distractions on a modified Likert scale. A total of thirteen anesthesia providers working at the ambulatory surgery center responded to the survey. The results show that conversations were found to be the most severely distracting while music and equipment alarms were equally found to be the least distracting. Females found music, conversations, and personal cell phone use to be more distracting than males. Younger anesthesia providers found equipment alarms to be more distracting than older anesthesia providers. Across the three site locations, survey comparison found no difference between results. The aim of this project is to discover what is distracting to anesthesia providers during anesthetic induction so that future projects can begin to mitigate the

occurrence of these distractors and promote increased patient safety during the induction of anesthesia.

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LIST OF ABBREVIATIONS

ACT	Anesthesia Care Team
CRNA	Certified Registered Nurse Anesthetist
DNP	Doctorate of Nursing Practice
IRB	Institutional Review Board
OR	Operating Room
PDSA	Plan Do Study Act
SRNA	Student Registered Nurse Anesthetist

Introduction/Background

The American Society of Anesthesiologists' seal depicts a lighthouse shining brightly over a ship at sea. The ship sailing in rocky seas represents the patient, and the captain of the ship is the anesthesia provider guiding the patient through their journey of fear and uncertainty. The lighthouse portrays the firm foundation of safety and provider knowledge of the science and art of anesthesia (American Society of Anesthesiologists, 2021). Anesthesia providers hold the responsibility of safely guiding patients through their anesthetic experience during surgery; however, a variety of distractions in the operating arena can create barriers for the provider in delivering safe and efficient anesthetic care. Harten et al. (2020) performed an observational study spanning 148 hours in the operating room (OR) and found a total of 4,594 distracting events occurred. These distractions can cause serious safety issues, with 5% of human errors in the operating room being attributed to distracting events (Riutort, 2020). Induction is a critical point in the anesthesia process where the anesthesia provider is securing an airway and administering a number of drugs to prepare the patient for the surgical procedure. It is essential that distractions in the operating room during the induction of anesthesia be mitigated in order to facilitate focus for the anesthesia provider as they safely get the patient anesthetized.

Problem Statement

Operating rooms are known for being loud work environments. However, studies have found that before and after surgery, and during critical moments like intubation for anesthesia, noise levels are consistently even *higher* (Ginsberg et al., 2013, p.528). A systematic review of 38 articles found the two most common distractions identified by anesthesia providers to be small talk and staff entering and exiting the room. Additional significant distractions included music and equipment alarms (Gui et al., 2021). Studies have found that these distractions and

noise levels decrease anesthesia providers' clinical reasoning, performance, and lead to poorer patient outcomes (Gui et al., 2021; Enser et al., 2017). Evidence clearly shows that distractions in the operating room during intubation can yield serious consequences that lead to patient harm and need to be addressed.

Stakeholders affected by this issue include anesthesia providers (nurse anesthetist and anesthesiologist), the surgical team, hospital administrators, the patient, and the patient's family. The surgical team has many tasks to accomplish during the induction period, and their collaboration is necessary to decrease distractors. Hospital administrators are also stakeholders, as they are interested in decreasing adverse events, increasing cost efficiency, and shortening operating room times. They can be central to implementing policies to help decrease the distractions. Lastly, the potential adverse events caused by distractions can have lifelong impacts on patients and their family members. The top priority of each stakeholder and ultimate goal of distraction reduction is to provide the safest patient care.

PICO Questions

This quality improvement project is part of a larger project addressing distractions in the OR during induction. The PICO question for the larger project is: “How do anesthesia staff members (P) perceptions of distractions during induction (I) at three different clinical sites (C) vary (O)?” The three sites are an ambulatory surgery center, a level one trauma center, and a mid-sized, suburban hospital. These three locations each have unique characteristics that can yield insight to location-based characteristics that can ultimately improve the quality of care that patients receive in the perioperative environment.

The PICO question specific to this project is “At an ambulatory surgery center (P) how do perceptions of distractions during induction (I) amongst anesthesia providers (C) vary (O)?”

The project assessed the types of distractions during induction that occur at a same-day, ambulatory surgery center. The center cares for patients undergoing minor surgical procedures and who are expected to go home on the day of surgery. The fast-paced nature of this outpatient center will likely present its own unique challenges. The ambulatory surgery center prioritizes fast turnover rates to accommodate the high volume of cases it sees each day. It is probable that anesthesia providers will report a variety of distractions that they experience during the induction period.

Conceptual Framework

This project uses the Plan-Do-Study-Act (PDSA) model which is a four-step framework used to improve a process or to carry out a change (Agency for Healthcare Research and Quality, 2020). For this project, the planning component of the model begins with identifying known induction distractions in the literature, followed by the development of a survey to elicit the top induction distractions at each of the three clinical sites. Next, the "do" component encompasses implementation of the survey. After the results were collected, the "study" phase requires thorough review of data and analysis. To finalize, each group member "acts" by drawing conclusions and making recommendations for distraction mitigation. One main strength of the PDSA model is that it is formulated to be cyclical in nature promoting the idea of continual quality improvement. Implications beyond this project may include creation and implementation of policies, educational tools, and further evaluation of outcomes.

Literature Review

It is important to evaluate the presence and impact that distractions in the operating room have on the anesthesia provider when seeking to improve the quality of care and safety of patients. The first step in mitigating distractions is to identify the problem so that the appropriate

solutions can be implemented. This doctoral quality improvement project aims to achieve this by assessing anesthesia providers' perceptions and attitudes towards distractions in the OR, specifically during *induction*- one of the most critical periods of anesthetic care.

