Reducing Noise Pollution in the Operating Room During Critical Phases of Anesthesia

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Abstract

Introduction/Purpose*: Noise pollution in the Operating Room (OR) has been a problem since the 1970's. Noise levels have been recorded much higher than recommended which can lead to distractions during the anesthesia induction and emergence phases. The purpose of this project is to evaluate if the perceived level of noise in the OR, level of distraction, and level of stress for the anesthesia provider is improved after an educational Toolkit is implemented for the OR staff.*
Review of the literature*: Research shows that noise levels and number of distractions during anesthesia induction and emergence are far too high. Studies have been conducted to implement educational interventions in order to decrease noise levels and number of distractions during these periods, and they have shown significant improvement.*
Methods: *A Toolkit was developed to encourage staff to add a cue into the pre-anesthesia verification and period at the end of the surgical case. In addition, the operating room staff and anesthesia staff were provided with an education module on the topic of noise pollution in the OR with a specific focus on the anesthesia induction and emergence phases.*
Results: *Utilizing a repeated cross sectional design data analysis, data revealed results both consistent and inconsistent with previous research. There was even distribution among the different OR cores, and unequal distribution among providers who filled out the data collection surveys with CRNAs participating more frequently than resident physicians. There was a decrease in unnecessary conversations and occurrence of loud noises during induction When compared using p-values, there was only a statistically significant change in occurrence of unnecessary conversations ($p = 0.0009$). When combining the two categories, there was a total of a 20.7% decrease in occurrence. Music playing during induction and emergence decreased after intervention but not to a statistically significant level. There was an increase in unnecessary conversations during emergence to a statistically significant level. There was a decrease in the occurrence of loud noises during emergence, but not to a statistically significant level. A majority of participating anesthesia providers (64.62%) felt that the educational intervention improved clinical care during critical anesthetic periods.*
Discussion: *This project revealed that it is possible to decrease noise and distractions by implementing an educational intervention. The results did not show as much improvement as revealed in other studies. This is possibly from COVID-19 limitations causing changes to be made to the implementation of the educational intervention. Data may have also been different than expected due to the providers who filled out the surveys becoming more aware of noises and conversations as participation continued on throughout the project. Statistically significant changes during the induction period and not during emergence may have been due to the presence of an anesthesia pre-induction verification that creates a natural pause in the room.*
Plan: *This project had pre- and post- intervention data collection through surveys that were filled out by the anesthesia provider just after induction and just after emergence. This survey had yes and no questions about the presence of noise and distractions during induction and emergence that has been borrowed with permission from another study. Two additional questions about the impact of the noise and distractions are asked and measured on a Likert scale.*

Keywords: "operating room and noise" and "noise pollution and operating room"

Reducing Noise Pollution in the Operating Room During Critical Periods of Anesthesia

Introduction

Noise pollution in the operating room (OR) has been an ongoing problem, despite recognition of the problem in the 1970's. Noise pollution was first identified by Shapiro and Berland (1972) as "The Third Pollution" (p.1236) and was further defined as "unwanted noxious or harmful sound" (p. 1236). Noise levels in the OR continue to be measured at levels exceeding national and international recommendations. Excessive noise in the OR influences the staff and communication. Many times, noise levels are much higher than recommended during critical periods of anesthesia, including the induction and emergence phases. Staff education can be helpful in decreasing noise pollution in the OR.

Background

The Association of periOperative Registered Nurses (AORN) has published a position statement to address the problems of noise pollution and distractions in the operating room (AORN, 2020). Prior to this, a position statement was published in 2014. Despite these, there has still been a problem with noise pollution and distractions in the OR, especially during the critical periods of anesthesia induction and emergence. Noise in the OR causes distractions for perioperative staff and leads to vital errors. Noise produced by equipment alone is louder than recommendations set by regulating bodies such as the World Health Organization and Environmental Protection Agency (Hasfeldt et al., 2010). In two studies, noise levels in the OR exceeded all regulating body noise recommendations (Wang et al., 2017; Giv et al., 2017). Ambient noise levels in the OR reached 53.49 dBA, and with the addition of equipment and music, the levels measured 81.78 dBA, which is similar to the sound of a freight train passing from 30 feet away (Cheriyan et al., 2016).

Induction and emergence periods require vigilance from the anesthesia provider as anesthetic complications occur more frequently during these times. Noise levels have been measured above maximum recommendations during induction and emergence phases of anesthesia (Hogan & Harvey, 2015; Wang et al., 2017; Wright, 2016).

In 2014, Recommendation VIII of the "Implementing AORN Recommended Practices for a Safe Environment of Care, Part II" turned the focus of the guidelines to noises created by people, equipment, and communication devices and recognizes that although some noises are required, music and personal conversations should be minimized (Kennedy, 2014). In 2019, the guideline was altered to focus on personnel and equipment generated distractions and noises and also focused on critical periods such as anesthesia induction and emergence (Hauk, 2019). The AORN recently published a position statement on managing distractions and noise in the OR. This document provides an in-depth evaluation of the effects of noise in the OR along with evidence to support a need for changes in the OR to decrease noise pollution and distractions (AORN, 2020). The AORN recommends implementing noise reduction activities such as no-interruption zones during critical periods. Studies that implement educational interventions on noise reduction techniques during critical periods have been successful in decreasing the number of distractions and noise levels during critical anesthesia phases (Hogan & Harvey; 2015 and Wright, 2016). Hauk (2019) recommends personnel-generated noise reducing strategies such as limiting non-essential conversations and controlling the volume of the conversations and restricting the number of people in the OR. Equipment-generated noise reduction can be accomplished by turning portable devices down or by leaving them outside the OR and using communication devices on lowest volume settings (Hauk, 2019). It is recommended that a multi-disciplinary team be used to successfully implement the change, and interventions to decrease

noise should be adaptable to all areas of the OR and where invasive procedures are performed (AORN, 2020).

Problem Statement

Noise pollution in the OR is an ongoing problem, especially during the induction and emergence phases of anesthesia. The AORN published two position statements on managing distractions and noise in the OR. The AORN is committed to supporting an OR environment that minimizes distractions, noise, and interruptions, along with other critical periods in the OR (AORN, 2014; AORN, 2020). Of these critical times, noise levels during induction and emergence have not been addressed in the OR at the site of this improvement project. This hospital has residents and nurse anesthesia students, and it is imperative to have an optimal environment during critical phases of anesthesia. A needs assessment and a departmental survey have completed in order to strengthen the evidence that there is a need for improvement. A multidisciplinary team will be created as it is recommended when creating a safer OR environment (Joseph et al., 2017).

Organizational "Gap" Analysis of Project Site

The AORN has guidelines that recommend decreasing noise and distractions created by personnel and equipment during critical periods, including during anesthesia induction and emergence (Hauk, 2019). Their position statement specifically suggests no-interruption zones, limiting non-essential conversations, and restricting the number of people in the OR during these periods (AORN, 2020).