Key Topics in Reviewing the Literature

In reviewing the literature, common distractions in the operating room were identified. These distractions were divided into the following major categories: noise, music, cell phones/pagers, production pressure and conversations/movement. The first step to changing the operating room environment into a safer space for patients is to recognize that distractions stem from a variety of sources. Each of the categories is addressed in the following sections.

Noise

Operating rooms are notoriously loud work environments during surgery, and noise of any kind can be detrimental to the anesthesia provider's concentration and communication. A prospective study found that during critical moments for anesthesia, including induction, the noise levels are at their *highest* (Ginsberg et al., 2013). Shapiro & Berland (1972) found that noise in the operating room can be as loud as a traffic highway. This is significant, because noise can cause serious negative consequences that include communication breakdown, decreased mental effectiveness, short-term memory reductions, inability to hear important monitors such as the pulse oximeter, and creates physiologic stress in the anesthesia provider (Hodge & Thompson, 1990; Murthy et al., 1995; Stevenson et al., 2013; Kam et al., 1994).

Broom et. al (2011) likens the distractions occurring in the operating room to those that occur in aviation. The authors refer to the sterile cockpit rule that prohibits non-essential conversation during crucial time periods of the flight in order to prevent any distraction that could lead to a potential accident. Take-off and landing of a flight mirror the induction and

emergence phases of anesthesia. Interestingly, this study found the emergence phase, the time period when the patient gradually regains consciousness after anesthesia, to be far noisier than the induction phase of anesthesia (Broom et al., 2011). A limitation of this study was the proximity of each data recorder to the anesthetist which could have contributed to variability in decibel recordings by the anesthetist. The researchers recorded data throughout all three phases of anesthesia: induction, maintenance, and emergence. By focusing on only one phase of the anesthesia process, the researchers could have examined unique contributors to noise pollution based on that phase of the anesthesia process. While this study found emergence to be the noisiest, another study found the preparation of the room and patient for surgery to be the noisiest (Hodge & Thompson, 1990). Each of these studies correlates increased noise to decreased effectiveness in communication (Broom et al., 2011; Hodge & Thompson, 1990). When the anesthetist cannot communicate effectively during the induction of anesthesia, an opportunity for potential harm to the patient is created. Induction during anesthesia is a team effort, and a quiet environment allows for better communication.

The impact of noise on the mental effectiveness and short-term memory capabilities of anesthesia providers was examined using a case-control study of anesthesia providers (Murthy et al., 1995). Anesthesia providers were taken to an audiology lab and listened to recordings from an operating room while tests were administered to measure the noise level effects on their mental ability and short-term memory retention. The results demonstrated a statistically significant reduction in the mental efficiency and short-term memory abilities when exposed to the operating room noise recordings compared to no noise at all (Murthy et al., 1995). Similar to the Hodge and Thompson (1990) study, this study also found the highest decibel readings occurred during the preparation phase of the surgery. One limitation of this study is that it

measured mental and short-term memory effectiveness in the audiology lab (Murthy et al., 1995). If these tests had been performed in the operating room, they may have shown an even greater reduction in mental and short-term memory effectiveness related to specific anesthesia tasks. The delivery of anesthetic care requires extreme vigilance and high levels of critical thinking. These studies support that high levels of noise can impede the mental functioning of the anesthesia provider.

Patient monitoring of vital signs and cardiopulmonary status in the OR is a critical component of safe anesthetic care. Without the ability to monitor the patient's vital signs, the surgery would not be allowed to proceed. A group of researchers studied anesthesia providers in a lab setting and measured their ability to hear pulse oximeter changes when recorded operating room background noise was applied. The anesthesia providers were asked to press a button once they recognized a change in pulse oximeter tone while hearing the recorded background noise. The study found that the background noise significantly decreased providers' response times in noticing a drop in oxygen saturation (Stevenson et al., 2013).

Noise levels in the operating room are above recommended levels (Kam et al.,1994). An observational study of 403 general surgeries found noise in the OR to be consistently above 35 decibels, and averaged 63 decibels during the induction phase of anesthesia (Arabaci & Onler, 2021). Kam et al. (1994) explain the physiologic implications that noise can have on a provider. High levels of noise above 90 decibels can increase stress hormone levels such as epinephrine and norepinephrine and additionally increase cardiovascular stress by raising blood pressure and heart rate. The physiologic effects caused by noise can lead the anesthesia provider to feel irritable or annoyed. Irritability and annoyance can produce side effects such as fatigue and

headache. Noise levels above 90 decibels are considerably higher than what the US Occupational Safety and Health regulations recommend (Kam et al., 1994; Arabaci & Onler, 2021).

Music

Similar to noise, music is an audible factor that can divert the attention of anesthesia providers. Weldon et al. (2015) suggest that music is played during 53-72% of surgeries. This high frequency and lack of clinical policy guiding the use of music have raised questions about the impact of music on provider performance and focus. An ethnographic study conducted at a London teaching hospital observed over 33 hours of surgery with 5,303 observations of interactions requesting or responding to others in the room. Results showed that when music was played, requests had to be repeated five times more than when no music was played. Moreover, tensions between staff heightened after these repeated requests, surgical task times increased, and the music was often not turned down during crucial times (Weldon et al., 2015). This study did not include a variety of surgical specialties, nor did it include different types of surgical facilities.