To evaluate how anesthesia providers feel during these critical periods, a survey was distributed to all CRNAs and anesthesia residents. This survey asked their perception of the noise level, whether or not they felt the noise level is distracting, and whether or not they believe

there is room for improvement in this area. Results of this survey support the need for intervention to meet these recommendations by the AORN. A combined total of 109 CRNAs and residents responded to the survey. In regard to the noise level, 41.67% reported that it is loud during induction and emergence. When asked if the noise level is distracting, 6.42% reported "always", 26.6% reported "often", and 47.71% reported "sometimes". The final question asked if there is room for improvement, and 84.4% responded "yes". These results support the need for an improvement project to decrease the noise level in the OR during anesthesia induction and emergence.

Review of the Literature

Search Strategy

A systematic search was performed in the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and Medline-Ovid databases. The search was limited by peer-reviewed articles only and by date. Initial searches were not limited by date and included CINAHL (1968-present), PubMed (1978-present), and Medline-Ovid (1946-present). Only studies published within the last five years were considered as results were narrowed. No limitations were set for language. The same search terms were used for each of the databases. These terms were "operating room and noise" and "noise pollution and operating room." Studies that measured noise levels in the OR, the effects of noise on perioperative staff, and those that provided potential solutions or interventions for decreasing noise in the OR were considered. Reference lists were used to identify additional publications that did not initially result in the database searches. See Appendix A for Prisma Flow Diagram.

Study Selection

Electronic data searches resulted in 270 total articles. By narrowing the search to articles published in the past five years, there were 93 articles. Excluding duplicate articles left 66 studies. Articles were further excluded based on key words in the title, leaving 38 articles. Review of the abstracts left the final number of articles included at eight. Articles were excluded if they did not include original data.

Study Characteristics

See Appendix B for a results breakdown in table form.

Noise Levels

Elevated noise levels above recommendations from WHO, CDC, and EPA occurred in all six of the studies that measured noise level in the OR. Ambient noise level in the OR starts above the recommendations at 53.49 dBA, and with the addition of equipment and music, increases to 78.79 dBA and 81.78 dBA, respectively (Cheriyan et al., 2016). Pre- and post-intervention testing of noise levels in the OR also revealed elevated noise levels at >50 dBA in both studies (Hogan & Harvey, 2015 and Wright, 2016). Maximum noise levels reached >80 dBA in pre-intervention testing in one of the studies (Hogan & Harvey, 2016).

Noise measured during the beginning, middle, and end of various surgeries revealed that levels exceeded recommendations from WHO and the International Noise Council (Giv et al., 2017). The main sources of noise were identified as from the autoclave and trolley movement. Orthopedic surgeries produce the highest levels of noise pollution, and cardiac surgeries produce the lowest, however, even the lowest noise levels still exceeded recommendations (Giv et al., 2017).

Effects of Noise on Staff

Increasing visual attention load for anesthesia residents decreases their ability to recognize changes in the pulse oximetry tone, indicating a decrease in oxygen saturation from 99-98% at a statistically significant level of $p<0.01$ (Stevenson et al., 2013). With the addition of auditory stimuli, resident performance declined by 17% at a level of $p<0.03$ (Stevenson et al., 2013). This study is specific anesthesia practice, and it is included despite being published in 2013.

With ambient noise levels in the OR, the first assistant, anesthesiologist, and circulating nurse were able to hear 100%, 100%, and 96% of the words that the surgeon spoke, respectively (Cheriyan et al., 2016). With the addition of equipment, the ability to hear went to 97% ($p=0.208$), 81% ($p=0.012$), and 56% ($p<0.001$). When music was added, word recognition decreased further to 90% ($p=0.022$), 48% ($p=0.002$), and 13% ($p<0.001$) (Cheriyan et al., 2016).

Keller et al. (2018) found a correlation ($p<0.001$) between noise level and reported feelings of distraction. Resident surgeons felt more distracted during the main, more technically challenging portion of a surgery. Noise levels during this phase were higher than in the beginning phase. Anesthesia providers reported feeling more distracted during the last phase of the surgery, which is the critical, emergence phase of anesthesia, and noise levels were also louder during this phase when compared to the first phase ($p<0.001$) (Keller et al., 2018).

Induction and Emergence

Noise levels during the two critical periods of anesthesia, induction and emergence, are the loudest perioperative periods (Hogan & Harvey, 2015; Wang et al., 2017; Wright, 2016). Hogan and Harvey (2015) measured average induction and emergence noise levels at >62 dBA with maximum levels during both phases registering > 83 dBA. Wang et al. (2017) measured noise in the OR and the noisiest levels were measured during the beginning and end of surgery, coinciding

with the induction and emergence phases of anesthesia. Wright (2016) measured noise levels >60 dB during both the induction and emergence periods.

Education Interventions

Education helps to decrease noise pollution and noise levels in the OR. Three studies implemented education interventions with pre- and post-intervention testing, and in two of the studies, noise levels decreased after the intervention. The third study revealed that distractions were decreased with education on noise in the OR. Hogan and Harvey (2015) measured the mean and maximum noise levels during induction and emergence from anesthesia before and after an educational intervention at two different hospitals. Mean and maximum noise levels decreased to a statistically significant level on induction and emergence at both hospitals ($p<0.05$). Noise levels measured during 5 critical periods in the perioperative phase decreased after an educational intervention ($p<0.001$) for intubation, specimen collection, final count and debriefing, and emergence (Wright, 2016). There was a statistically significant decrease during briefing at a level of $p<0.05$ (Wright, 2016). Distractions in the OR were defined as music playing, unnecessary conversation not related to the patient, and loud noises (Crockett et al., 2018). After an educational intervention and assigning specific tasks to decrease noise and distractions in the OR, the number of recorded distractions decreased from 61% of the cases to 15% and then later, 10% of cases (Crockett et al., 2018).

Evidence-based Practice: Verification of Chosen Option

Based on the review of literature, it is evident that educational interventions have been successful in improving noise level and attention to the patient during the critical anesthetic periods of induction and emergence. This project will focus on assessing the perception of the anesthesia provider related to noise level, attention of the staff in the room to the patient, and

distractions during induction of anesthesia. Following this, a Toolkit was created and implemented to provide education to the operating room staff. In addition, a cue was added to the anesthesia pre-induction verification (induction period) and to the surgical debriefing (emergence period) at the end of the case to remind staff in the room that the focus should be on the patient and anesthesia providers and that unnecessary noise should be limited at this time. These cues were taught in the educational intervention, but not specifically added to the formal debriefing period. Once the Toolkit was implemented for one week, the initial survey that was completed prior to launching the Toolkit was completed by the anesthesia provider as a post-intervention survey for a six-week period. The PICOT question for this project was "For anesthesia providers, does an intervention for OR staff on noise pollution reduction increase noise reducing techniques, increase attention to the patient, and decrease distractions in the operating room when compared to pre-intervention survey results over a 13-week period?"

Theoretical Framework or Evidence-based Practice Model

Lewin's change theory can be utilized to implement a change in practice in the OR. This model is separated into four areas, field theory, group dynamics, action research, and three steps of change. The first three parts of this theory will be discussed, and then Lippitt's change theory will be utilized for concept building instead of Lewin's original three steps of change. Lippitt's process follows Lewin's, but follows more of a nursing process construct, providing more structure for this project. A concept map illustrating the connection between the two frameworks is located in Appendix C.

Lewin's Change Theory

Field theory looks at the forces that provide the construct of an environment (Suc et al., 2009). These forces impact the structures and processes at the group level, but they further

influence the individual behaviors. The forces also provide the motivation for change to occur. Very closely interconnected with field theory is the concept of group dynamics. This further looks at how the characteristics of the group influence the forces within the field theory. Cognitive and behavioral aspects of the group establish the value system and social habits of the group. There are both driving forces and restraining forces within the group, and these are what influence the process of change. Some driving forces are ambitions, goals, needs, and fears. Action research has two parts. The first is that the study group needs to see a necessity for change, and this includes seeing the current status and goals and recognizing that there is room for improvement or change. The second part is that the most appropriate solution should be the one that is utilized. The three steps of change in this theory are *Unfreezing, Moving,* and *Refreezing* (Suc et al., 2009).

Lippitt's Theory

Lippitt's Theory is a change theory similar to Lewin's theory, but it is more detailed and fits into the structure of nursing process: *assessment, planning, implementation, and evaluation* (Mitchell, 2012). Lippitt's theory consists of seven phases in the change process. These phases are congruent with the nursing process and Lewin's three phases. The *Unfreezing* stage is in line with the *assessment phase* of the nursing process and *phases 1-3* of Lippitt's theory, which are: *phase 1*- diagnose the problem, *phase 2*- assess motivation/capacity for change, and *phase 3*- assess change agent's motivation and resources. *Phases 4 and 5* fall into the *planning* category and include *phase 4*- select progressive change object and *phase 5*- choose appropriate role of the change agent. *Implementation* aligns with *phase 6*, which is maintain change, and evaluation is *phase 7*- terminate the helping relationship (Mitchell, 2012).

Application to Practice

These two theories with the additional structure of the nursing process can be used to guide the implementation of change in the OR. The *assessment* and *phases 1-3* consisted of performing a needs assessment evaluation to identify if there were deficits in the current process and created validity for change. Both theories address that there needs to be an assessment of motivation and capacity for change. The current literature that supports that there can be negative outcomes from increased noise in the OR, along with pre-testing noise levels, can be used to show the need for change. These can also act to motivate leadership to agree to a process change. This is where group dynamics and field forces were addressed. A pre-assessment was performed to identify motivating factors and driving forces from task force members. The educational intervention was made to be in alignment with the reported driving forces from the staff. It was impossible to remove all restraining forces, but increasing driving forces can overcome the restraining forces, and this was done through education (Mitchell, 2012).

The *planning* and *phases 4* and *5* are where the final plan for the intervention took place. The education sessions took place for support staff who were available to facilitate change. Integrated into the education portion was the *Action Research* phase of Lewin's change theory, which included properly identifying the gap in practice and background information to support the need for change. There was also a chance for alterations and suggestions for change and revision of the educational intervention prior to the final roll out. This process took place multiple times until the best version was accepted by the reviewers.

The *Implementation* and *phase 6* consisted of presenting the educational intervention and transitioning the new process into the OR. This is where the process was carried out, and it was important to have communication, feedback, teamwork, and motivation to help staff to feel supported during the change. In this phase, the driving and restraining forces made another

appearance, and driving forces were more impactful when open communication was utilized among the team, and the group felt as if they were empowered to have a say in the change that was being made (Mitchell, 2012).

The *Evaluation* and *phase 7* were the final stages of the process. This included continuing the process without the support of the implementation group. In this stage, there needed to be evaluation to determine if the process has improved (Mitchell, 2012). This was done with post-intervention survey completion by the CRNA's and anesthesia residents in the OR. Another important aspect of this phase was reinforcing the change periodically. For this process, since it is recommended as a standard of practice, it would be beneficial to transfer the educational module into a yearly learning mandatory to reinforce the key points on a regular basis. By seeing improved sound levels in the OR, the final outcome will be met to provide a safer environment for patients during the critical periods of induction and emergence from anesthesia.

Goals, Objectives and Expected Outcomes

The main objective was to implement a Toolkit that included presenting education to the OR staff about the effects of noise pollution during the critical anesthetic periods and to implement cues to address these critical periods during the pre-anesthesia verification (induction) and during the emergence phase once the surgical dressing was placed. The project facilitator disseminated a twenty-minute PowerPoint educational intervention that was recorded and sent through departmental email. In addition, the facilitator presented posters in all of the anesthesia and OR breakrooms daily over the span of one week. The goals of implementing this Toolkit were to decrease the distractions, noise level, and stress level as perceived by the anesthesia provider during induction and emergence phases of the anesthetic period.

Methods (Plan)

This Project started with completing a needs assessment and reviewing the gap analysis in order to support a need for this Quality Improvement project. Further planning for this project was guided by utilizing the Delphi method. The facilitator reached out to the anesthesia department to recruit interested colleagues to participate on the task force, which aligns with the experts that are described in the Delphi method (McMillan et al., 2016). This taskforce consisted of anesthesia physicians and nurses and other colleagues involved in departmental research. The group met officially, two times. There were multiple other smaller meetings with the statistician and anesthesia providers to gather ideas. The tool that was utilized was validated and borrowed, with permission, from Crockett et al. (2018). In order to keep the experts engaged, the number of large all-inclusive meetings were limited to two meetings to develop and review the questions and project implementation details (McMillan et al., 2016).

Once there was permission to utilize the questionnaire, it was distributed to the anesthesia providers to fill out as closely to induction and emergence completion as possible. The data collected was then used to compare to the data collected after the intervention with the OR and anesthesia staff. These details are further explained in the next sections.

Project Design

The design for this DNP project was a Quality Improvement with controlled before and after design. The methods included quantitative data collection. This data collection utilized yes and no questions with a simple follow-up question to identify which group in the OR contributed to the distractions. The survey consisted of three total questions with an additional comments section. In addition to the validated survey, the providers also answered a question asking if they felt that the distractions were enough to impact their ability to provide care to the patient. A

global analysis question was then sent in survey form to the anesthesia providers to find out if they believe that the educational intervention to decrease noise and distractions in the OR improved clinical care.

Project Site and Population/Data Collection Procedure

This project took place at an academic hospital in the Midwest. Further, it took place in the operating rooms at this hospital. Data collection was conducted for six weeks prior to Toolkit implementation. The OR is split into three separate areas labeled Core A, Core B, and Core C. It was anticipated surveys would be gathered equally or as close to equally as possible since they each have different groups of people who staff them. There was a pre-intervention survey (Appendix F) that the anesthesia providers filled out related to the OR environment during induction and emergence. Once these were completed for six weeks, the project facilitator implemented a Noise Reduction Toolkit that included educating the OR staff on noise pollution during critical periods of the anesthetic, adding a cue to the pre-induction verification, and adding a cue to the end of the case to address the noise prior to the emergence from anesthesia. Once this Toolkit was in place for one full week, there was a post-intervention survey measuring the same OR environmental factors that the pre-induction survey measured.