In contrast to the previous study, Faraj et al. (2014) sought to understand the opinions of music use from both medical and nursing staff in the OR. The sample included 54 respondents from a hospital with five-operating rooms. Overall, the majority (66%) of both medical and nursing staff responded that they enjoyed their workday more when music was playing. Some survey respondents indicated that music should be regulated, as it becomes distracting during times like instrument counting or critical surgical moments (Faraj et al., 2014). Anesthesia professionals were included in the study, but no comments were included about the impacts of music specific to critical moments in anesthesia care. This suggests that anesthesia tasks like induction and airway management, are often overlooked by the surgical team. Music continues

to be played during pivotal anesthesia tasks and more research is needed to highlight its impact on anesthetists' focus and patient safety.

A survey of 104 anesthesia providers in 1997 by Hawksworth et al. on music prevalence and opinions on it being played found that music was played 72% of the time. Issues of safety were apparent as, "26% of the sample felt that music reduced their vigilance and impaired their communication with other staff while 11.5% felt that music might distract their attention from alarms" (Hawksworth et al., 1997, p. 80). Many of today's operating rooms are routinely equipped with upgraded stereo systems. This upgraded technology likely has louder audio capabilities, access to a larger variety of music genres, and complex control consoles which can be distracting when having to change music type, volume, or stop the music.

A final study published in 2021 by Fu et al. studied medical students performing simulated laparoscopy. Two groups were selected, one listened to music of their choice, while the other listened to standard pre-recorded OR noise. The group listening to music scored significantly lower on a standardized mental workload questionnaire (SURG-TLX) after the experience and in lower heart rate variability. Surgical task performance showed no differences between the two groups. While this shows that music in the OR can have some positive effects, there are shortcomings in the experiment. No interruptions or alarms were levied on the medical students, which would likely be present in a non-simulated situation. While the applicability of these findings to anesthesia tasks is small, the results suggest that more work is needed on the impacts of music during certain phases of surgery.

Cell Phones and Pagers

With cell phones becoming a common part of everyday life, it is no surprise that they have found their way into the workplace. When working in the operating room, a communication

tool is needed to call for help or update others on the progress of the procedure. These tasks can be done with a hospital-issued device or are often done using a personal cell phone. Observations of 52 surgeries recorded 205 phone calls during the surgeries. Anesthetists were responsible for 11.7% of the incoming calls and 50% of the outgoing calls (Avidan et al., 2019). While the majority of these conversations were work-related, none of the conversations were related to the patient in the room. Some of the incoming calls adversely diverted the attention of staff in the room. These findings were limited in that they were measured by the observer and the content and necessity of the calls were not assessed. Overall, the study suggested turning phones off or leaving them outside of the OR. This is not always feasible in cases where the hospital requires non-scrubbed OR staff to use their personal phones as a work-related communication tool.

It has also been suggested to activate the "do not disturb mode" on cell phones when in the operating room (Gui et al., 2021). This intervention offers a layer of safety as vital notifications can be seen at appropriate times and quick communication can be made during emergencies while reducing non-essential communication. The unexpected or repeated beep of a pager during critical moments like intubation can not only be distracting but can jeopardize patient safety. The actual frequency of pager and cell phone distractions are reported as uncommon but when they do occur, they create a "high level of disturbance in terms of consequences and duration" (Savoldelli et al., p. 686). It is clear that patient safety can be impaired in the operating room because of these devices. As communication technologies continue to change, further investigation should look at smart watches, text messaging and social media applications used by anesthesia providers.

Production Pressure

The Agency for Healthcare Research and Quality (AHRQ) defines production pressure as the obvious or unspoken pressure placed on healthcare workers by their organization to prioritize the amount of work they complete over safety and quality (Carayon, 2007). Production pressure is certainly prevalent in the OR and distracts anesthesia providers by focusing them on the next surgery and keeping to a schedule. In a survey completed by 279 anesthesiologists, 49% reported witnessing production pressure causing an unsafe action by the anesthesia provider (Gaba et al., 1994).

A similar study surveyed 422 hospital employees, the majority being nurses, to investigate whether production pressure decreased safety behaviors. The survey included five questions on how production pressure distracted providers from their work, with the items having a Cronbach alpha of 0.91. The survey results concluded that production pressure had statistically significant negative effects on safe behavior (Amponsah-Tawaih & Adu, 2016).

Conversations and Movement

While communication amongst healthcare staff is crucial in ensuring safe patient care, conversations can be distracting during the induction phase of anesthesia. In Broom et al.'s (2011) observational study, side conversations were occurring 40% of the time during the induction phases, with 3% having more than two simultaneous conversations. In a systematic review by Gui et al. (2021), conversation was found to be the most frequently reported distracting event, with irrelevant small-talk present in 70.3% of the induction time period. Side conversations that overpower the interactions of the anesthetists during induction could create delays in care or communication misunderstandings.

Even relevant conversations about the patient in the room can reduce provider attentiveness, especially if they are teaching or guiding another anesthetist. Gui et al. (2021)

included a study where vigilance was measured by a provider's response time to a flashing light. When talking with a student and providing intraoperative teaching, the provider's responsiveness during the phases of induction and emergence was significantly reduced (Gui et al., 2021). Supervising and interacting with students is a common practice and warrants additional assessment.

Staff entering and exiting the operating room is also common, and this movement can be highly distracting to the anesthesia provider. Staff movement in and out of the OR was reported during 37% of inductions (Broom et al, 2011). Harten et al. (2020) found that door movements were the most frequent distraction during the induction phase of anesthesia, with staff entering or exiting the OR on average 28 times per hour at the beginning of the case. Conversation and movement of staff in the OR are consistently found in the literature to be some of the most persistent distractions during the induction phase. A limitation of each of these studies is that although they observed the frequency of the distractions, they did not assess whether the providers found the interruptions to be a barrier or distraction to their workflow and practice.