The Toolkit included three parts. The first part was to provide education to the OR staff and anesthesia staff about noise pollution during the critical anesthetic periods of induction and emergence. The second part was to incorporate a cue in the pre-anesthetic verification that reminds the staff in the room that they need to have their focus on the patient. The last part of this was to incorporate a cue at the end of the case to remind all providers in the room that emergence is a critical period of the anesthetic, and that the focus should be on the patient with minimal noise and distraction. One week of actively disseminating and utilizing the Toolkit in

person, the poster presentations remained in the breakrooms as reminders. At this point, the anesthesia providers once again filled out the same survey that was filled out before the Toolkit was implemented.

Setting Facilitators and Barriers

Implementing this project revealed some barriers and positive influences. Barriers came from those who lacked interest in the project or who believed that there was not a need for improvement. Thorough education helped to reveal some reasons why it was an important project for improvement. Another barrier came from constraints on being able to properly disseminate the educational portion of the Toolkit. Having multiple different avenues to disseminate this information helped to avoid too much influence of this barrier. One positive influence was that the department of anesthesia has its own clinical safety committee, and their support helped to validate the importance of this project. Another positive influence was the development of a taskforce who assisted in structuring the Toolkit in a way that positively influenced the greatest number of people who work in the OR.

Measurement Instruments

Outcomes of this project were measured by using the pre-Toolkit/post-Toolkit anesthesia provider surveys. Data was collected related to the number of distractions present during induction and emergence periods of the anesthetic. Education explaining the use of this tool was provided through a certified departmental email announcement. In addition, a general consent form was attached to each data collection folder in each OR. The provider consented to being part of the project as indicated by completing a survey. It was presumed that those who did not give consent to participate simply did not fill out a data collection survey. It was clear that they were not required to participate in data collection for this project. The tool containing these

questions was provided to the anesthesia provider at the start of the first case of the day and any potentially subsequent cases depending on case length and turnover in each specific operating room. The surveys were placed in a folder in each OR and available throughout the day for first case completion and any subsequent cases. The surveys were collected daily. The tool that measured the number of distractions is the OR was utilized from the study by Crockett et al. (2018) with permission from this group of authors. Changes that were made to this survey were removal of identifiers such as the name of the staff in the room, date, and the OR room number. In addition, a question was added and not part of the validated survey to ask the anesthesia provider if they felt that the distractions in the room affect their ability to care for the patient. Surgery type and OR core (A, B, C) were left as identifiers to help with categorizing results. Proposals for IRB were submitted and approved at both The University of Alabama (UA) and UM prior to the start of data collection.

The surveys were kept in a folder in each OR. Once the survey was completed, it was placed in the right side labeled “Completed,” and the surveys were collected by the PI. Data was transferred to excel spreadsheets and google spreadsheets in secured locations.

Data Analysis

Exploratory data analysis techniques (EDA) were used to identify extreme values and their removal was determined. Missing values and rates were assessed, and multiple imputations techniques were considered. Non-response rates were estimated. Data analysis occurred to evaluate the recorded number of distractions present during induction and emergence of anesthesia. Once the Toolkit was presented to the OR staff, the surveys were re-distributed to the anesthesia providers. Using SAS for Windows 9.4 software and SAS macro, data was analyzed using dependent sample t-test and Chi-squared testing methods. A statistically

significant finding would be a $P<0.05$. Additionally, standardized differences analysis was completed to produce Cohen's d values to measure the effect size between the two groups. The results from the pre-Toolkit survey were used to help guide the educational component of the Toolkit.

Power analysis and sample size determination were based on the statistical recommended rule of thumb of approximately sample size for a survey of at least 10 to 15 complete surveys per question. In addition, considering a confidence level of 95% with a margin of error between 1% and 2.5% we determined that a sample size of 115 survey respondents will allow us to test our research questions. Account for 20% dropout or incompletion rate, the final power analysis revealed that it was necessary to collect 144 surveys during each of the pre and post intervention data collection periods. A rolling count was needed to be sure that there were equal data sets from each of the three Core OR locations.

Cost-Benefit Analysis/Budget

Monetary costs of this project were minimal. The cost came from supplies needed to print the questionnaire cards for pre- and post- surveys, cost for utilizing Survey Monkey for needs assessment data collection, and materials to create the Toolkit intervention. Time to conduct the project is a minimum of 540 hours as required for the courses. All costs for this project were paid for by the project facilitator.

Timeline

The timeline for this project was January-September. February included submission of proposals for both UA and UM and contacting the UM Anesthesia Clinical Research Committee (ACRC) for pre-approval. I also established the taskforce for this project. In March, the Institutional Review Board (IRB) applications were submitted for approval at both UA and UM,

and the taskforce group met two times in April/May. In June and July, pre-intervention data collection took place, and I created the Toolkit intervention. July included implementation of the Toolkit education. Post-intervention survey data collection took place in August and September. Data analysis, final write-up, and dissemination of findings are taking place in September-November. A table of this timeline is available in Appendix D.

Ethical Considerations/Protection of Human Subjects

The University of Alabama and the UM IRB exempt approval was obtained prior to project implementation and data collection. There were not any human subjects participating in this project. Standards of care for practice in this setting were carefully followed.

Results

Utilizing a repeated cross-sectional design, the data was analyzed and produced results as reported below. The distribution of survey items collected before and after emergence as well as induction were compared. Our findings show that three different OR cores were evenly distributed across Core A, Core B, and Core C for before and after emergence as well as before and after induction. There was an unequal distribution when it came to provider level of experience for those completing the surveys, with a larger number of surveys completed by CRNA's over resident physicians for both induction and emergence surveys in the pre and post intervention periods. For the pre-intervention surveys, the CRNA's filled out 86.03% of the surveys for induction and 92.13% for emergence surveys. For post-intervention surveys, CRNA's filled out 88.14% of the surveys during induction and 91.08% for emergence. There was also an unequal distribution for type of surgery for both the induction and emergence surveys.

For both induction and emergence, music playing during these phases did decrease after the intervention, but not to a statistically significant level ($p = 0.2108$). Unnecessary conversations and occurrence of loud noises decreased at a statistically significant level for the induction phase when compared using Cohen's d (-0.3676/0.5535). When compared using p-values, there was only a statistically significant change in occurrence of unnecessary conversations ($p = 0.0009$). When combining the two categories, there was a total of a 20.7% decrease in occurrence. For emergence, there was a statistically significant increase in unnecessary conversation and a decrease in occurrence of loud noises, but not to a statistically significant level. There was variation in the sources of unnecessary conversations, and this is shown in the table below.

Providers reported on a Likert scale their feelings about extraneous noises, and if they felt that those noises impacted their clinical care during induction and emergence. For the category of "strongly disagree" and "disagree" there was actually a decrease in numbers for both induction and emergence when pre intervention and post intervention numbers were compared. For those who reported "agree" or "strongly agree" there was an increase before and after the intervention in both the induction and emergence phases.

In addition to the provider survey for induction and emergence, there was a one question survey that was sent to all CRNA 's and anesthesia resident physicians. This was sent at the conclusion of the data collection and was in a Likert scale format. The question read "How likely is it that the intervention to decrease noise and distractions in the operating room improved clinical care?" The results of this survey revealed that 24.62% of respondents reported "Very Likely" and 40% reported "Likely." This means that 64.62% of participants believe that there is a likelihood that this intervention improved clinical care.

Level of Experience of Participants

Phase	N	CA1	CA2	CA3	CRNA <5yrs	CRNA >5yrs
Induction-Pre	**136**	**9**	**5**	**5**	**11**	**106**
Induction-Post	**194**	**10**	**2**	**11**	**30**	**141**
Emergence-Pre	**104**	**3**	**2**	**3**	**11**	**85**
Emergence-Post	**155**	**4**	**2**	**8**	**28**	**115**

Noise/Music/Loud Noises

Phase	Music Playing?		Unnecessary Conversations?		Did Loud Noises Occur?	
	Y	N	Y	N	Y	N
Induction-Pre	**10**	**127**	**50**	**87**	**11**	**26**
Induction-Post	**14**	**184**	**40**	**158**	**7**	**191**
Emergence-Pre	**22**	**83**	**26**	**79**	**10**	**95**
Emergence-Post	**24**	**136**	**53**	**107**	**12**	**147**
CHISQ- Induction/Emergence	**p = 0.9364/0.2108**		**p = 0.0009/0.1455**		**p = 0.0729/0.5695**	
Cohen's d*- Induction/Emergence	**-0.0089/-0.1555**		**-0.3676/0.1852**		**0.5535/0.0707**	

*A significant change between the groups is represented by an absolute value of >0.2

Source of Unnecessary Conversations

Source	Induction-Pre	Induction Post	Emergence-Pre	Emergence-Post
None	**67.71**	**80.61**	**75.96**	**66.67**
Surgery	**9.56**	**6.63**	**4.81**	**10.06**
Anesthesia	**0.74**	**0**	**0**	**0.63**
RN	**2.94**	**2.04**	**0.96**	**3.77**
Surgery/RN	**4.41**	**2.04**	**3.85**	**6.92**
RN/Tech	**3.68**	**0.51**	**2.88**	**3.77**
Surgery/Tech	**0.74**	**4.59**	**0**	**0**
Surgery/Anesthesia/RN	**0**	**0**	**1.92**	**0.63**
Surgery/RN/Tech	**11.76**	**0.51**	**8.65**	**5.66**
All Groups	**1.47**	**3.06**	**0.96**	**1.89**

Interpretation/Discussion

The results of this project were both aligned and inconsistent when compared to the literature. Our data supports that an educational intervention on reducing noise and distractions during induction and emergence in the OR is capable of decreasing noise and distractions. It is possible that this was only statistically significant during the induction period, and not during emergence, because of the anesthesia pre-induction verification that creates a natural pause in the room. The pre-induction creates a period where all staff in the room need to direct attention to the head of the bed and patient. Without this pause at the end of the case, there is a lack of that time when everyone stops talking and pays attention to the patient.

The anesthesia team was responsible for the data collection in this project, and because of this, the anesthesia team may have been more aware of the distractions in the OR and more likely to keep the unnecessary noise to a minimum. This could be why the anesthesia team was identified as the source of unnecessary noise the fewest number of times compared to the other services. The anesthesia team had the most training in this project between the intervention and implementation through survey completion. This may indicate that providing more education exposure to those who were the source of unnecessary conversations more frequently may help to decrease the occurrence of unnecessary conversations.

It would have been ideal if providers had improvement in feeling that the extraneous noises in the OR were distracting enough to affect their clinical care during induction and emergence. This could have been another supporting factor for continuing education on the topic of reducing noise and distractions during anesthesia induction and emergence phases. One reason that the results were in the opposite direction than expected is because of exposure time to the project. As the providers collected data and paid more attention to the noises and distractions, they may have become more aware of the impact that the noise had on their clinical care.

Providers indicated that they feel that the educational intervention had an impact on clinical care. This is a good indication that continued education may be well accepted. In order to have participation in improvement projects, those involved have to see value in the intervention. This would support continued education in this area. Due to Covid-19 restrictions, the educational intervention was modified from the original plan, which would have had more in person contact with the anesthesia providers, RN’s, techs, and surgery teams.

Conclusion

Noise pollution has been recognized as a problem in the OR since the 1970's. This elevated level of noise can cause distractions during critical periods of the anesthetic, including induction and emergence phases. Research has shown that there are benefits to educating OR staff about noise pollution in the OR. This education can lead to decreased noise level and a decrease in the distractions within the OR. This project utilized a Toolkit that included a pre- and post- intervention survey to evaluate the effectiveness of an educational intervention. In addition, this Toolkit included a verbal cue at the end of the pre-anesthesia verification and at the end of the surgery to remind the staff in the room that it is a critical period of the anesthetic. The goal of this project was to decrease the noise level and distractions during critical anesthetic periods through implementing a Toolkit for OR staff.