Multifactorial Issues

While lone factors have often been highlighted and studied, these distractions frequently happen in combination which compound the challenge for the anesthesia provider. An observational study during induction of general anesthesia found the median number of five distractions during a single induction and 39.5% of the time, at least one distracting event spanned the entire duration of the induction process (Savoldelli et al., 2009). A negative impact on the patient occurred 21.5% of the time, including poor preoxygenation, accidental volatile agent administration, and increased duration of tourniquet needed for peripheral intravenous catheter placement (Savoldelli et al., 2009).

Slagle et al. (2018) observed 319 nurse anesthetists and anesthesiology residents during all phases of anesthesia. They concluded that self-initiated distractions, such as social conversations, reading, and personal email were concentrated during periods of patient stability. This suggests that anesthesia providers distract themselves during non-critical times of a surgery. The researchers proposed that distraction management training should be included during anesthesia provider education. With few guidelines existing to lessen potential distractions, provider focus and patient safety continue to be suboptimal.

Crockett et al. (2018) studied the implementation of a distraction reduction tool during the induction phase of anesthesia in a pediatric otolaryngology operating room. The team investigated the impact of noise, conversation, and music on increasing levels of distraction to the anesthesia provider during induction and correlated the increased noise level to decreased patient safety. A process was created to mitigate distractions during induction using three specific interventions. First, education was provided to the entire perioperative staff on the negative impact of induction distractions on patient safety. Second, the circulating nurse was given the responsibility of turning any music off just before the patient entered the OR. And third, the anesthesiologist took the role of announcing induction time and addressing the room if any disrupting noise occurred during the induction phase. Over the nine-week implementation of this quality improvement measure, the team decreased induction distractions to 10% in pediatric otolaryngology operating rooms (Crockett et al., 2018). This project demonstrated that mitigating distractions in the operating room during induction can be done with the collaboration and dedication of the entire perioperative team.

Project Design

Methodology

This project aims to assess the presence and types of distractions in an ambulatory surgery center and is part of a larger project assessing distractions in three operating room settings: an ambulatory surgery center, a level one trauma center, and a mid-sized, suburban hospital. This quality improvement project uses a descriptive survey examining anesthesia provider perceptions of distractions in the OR. Surveys were administered to CRNAs, SRNAs, and physician anesthesiologists over a three-week time period. A total of 45 providers received an invitation to participate.

Settings

The outpatient, ambulatory surgery center consists of eleven operating rooms. The facility surveyed is known for its expert regional anesthesia, fast surgical times, minimally invasive procedures, and low patient pain scores postoperatively. The center currently staffs 36 certified registered nurse anesthetists (CRNAs) with many who have worked at the facility for ten or more years. Several CRNA staff split their work hours between the ambulatory surgery center and other facilities. The ambulatory surgery center averages around forty surgical cases per day. Patients with a history of serious reactions to anesthesia, history of intractable nausea and vomiting, uncontrolled diabetes, sepsis requiring isolation, cystic fibrosis with acute pulmonary symptoms, premature infants with gestational age less than 37 weeks, malignant hyperthermia diagnosis, known difficult airway, and pediatric patients with craniofacial anomalies are not typically seen at this site. Additionally, outpatient surgery is not for patients with planned admissions, invasive lines/monitors, or expected transfusion of blood products.

Sample

The sample for this project consists of CRNAs, SRNAs, and physician anesthesiologists. The CRNA population has either a doctoral degree, masters degree, or in some cases a

certificate. The SRNA population for this project includes currently enrolled students in a Doctorate of Nursing Practice (DNP) Nurse Anesthetist program. Anesthesiologists have completed four years of medical school, four years of anesthesia residency, and many complete a fellowship in an anesthesia specialty.

The clinical site operates under the anesthesia care team (ACT) model which consists of one physician anesthesiologist supervising typically three ORs, each with a CRNA providing anesthesia for that OR. The physician anesthesiologist performs a documented preoperative interview for each patient, is typically responsible for procedures such as peripheral nerve blocks, central line insertions, transesophageal echocardiograms etc., and is present on induction and emergence of anesthesia given by CRNAs. The CRNA is assigned to one operating room and patient.

Inclusion criteria for participation in the survey required the participant to be an anesthesia provider, either a CRNA, SRNA, or anesthesiologist. Anesthesia providers received a survey through their work-related email or via QR code on posted fliers. Those excluded from participating were SRNAs who were not currently active at the targeted clinical sites. Emails sent to SRNAs instructed them to respond based on their current clinical placement; if they were at a site other than the three listed, they were excluded.

Tools/Measures/Methods

This project used a survey developed by the project team. Distractions identified during the literature review guided question development for the survey. The survey uses a modified Likert scale; a validated tool for data collection with ordinal measurement (Davino & Fabbris, 2013). The five-point Likert scale response selections ranged from ‘not distracting’ to ‘highly distracting’ as the extreme anchor points on each end of the scale. The survey was distributed to

all CRNAs, SRNAs, and physician anesthesiologists at the clinical sites using Microsoft Forms. The survey software did not allow users to skip sections of the survey. Incomplete or unfinished surveys were discarded.

The electronic survey was securely distributed to CRNAs, SRNAs, and anesthesiologists at the ambulatory surgery center using secure Enterprise Microsoft Outlook email and on a QR code in break rooms. The introduction page stated the survey inclusion criteria, the definition of 'distraction', and a statement regarding confidentiality and anonymity before providers began. The first portion of the survey asked participants for demographic information such as job title, age, gender, and clinical site. Anonymity was maintained by having the participant select within a numerical range instead of providing a specific number for age.