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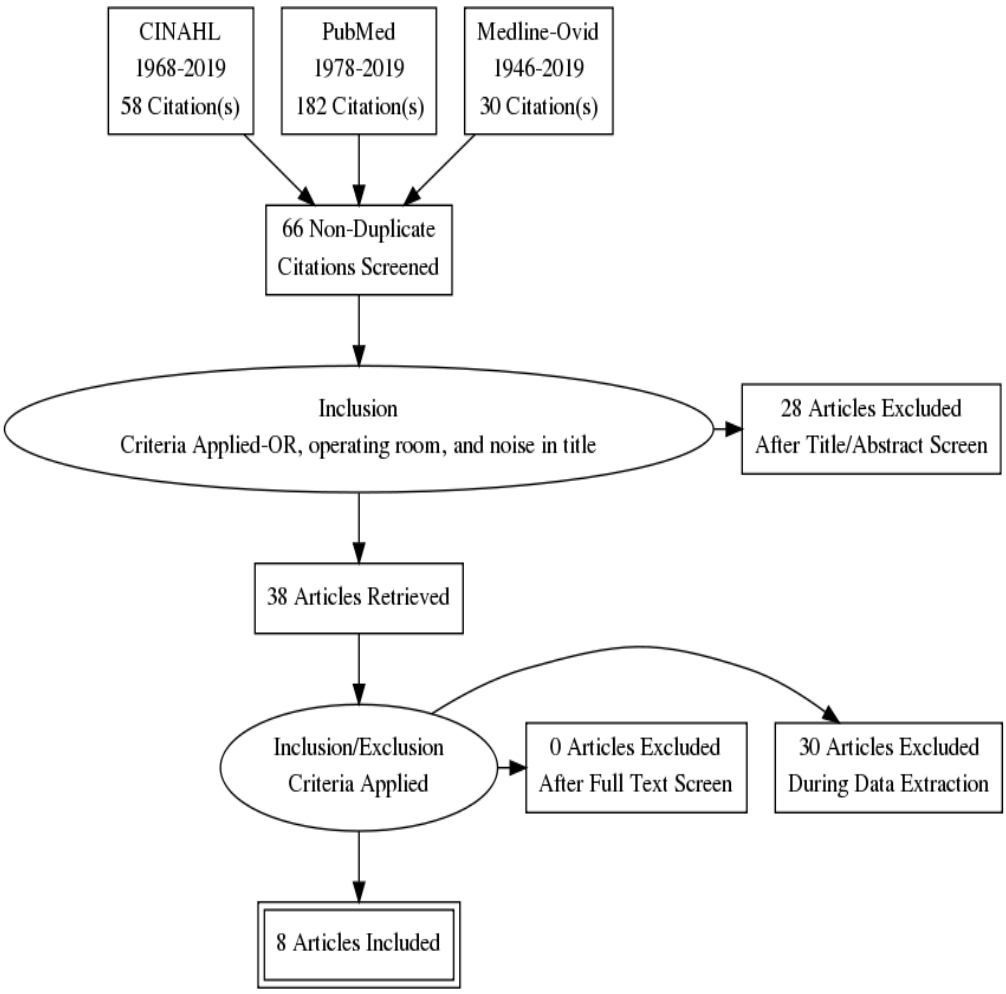
Appendix A

Prisma Flow Diagram



Appendix B

Literature Review Articles

Study/ Report MeSH Terms	APA Citation (6th ed)	Study Design	Data-Based Yes/No	Sample/ Setting	Variables, Instruments, Interventions, and/or Comparisons	Results	Level of Evidence	Implications	Limitations
1 operating room, noise, noise pollution	Stevenson et al.	Quasi-experimental design	yes	-n=33 resident anesthesiologists (19 males, mean age 30 +/- 3yo). -Participants were paid. -The setting is in a laboratory.	The impact of visual attentional load and auditory background noise on the participants ability to detect changes in pulse oximetry tone change.	Visual attention load affects the ability to detect changes in the pulse oximetry concentrations that signal a decrease in oxygen saturation from 98-99% (P<0.01). With the addition of auditory stimuli, there was a 17% decline in resident performance (P<0.03). By itself, increasing the noise level decreased the residents' ability to detect changes with P<0.01.	Level 3	The results show that visual and auditory distractions can affect the ability to detect changes in pulse oximetry and can be used to implement sensory training protocols. These training protocols can be used to enhance sensory performance.	This was performed in a laboratory setting and may not transfer to the real world. The average noise level in the operating room is 77dB and was only 67dB in this study.
2	Cheriyan et al.	Quasi-experimental design	yes	n=3, a circulator, a first assist, and an anesthesiologist. A benchtop model was developed to replicate the operating room during a percutaneous nephrostolithotomy (PCNL).	Three different environments were used for performing the testing: ambient noise, ambient noise with PCNL equipment, and ambient noise with PCNL equipment and music. The surgeon spoke 20 different medical words or phrases. Each of the participants recorded what they heard. This was repeated for a total of five rounds.	Statistical analysis was performed using Student's t-test for continuous variables and the chi-squared test for categorical variables. Word/phrase recognition was measured with just ambient noise. The first assistant, anesthesiologist, and circulator correctly heard 100%, 100%, and 96% of the words, respectively. Once the equipment was	Level 3	Surgeons need to be aware of the effect that noise may have on communication and patient safety. Methods to decrease intraoperative noise pollution and improve communication should be explored.	This study used a small sample size. The benchmark model used may not be an accurate representation of an actual operating room. The equipment used was commonly used equipment, but also brands that are most commonly used at that hospital. Other hospitals may

						added, the percentages went to 97% (p=0.208), 81% (p=0.012), and 56% (p<0.001), respectively. Adding music decreased the recognition to 90% (p=0.022), 48% (p=0.002), and 13% (p<0.001), respectively. Significant results came from the anesthesia provider and circulator, who had changes that were significant to p=0.010 and p=0.001)			use equipment that is quieter or louder than what was used in the study.
3	Hogan & Harvey	Quality improvement with pretest/post-test design	yes	The setting is in two community OR's, not affiliated with each other. The sample is a convenience sample of n=118.	A pretest/posttest design was used to measure noise levels in the OR during induction and emergence phases. Noise levels were measured prior to an educational in-service and then one month after the in-service. At the first hospital, noise levels were measured during elective arthroscopic cases. At the second hospital, noise levels were measured during general surgery cases.	Statistical analysis was performed using a paired samples t-test. Statistical significance was considered for results of P<0.05. Noise levels at both hospitals after the intervention were statistically significant (P<0.05) for induction and emergence. Both hospitals also had a statistically significant reduction in maximum noise level reached during induction and emergence (P<0.05). The first hospital experienced a statistically significant reduction in noise events greater than 70dBA during induction and emergence with P=0.000 for both periods,	Level 4	Perioperative team members need to be aware and mindful of the increased risk of mistakes that come from communication errors related to noise pollution. Managers and educators should implement strategies to reduce noise in the OR. If this is an educational intervention, it needs to be ongoing education.	One of the limitations is that the cases at the second hospital were varied, compared to the first hospital. The first hospital was only similar types of cases, and for that reason, the results may not be generalizable.

						The second hospital experienced a statistically significant reduction in noise events during emergence only (P=0.019).			
4	Giv et al.	Cross-sectional study	yes	The setting was in ten hospitals affiliated with Hamadan University of Medical Sciences in Hamadan, Iran. The study took place in the operating rooms for three days.	Noise levels were measured during three, five-minute periods- beginning of surgery, middle of surgery, and end of surgery. Noise levels were then compared to noise level recommendations provided by the Environmental Protection Agency, WHO, and the International Noise Council.	Data for comparing noise levels in various operating rooms was analyzed using one-way ANOVA. Pearson's correlation test was used to compare noise level with types of surgery. A t-test was used to compare noise pollution levels with existing standards. The main sources of noise were noted to be from the autoclave and trolley movement. The highest level of noise pollution was related to orthopedic surgery, and the lowest level was related to open heart surgery. The noise pollution levels in the OR were higher than WHO recommended noise levels and the recommendations by the International Noise Council.	Level 4	The study suggests that there needs to be an elimination of excess noise in the OR. This may need to be a multidisciplinary approach to implement effective standards and include the entire surgical team in implementing change.	There is not a clear number listed for the total number of observations made. The types of surgeries are listed, but there is not a clear n for this study. The study setting is in another country, outside of the United States, so the equipment used may be louder or quieter than the equipment that is used in the United States.
5	Wang et al.	Cross-sectional study	yes	N=23, n=223 This study took place in 23 operating rooms.	Sound measurements were measured during weekdays. The noise dosimeter was placed in the OR	Student's t-test was used to compare noise levels to international and internal standards.	Level 4	Work needs to be done with the surgical team to determine how to decrease the noise level in the OR.	One limitation identified is that specific events could not be directly linked to the