The second portion of the survey was designed to present providers with a list of potential distractions. The survey includes questions about the following events: music, conversations, equipment alarms, vocera/work phone, staff entering/exiting the OR, and personal cell phone use. The participant was asked to rank each event on the modified Likert scale based on their last administered general anesthetic. The question read 'Please rate each event based on the last general anesthetic you provided at your primary work site'. The provider then selected an option, indicating whether the event was not distracting, somewhat distracting, undecided, distracting, or highly distracting. The survey concluded with a free text box where the participant could write any distracting events that were not listed (Appendix A).

Data Collection and Timeline

The survey was created and distributed using a link to Microsoft Forms. Fliers were placed in lounges and break-rooms advertising the survey and providing a QR code for quick access. The project team also advertised the survey dates via word of mouth. These steps were

implemented to hopefully yield higher participation rates. The survey could only be completed *one time* by a provider. Reminders supplying the link were emailed to providers midway through the survey period. Contact information for the project team was included in the email so participants could reach out with concerns. An anonymity disclosure was listed before the participant began the survey. Data collection occurred over a period of three weeks in September 2022 and was gathered using Microsoft Forms. The project was reviewed by the health system IRB and University IRB and determined to be a quality improvement project which required no further action. Appendix B contains a copy of the IRB approval. Once final data was collected, a statistical analysis was performed in November 2022.

Data Analysis and Evaluation

The survey software collected the survey response data. No patient information or definite provider identifiers were collected. The survey results are password protected, and access is restricted to the project team only. Incomplete surveys were identified and eliminated before analysis.

Microsoft Forms provides basic data collection tools. The data was exported from Forms to Microsoft Excel for more advanced computations. This project's primary analysis investigates and compares distraction prevalence at three different surgical site locations. ANOVA was used to compare the difference between the three clinical sites. It also analyzed the levels of variance within the three groups throughout samples taken from each of them. Distractions by demographics such as provider type and age are included. For example, did age, gender, or role affect the perceived level of distraction? Demographic and distraction structured response items were analyzed with basic descriptive statistics (e.g. mean, median, and mode). A frequency table displays site versus distraction prevalence and demographic versus distraction prevalence. Open-

ended written responses from the text box were compiled and assessed for content themes by project committee members.

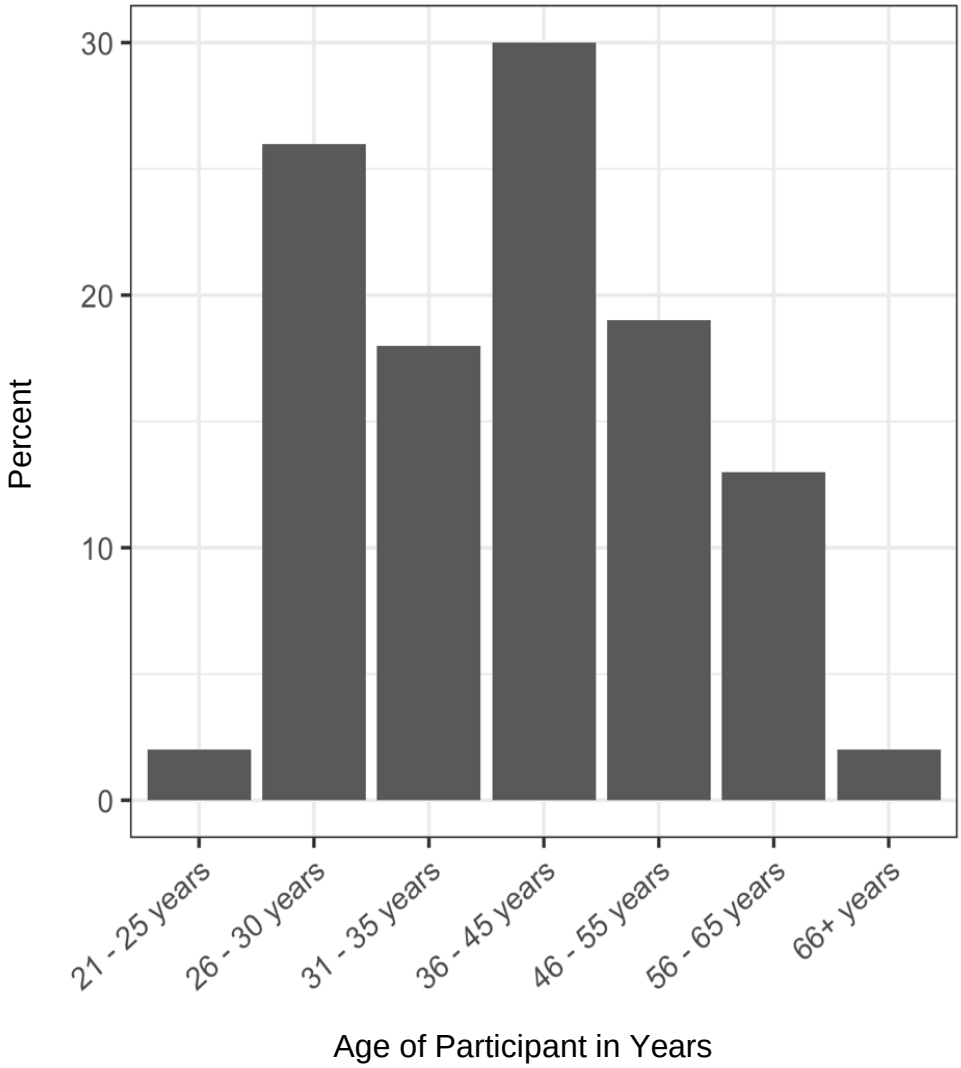
Project Findings

Results

The survey results from Microsoft Forms were exported to Microsoft Excel for purposes of statistical analysis. The sample consisted of 110 individuals (80 female and 30 male) working in the three hospital sites. Seventy-five (68.2%) were from the level one trauma center, 13 (11.8%) from the ambulatory surgery center, and 22 (20.0%) from the mid-sized, suburban hospital. Of the 45 anesthesia providers working at the ambulatory surgery center, 13 (28.8%) responded to the survey. There were 11 females and 2 males who participated. The sample ranged in age between 26 to 65 years old with four participants in the 26-30 category, four participants in the 31-35 category, three participants in the 36-45 category, and two participants in the 46-55 category. Figure 1 displays the age distribution by bar graph. Specific to this project, the ambulatory surgery center responses consisted of eight CRNAs, four SRNAs, and one physician anesthesiologist (n=13). There was a total of three responses in the free text box from anesthesia providers at the ambulatory surgery site. The first text entry from a SRNA who stated, “I find it distracting when CRNAs and MDs try to educate students during the induction.” The second text response was also from a SRNA stating, “Surgeon stimulating the patient while trying to place an airway.” The third text response was from a CRNA who stated, “Personally, if music is very low and conversations are very low, they are not distracting for me. The volume level is more distracting to me than the actual distractor usually. Unless it’s a known difficult airway, I don’t mind a low background noise. I like having the MDA and circulator at bedside for induction, and I tune out everything else except my patient and monitor/machine.”

Figure 1

Age Distribution



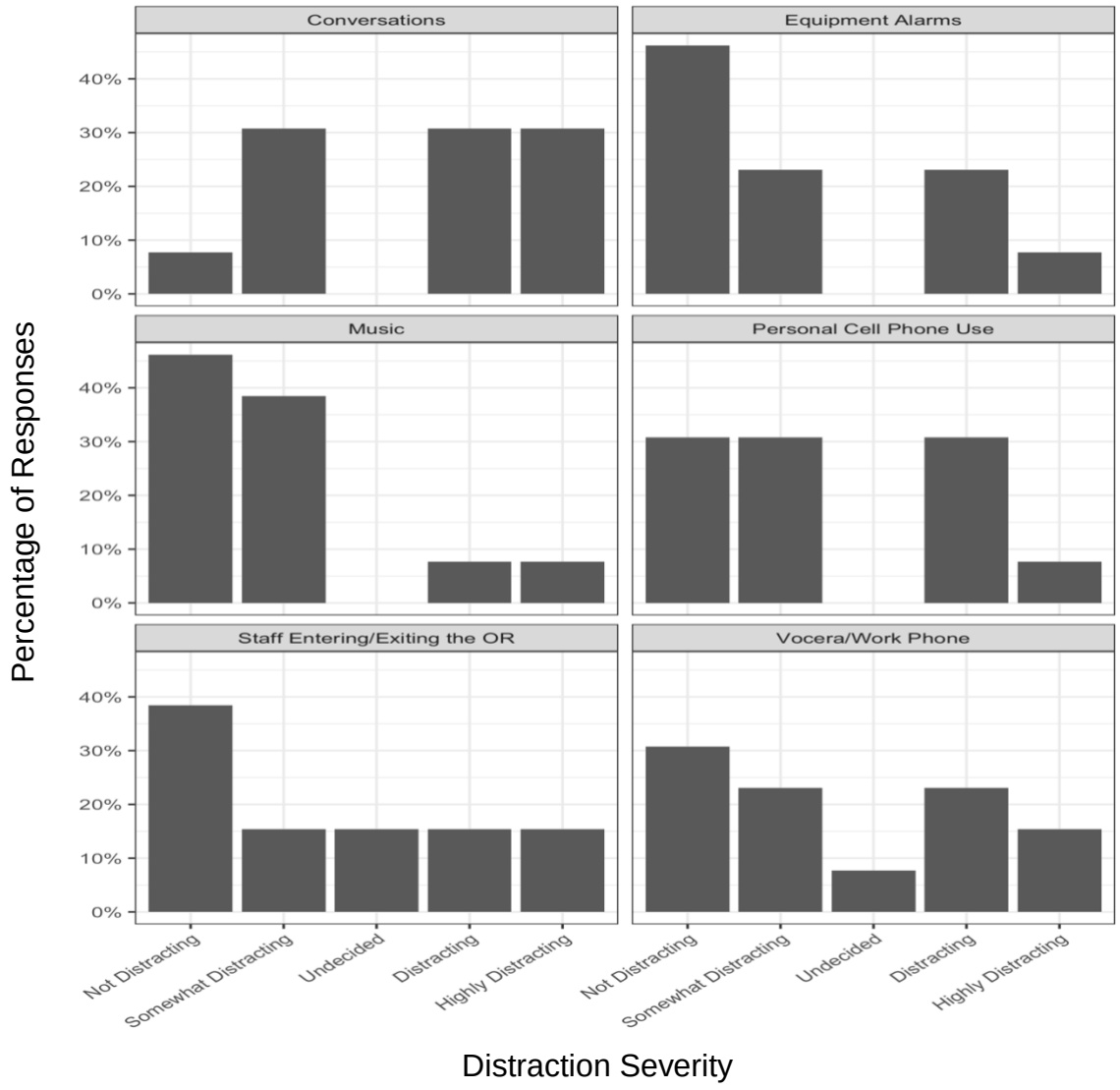
Note. Figure 1 describes the percentage of participants by age range.