					prior to anyone entering the OR for the day. It remained in the OR until the end of the day. Measurements were taken and then the surgical log was used to identify the type of surgery that was performed during the measurement period.	One-way ANOVA was used to analyze the difference in noise levels between types of surgeries. A statistically significant p value was noted to be p,0.05. Noise levels exceeded the recommendations from the EPA, WHO, and Chinese standards, 100% of the time. Noise levels were highest at the beginning and end of the surgery.		There is recommendation to do a pre-test and post-test to see if intervention changes the noise levels in the OR.	recorded noise levels. This study was limited to a tertiary hospital in China.
6	Keller et al.	Prospective observational study	yes	N=110 (number of operations) n=101 (main surgeon) n=84 (second surgeon) n=106 (anesthetist) n=105 (scrub nurse)	Sound measurements were taken for the duration of the case, with designated phases of surgery- phase 1 (period prior to main surgeon entering), phase 2 (from the time that the main surgeon enters until he/she exits), and phase 3 (after main surgeon left). If the main surgeon was present for the entire surgery, it was all considered phase 2. After the surgery, the main surgeon, second surgeon, anesthetist, and scrub nurse were each given a questionnaire asking about their perception of the difficulty of the surgery and how distracted they felt during the surgery.	Statistical analysis was performed using SPSS. Results considered statistically significant were at P<0.05 and 95% confidence intervals were reported. Noise levels were louder during the main phase compared to the first phase at a statistically significant level (P<0.001) and louder during the closing phase compared to the first phase (P<0.001). For the second surgeon (usually the surgeon with less experience), reported distraction was related to higher noise levels in the main phase. For the anesthetist, reported distraction was	Level 4	Noise reduction strategies and noise reduction programs should be implemented in the OR.	Only the duration, surgery type, and difficulty of the surgery were included as variables. It was not possible to assess the source of noise during measurement.

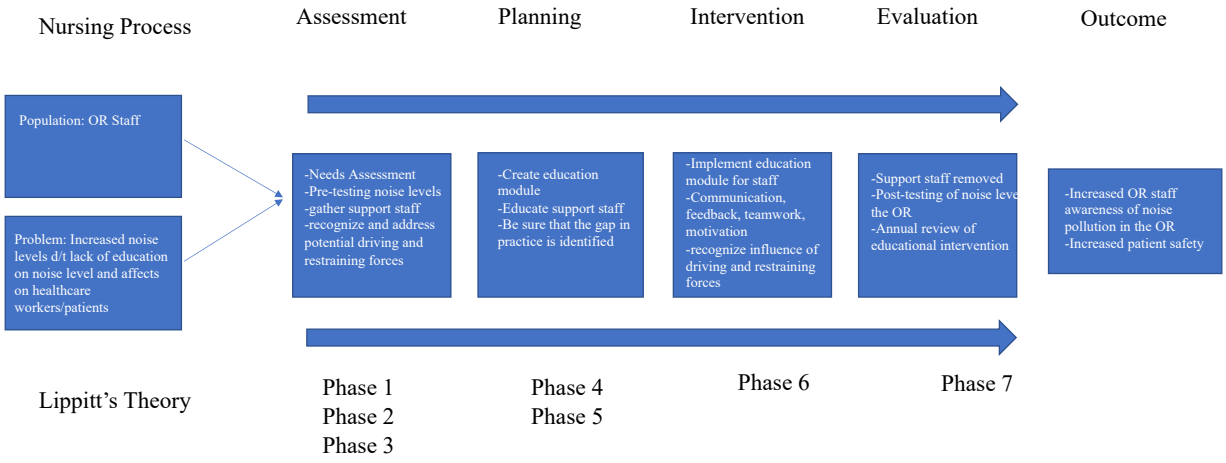
						significantly higher during the closing phase (one of the most critical periods for anesthesia). Noise levels exceeded the recommended 55 dBA in at least 50% of the studies in the main and closing phases.			
7	Wright	Quality improvement with pretest/posttest design	yes	Preintervention testing n=30 Postintervention testing n=27	Five critical phases were identified: Intubation, emergence, briefing/time-out, specimen collection, and final count/debriefing. Sound measurements were taken every 30 seconds during the induction and emergence periods and every 5 seconds during the others. An educational intervention was provided for the OR staff members with a focus on strategies to reduce noise during critical phases. Testing was then conducted postintervention in the same manner as preintervention testing	SPSS was used to perform independent-sample t-tests to determine statistical significance of mean dB difference between pre- and postintervention testing. There was a statistically significant reduction in noise levels in all five critical phases after the intervention.	Level 4	Education alone may not create permanent change within the department. It may be necessary to have refreshers of this information. It is also important to educate all disciplines that are involved in the OR. Additional data collection should be done randomly in order to evaluate whether or not the practice has been adopted successfully. Findings suggest that staff members' behavior can be modified with education to decrease noise levels during critical periods.	The Hathorne effect may have caused noise levels to naturally become lower when the staff observed the data collectors in the OR.
8	Crockett,et al.	Quality improvement with survey phase and data collection phase	yes	n=53 (anesthesia providers who completed the survey). Data collection phase consisted of gathering data for the first two cases in each of the ENT OR's each day during the study period.	Survey phase: each of the anesthesia providers completed a survey about their perception and relevance of auditory distraction on the providers during anesthesia induction.	There was a decrease in distractions during induction of general anesthesia from distractions in 61% of cases to 15% after the intervention was implemented. As measurements continued, two	Level 4	By decreasing distractions for anesthesia providers during induction and other critical periods of anesthesia, there may be a decrease in errors, improve vigilance and communication, and provide	The Hawthorne effect may play a part in improvement data. Data may not be generalizable to all areas of practice as this study was performed at

					In the data collection phase, the anesthesia provider documented each occurrence of 3 specified distracting noises. These were music playing, unnecessary conversation unrelated to the patient, and loud noises. Each time that one of these occurred, the anesthesia provider documented it. Interventions were then implemented. #1 OR nurse took responsibility to turn off the music prior to the patient entering the OR. #2 Education was provided to the perioperative staff. #3 Education for the otolaryngologists. #4 Education for the anesthesiologists. #5 Anesthesia provider responsible for placing a sign on the OR door prior to induction to as a visual cue for those entering to be quiet. #6 Anesthesiologist provides a verbal cue to be quiet as induction is beginning.	months later, that result was further decreased to 10% in the ENT rooms. There was a decrease to <15% in all 14 of the ORs at the 12-month mark of data collection.		safer patient care. This project could be expanded to the entire course of the surgery.	an academic children's hospital. The study only looks at the first cases of the day, so factors that may come up later in the day are not accounted for in results. Since the data is collected by the anesthesia provider based on their discretion of what is considered a distracting noise, there may be bias in the results that are reported.