Figure 2 displays percentage of responses for each distraction type based on whether the provider found the specific item to be not distracting, somewhat distracting, undecided, distracting, or highly distracting. Conversations were found to be the most severely distracting

with a percentage of 30%. Anesthesia providers chose equipment alarms and music to be the least distracting with both response percentages being around 45%.

Figure 2

Percentage of Responses for each Distraction Type Based on Level of Distraction Severity



Note. Figure 2 describes the percentage of responses each distraction type received based on the level of distraction severity.

Table 1 displays means for the severity of each distraction type across three factors: gender, age, and site location. Analysis of variance (ANOVA) compared group differences across gender, age, and site for the six distractions. The p-values based on the ANOVA are included for gender, age groups, and site. A p-value < .05 indicates a statistically significant difference across the groups being compared. Tukey HSD post hoc tests examined pairwise group mean differences. Means and standard deviations were calculated for each distraction type for each demographic category. Compared to males, females rated conversations more distracting ($F = 8.74$, $p = .004$), music more distracting ($F = 8.09$, $p = .005$), and personal cell phone use more distracting ($F = 7.12$, $p = .009$). There was an age difference in perceiving distractions of equipment alarms, $F = 9.31$, $p < .001$. Younger anesthesia providers (21-30 years old) perceived equipment alarms as significantly more distracting than their older peers ($p < .001$), and more distracting than the 46 years old or above group ($p < .001$). There was no difference across the three different sites.

Table 1

Perceptions of six sources of distraction across gender, age, and site.

	Perceptions of Distraction M ± SD, p-values					
	Conversations	Music	Equipment Alarms	Vocera/Work Phone	Staff Entering/ Exiting the OR	Personal Cell Phone Use
Gender	.004	.005	.393	.216	.080	.009
Male	2.40 ± 1.25	1.67 ± 1.09	2.43 ± 1.48	2.27 ± 1.23	1.70 ± 1.06	1.73 ± 1.05
Female	3.31 ± 1.51	2.46 ± 1.38	2.70 ± 1.44	2.64 ± 1.46	2.20 ± 1.41	2.56 ± 1.57
Age groups	.891	.371	< .001	.307	.280	.610
21-30 years	2.96 ± 1.35	1.96 ± 1.04	3.57 ± 1.26	2.68 ± 1.42	2.29 ± 1.30	2.25 ± 1.43
31-45 years	3.15 ± 1.54	2.38 ± 1.41	2.38 ± 1.39	2.60 ± 1.45	2.04 ± 1.35	2.56 ± 1.57
46 or above	3.03 ± 1.57	2.29 ± 1.49	2.21 ± 1.37	2.31 ± 1.33	1.91 ± 1.36	2.09 ± 1.42
Site	.416	.116	.107	.324	.219	.790
Level 1 Trauma Ctr	3.08 ± 1.50	2.43 ± 1.43	2.83 ± 1.46	2.63 ± 1.42	2.08 ± 1.35	2.35 ± 1.47
Ambulatory Surgery	3.46 ± 1.45	1.92 ± 1.26	2.23 ± 1.48	2.69 ± 1.55	2.54 ± 1.56	2.54 ± 1.45
Mid-sized suburban	2.77 ± 1.51	1.82 ± 0.96	2.18 ± 1.33	2.14 ± 1.25	1.73 ± 1.08	2.18 ± 1.62

Note. Perception of distractions were measured on a 1 thru 5 scale with higher values indicating the source as more distracting. In the cells are mean ± standard deviations. Analysis of variance (ANOVA) compared group differences across gender, age, and site for the six distractions, respectively. The p-values based on the ANOVA are included in the entry for gender, age groups, and site. A p-value < .05 indicates a statistically significant difference across the groups being compared. Significant difference existed between female and male for conversations, music, and personal cell phone use; and between three age groups for equipment alarms.

Discussion

This quality improvement project aimed to assess anesthesia provider perceptions of distractions during the induction of anesthesia at an ambulatory surgery center. This project is part of a larger, quality improvement project that assesses the frequencies and types of distractions that anesthesia providers perceive to occur during induction at three different surgical sites: an ambulatory surgery center, a level one trauma center, and a mid-sized, suburban hospital. CRNAs, SRNAs, and physician anesthesiologists were provided a survey that listed six different distractions and were asked to rank the severity of distraction on a modified Likert scale. A thorough literature review found several types of specific distractions that often occur in the operating room, and these distractions were selected for this project's survey.

Thirteen anesthesia providers at the ambulatory surgery center responded to the survey. Conversations were reported to be the most severely distracting, while equipment alarms and music were equally found to be the least distracting. Across the three site locations, females found conversations, music, and personal cell phone use to be more distracting than males. This is an interesting finding which warrants further investigation into the reasons why females are more distracted by these events than males.

In addition, younger anesthesia providers found equipment alarms to be more distracting than older anesthesia providers. Multiple alarming systems are present in the OR, and it is anticipated that anesthesia providers become desensitized to alarms the longer they are in practice. This is consistent with the findings that older anesthesia providers rated equipment alarms low on the distraction severity scale. Future projects could also focus on comparing CRNA and SRNA perceptions on what is distracting to them in order to identify if experience level impacts perceived distraction severity. When comparing the survey results of the

ambulatory surgery center, the level one trauma center, and the mid-sized, suburban hospital, no significant difference was found on what providers found to be most distracting between locations. The project team expected that there would be a greater difference based on clinical site and the differences in the types of surgeries, patients, and volume.