Nursing: Levels of Evidence. (2020, February 27). Retrieved from https://guides.lib.umich.edu/c.php?g=282802&p=1888246.

Appendix C

Theoretical Framework



Appendix D

Project Timeline

Month	Tasks
March	• Submit proposal for UA and complete pre-ACRC for UM • Establish taskforce
April/May	• IRB training and submission • Meet two times with taskforce
June/July	• Pre-intervention survey data collection • Create the Toolkit intervention
July	• Implement Toolkit education
August/September	• Post-intervention survey data collection
October/November	• Data analysis, final write-up and dissemination of findings

Appendix E

Educational Intervention Poster

Reducing Noise Pollution in the Operating Room During Critical Phases of Anesthesia

Amanda Jablonski, MSN, CRNA; Susan Appel, PhD, ACNP-BC, FNP-BC; Brad Phillips, DNP, CRNA; Thomas Klumpner, MD
The University of Michigan-Michigan Medicine and The University of Alabama-Capstone College of Nursing

BACKGROUND

Introduction

- Recognition of the problem in 1972
- Noise- a stressor that can affect the CV system, HR, and BP
- The physical stress response from noise can provoke a psychological stress response
- Noise levels in the OR exceed national and international recommendations (Hasfeldt et al., 2010)
- Noise levels much higher than recommended during critical periods of anesthesia (Wang et al., 2017; Giv et al., 2017; Cheriyan et al., 2016).
- The Association of periOperative Registered Nurses (AORN) has a position statement addressing noise pollution and distractions in the OR during critical periods (AORN, 2020).

Purpose

The purpose of this project is to decrease the noise creating distractions in the OR during critical phases of anesthesia

- Create an educational intervention introducing the topic
- Educate the surgical techs, OR nurses, and anesthesia teams on the topic
- Evaluate the educational intervention for possible permanent educational implementation

DATA COLLECTION SURVEY

Induction/Emergence Survey

OR Core: A B C. Years of experience: CA1 CA2 CA3 CRNA <5yrs CRNA >5yrs
Surgery Type:

AT THE TIME OF INDUCTION/EMERGENCE (whichever anesthetic period you are reporting):

YES NO

☐ ☐ Was music playing at any time during induction or emergence (even softly)?

☐ ☐ Was there unnecessary conversations/talking occurring not related to the patient? (IF yes, check all that apply)

☐ Surgery team ☐ anesthesia team
☐ OR RN's ☐ OR techs

☐ ☐ Did any loud noises occur during induction/emergence?

COMMENTS:

Extraneous noises were distracting enough to affect my clinical care during induction

Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Post Data Collection Survey

How likely is it that the intervention to decrease noise and distractions in the operating room improved clinical care?

Very Unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

SOURCES OF NOISE

	Induction-Pre	Induction-Post	Emergence- Pre	Emergence-Post
None	67.71	80.61	75.96	66.67
Surgery	9.56	6.63	4.81	10.06
Anesthesia	0.74	0	0	0.63
RN	2.94	2.04	0.96	3.77
Surgery/RN	4.41	2.04	3.85	6.92
RN/Tech	3.68	0.51	2.88	3.77
Surgery/Tech	0.74	4.59	0	0
Surgery/Anesthesia/RN	0	0	1.92	0.63
Surgery/RN/Tech	11.76	0.51	8.65	5.66
All Groups	1.47	3.06	0.96	1.89

RESULTS

Phase	N	CA1	CA2	CA3	CRNA <5yrs	CRNA >5yrs
Induction-Pre	136	9	5	5	11	106
Induction-Post	194	10	2	11	30	141
Emergence-Pre	104	3	2	3	11	85
Emergence-Post	155	4	2	8	28	115

Phase	Music playing		Unnecessary conversations		Did loud noises occur?	
	Y	N	Y	N	Y	N
Induction-Pre	10	127	50	87	11	26
Induction-Post	14	184	40	158	7	191
Emergence-Pre	22	83	26	79	10	95
Emergence-Post	24	136	53	107	12	147
CHISQ- Induction/Emergence	p= 0.9364/0.2108		p= 0.0009/0.1455		p=0.0729/0.5695	
Cohen's d- Induction/Emergence	-0.0089/-0.1555		-0.3676/0.1852		0.5535/0.0707	

- Equal distribution between Core A, B, C
- Unequal distribution for experience level of providers who completed the surveys and type of surgery
- **Induction/Emergence-** Decrease in music playing, but not statistically significant
- **Induction**- Unnecessary conversations decreased to a statistically significant level and occurrence of louds noises decreased but not statistically significant. This was a 20.7% decrease when these two categories were combined
- **Emergence-** statistically significant increase in unnecessary conversation and decrease in occurrence of loud noises but not to a statistically significant level
- **Unnecessary noises-** Variety of sources for unnecessary noises
- 64.62% of participants believe that there is a likelihood that this intervention improved clinical care

DISCUSSION

- Results were both aligned and inconsistent when compared to the literature
- Our data supports that the educational intervention is capable of decreasing noise and distractions during induction and emergence
- Why more change during induction? Possibly because there is a natural hard stop pre-induction verification that can support the cue to be quiet and direct attention to the patient
- The end of the case, emergence phase, does not have a natural pause to focus on the patient. Adding this may help to direct more focus on the patient during emergence
- Anesthesia team was responsible for data collection, which may have been more aware of the distractions and was responsible for the fewest distractions
- Anesthesia team had the most training with the intervention and involvement in data collection. This may indicate that increased exposure to training for other groups may further decrease their contribution to noise

Appendix F

Induction Survey

OR Core: A B C Years of experience: CA1 CA2 CA3 CRNA <5yrs CRNA >5yrs
Surgery type:

AT THE TIME OF INDUCTION (Anesthesia pre-induction verification until airway secured)

Yes	No	
☐	☐	Was music playing at any time during induction (even softly)?
☐	☐	Was there unnecessary conversations/talking occurring not related to the patient? ☐ Surgery team ☐ anesthesia team ☐ OR RN's ☐ OR Techs
☐	☐	Did any loud noises occur during induction?

COMMENTS:

Extraneous noises/sounds were distracting enough to affect my clinical care during induction

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

Emergence Survey

OR Core: A B C Years of experience: CA1 CA2 CA3 CRNA <5yrs CRNA >5yrs

Surgery type:

AT THE TIME OF EMERGENCE (from surgical dressing in place until patient extubated)

Yes	No	
☐	☐	Was music playing at any time during emergence (even softly)?
☐	☐	Was there unnecessary conversations/talking occurring not related to the patient? ☐ Surgery team ☐ anesthesia team ☐ OR RN's ☐ OR Techs
☐	☐	Did any loud noises occur during emergence?

COMMENTS:

Extraneous noises/sounds were distracting enough to affect my clinical care during emergence

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5