Strengths and Limitations

This project surveyed a small, ambulatory surgery center consisting of 45 anesthesia providers. Thus, the biggest limitation to this arm of the overall quality improvement project was a low number of total responses (28.8%). The response rate was low, and only one physician anesthesiologist completed the survey. It is a challenge to get participation of anesthesia providers to complete a survey when that participation may slow the pace of surgeries for patients and surgeons. The project team had a narrow three-week window to distribute and collect survey responses. Having the survey open for a longer amount of time could have resulted in more participation. The survey results provided important insight into what anesthesia providers perceive as distracting while they are inducing a patient at the ambulatory surgery center. This information is valuable in that it can guide the development of future distraction mitigation tools tailored to this surgery center.

Recommendations and Implications for Practice

The review of literature makes it clear that distractions pose a serious threat to patient safety during the induction of anesthesia. Many studies have provided data that identify specific types of distractions that occur in the operating room. This project provides beneficial data to the surgery center leadership that show potential areas where safety and quality could be improved. Currently, this surgery center does not have any tools in place to reduce distractions during the induction of anesthesia.

Based on this initial project, future projects could explore methods of lessening these identified distractions that are occurring during critical moments of anesthesia administration. For example, side conversations were found to be the most distracting. Implementing a project to decrease unnecessary conversation during induction could be very beneficial to this particular surgery center. The systemic review by Gui et al. (2021) also found conversations to be the most frequently reported distracting event during induction. It is recommended that a place to begin is by educating OR staff on the importance of not engaging in unnecessary conversation during the induction of anesthesia and empowering anesthesia providers to ask for a quiet time. Crockett et al. (2018) found that distractions during induction were decreased by 10% after providing staff education on the impact of distractions on patient safety, turning off music upon the patient's arrival to the OR, and announcing an induction time. Similar interventions could be tailored to the ambulatory surgery center and implemented throughout the 11 operating rooms. The ultimate goal of this distraction mitigation during the induction of anesthesia is to protect the patient and safely get them off to sleep.

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APPENDIX A: Survey

1. Select your primary worksite.

- ◯
- ◯
- ◯

2. Select your role.

- ◯ Anesthesiologist
- ◯ Certified Registered Nurse Anesthetist (CRNA)
- ◯ Student Registered Nurse Anesthetist (SRNA)

3. Select your age range.

- ◯ 21 - 25 years
- ◯ 26 - 30 years
- ◯ 31 - 35 years
- ◯ 36 - 45 years
- ◯ 46 - 55 years
- ◯ 56 - 65 years
- ◯ 66+ years

4. Select your gender.

- ◯ Female
- ◯ Male
- ◯ Non-binary
- ◯ Other

5. The following list includes events that may be distracting during the induction of anesthesia. Please rate each event based on the last general anesthetic you provided at your primary work site.

	Not Distracting	Somewhat Distracting	Undecided	Distracting	Highly Distracting
Music	◯	◯	◯	◯	◯
Conversations	◯	◯	◯	◯	◯
Equipment Alarms	◯	◯	◯	◯	◯
Vocera/Work Phone	◯	◯	◯	◯	◯
Staff Entering/Exiting the OR	◯	◯	◯	◯	◯
Personal Cell Phone Use	◯	◯	◯	◯	◯

6. If there is a distraction you find to be significant, but was not listed, please add your thoughts here.

Enter your answer

APPENDIX B: IRB Letter of Approval

Office of Research
INSTITUTIONAL REVIEW BOARD

MEMORANDUM

To: Exie Earnhardt
Atrium/Carolinas Healthcare System

From: Jeannie Sekits, Senior Protocol Analyst
Institutional Review Board

Date: 7/7/2022

Subject: Not Human Subjects Research: IRB00086377
Surveying Anesthesia Providers on Perceived Distractions in the Operating Room During Induction of Anesthesia

The Wake Forest University School of Medicine Institutional Review Board has reviewed your protocol and determined that it does not meet the federal definition of research involving human subject research as outlined in the federal regulations 45 CFR 46. 45 CFR 46.102(f) defines human subjects as "a living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) identifiable private information."

The information you are receiving is not individually identifiable. In recent guidance published by the Office of Human Research Protections (OHRP) on the Guidance on Research Involving Coded Private Information or Biological Specimens, OHRP emphasizes the importance on what is being obtained by the investigator and states "if investigators are not obtaining either data through intervention or interaction with living individuals, or identifiable private information, then the research activity does not involve human subjects."

Note that only the Wake Forest University School of Medicine IRB can make the determination for its investigators that a research study does not meet the federal definition of human subject research. Investigators do not have the authority to make an independent determination that a study does not meet the federal requirements for human subject research. Each project requires a separate review and determination by the Board. The Board must be informed of any changes to this project, so that the Board can determine whether it continues to not meet the federal requirements for human subject research. If you have any questions or concerns about this information, please feel free to contact our office at 716-4542.

The Wake Forest School of Medicine IRB is duly constituted, has written procedures for initial and continuing review of clinical trials; prepares written minutes of convened meetings, and retains records pertaining to the review and approval process; all in compliance with requirements of FDA regulations 21 CFR Parts 50 and 56, HHS regulations 45 CFR 46, and International

Medical Center Boulevard, Winston-Salem, NC 27157-1023 (336) 716-4542 / fax (336) 716-4480

Conference on Harmonisation (ICH) E6, Good Clinical Practice (GCP), as applicable. WFSM IRB is registered with OHRP/FDA; our IRB registration numbers are IRB00000212, IRB00002432, IRB00002433, IRB00002434, IRB00008492, IRB00008493, IRB00008494, and IRB00008495.
WFSM IRB has been continually fully accredited by the Association for the Accreditation of Human Research Protection Programs (AAHRPP) since 2011.