

CAN POSTPARTUM BREASTFEEDING MOTHERS SAFELY UNDERGO ANESTHESIA?

A KNOWLEDGE AND COMFORT ASSESSMENT OF CRNAs

PRE- AND POST-EDUCATION PRESENTATION

WITH COGNITIVE AID ADJUNCT

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Abstract

Background: Uncertainty in providing anesthesia to breastfeeding patients has been a concern for anesthesia providers for many years. Hospitals lack written protocols and standard guidelines for breastfeeding patients receiving anesthesia care. **Purpose:** The purpose of this project was to improve the quality of anesthesia care provided to breastfeeding patients by identifying knowledge gaps and uneasiness in CRNAs providing anesthesia care to this patient population. **Methods:** The knowledge and comfort level of CRNAs providing anesthesia agents to breastfeeding patients were surveyed pre-and post-evidence-based education on safe anesthetic agents for breastfeeding patients and information specific to the safe resumption of breastfeeding after surgery. **Results:** The pre-and post-education survey data sets were not able to be compared because of the small sample size, so the results of each survey were evaluated independently. The pre-education survey results assessing CRNAs' comfort levels resulted in 69% of CRNAs feeling comfortable caring for breastfeeding patients, and 64% answered the knowledge questions correctly. In the post-education survey, the comfort questions resulted in 65% of CRNAs responding that they are comfortable providing anesthesia care for breastfeeding patients, and 80% answered correctly to the knowledge assessment questions. 80% of CRNAs reported their practice changed after education was provided and 40% of CRNAs referenced the education materials and cognitive aid in their practice since the intervention. **Conclusions:** Breastfeeding patients can safely undergo anesthesia, there is no need to “pump and dump” breastmilk after anesthesia. It is safe to resume breastfeeding after anesthesia when the mother is awake enough to hold the infant. CRNAs have the means to make an impact by using current evidence-based guidelines when caring for and providing recommendations to breastfeeding patients.

Key search terms included breastfeeding after anesthesia, breastmilk, drug transfer, newborn, infant, lactation, postpartum breastfeeding, Relative Infant Dose, breastfeeding importance, and reliable resources for breastfeeding mothers.

Background and Significance

It is common for breastfeeding mothers to require anesthesia for non-obstetric surgery. The effects of anesthesia transferred to developing infants through breastmilk have been a concern for many years (Reitman & Flood, 2011). Providers, the Food and Drug Administration (FDA), and hospital policies have conflicting ideas on recommendations and practices for providing anesthetic medications and their effects on the breastfeeding infant (Cobb et al., 2015).

Hospitals vary in the number of anesthetics they provide to breastfeeding patients. Even though it is common for breastfeeding mothers to require surgery, CRNAs may feel uncertain or feel they lack information or confidence when providing anesthesia to this patient population. This uncertainty can be related to when or how medications transfer to breastmilk, what quantities of medications transfer, and for how long anesthetic medications are transferred to breastmilk. Anesthesia providers should have the knowledge and confidence to provide safe anesthesia care to breastfeeding patients when the occasion arises.

There is no optimal anesthetic technique for breastfeeding patients and few human studies have been conducted on this patient population. Most of the research on medication transfer from mother to infant has been performed on animals or research from small observational human studies (Reitman & Flood, 2011). The limited clinical human trials and small sample sizes in this patient population may not accurately reflect the transfer of anesthesia medications in breastmilk (Cobb et al., 2015). Therefore, an understanding of medication pharmacokinetics enables CRNAs to tailor the anesthetic techniques to the requirements of breastfeeding patients.

In the clinical setting, inconsistent instructions for the safe resumption of breastfeeding have been given to mothers by different anesthesia providers. This is frustrating to the patients

and can cause the loss of the patients' trust during the perioperative process, leaving the patients confused about safety of anesthesia and the appropriate time to resume breastfeeding. Health care professionals can be ineffective in providing consistent and accurate information and recommendations to breastfeeding mothers. The substandard advice is based on a weak knowledge base. Health care providers, especially anesthesia providers, need to provide accurate, evidence-based, and consistent information and recommendations (Marks & Spatz, 2003).

Not all hospitals have written protocols or standard guidelines for providers to follow regarding preoperative assessment questions, guidelines for providing anesthesia, or consistent recommendations for safely resuming breastfeeding after anesthesia. Many CRNAs in the clinical setting expressed a desire to review anesthesia medications and recommendations before providing anesthesia care to breastfeeding mothers. The lack of protocols, the uncertainty and comfort levels of CRNAs, and the irregularity with which CRNAs care for breastfeeding patients underscores the need for evidence-based guidelines for anesthesia providers.

Purpose

The purpose of this project was to improve the quality of anesthesia care provided to breastfeeding patients by identifying knowledge gaps, refining practice, and increasing the confidence of CRNAs providing anesthesia to breastfeeding patients. The project evaluated CRNAs' knowledge and comfort when delivering anesthesia care to breastfeeding patients before and after SRNAs provided education and displayed cognitive aids in the perioperative areas. The adoption of evidence-based practice change was assessed in the post-education survey.

Review of Current Evidence

Key search terms included breastfeeding after anesthesia, breastmilk, drug transfer, newborn, infant, lactation, postpartum breastfeeding, Relative Infant Dose, breastfeeding importance, and reliable resources for breastfeeding mothers. Databases searched included PubMed, NCBI, and US National Library of Medicine via the UNCG Library search engine, and LactMed website. The search produced 27 articles. Inclusion criteria for the project were articles containing anesthetic medications and their pharmacokinetic and pharmacodynamic properties, medication transfer in lactating patients, and medication appearance in breastmilk after surgery. Exclusion criteria were articles greater than 20 years old, articles on mothers strictly formula feeding their infants, and articles on anesthesia during pregnancy.

Throughout the literature there are a few main themes. The first theme is the importance of breastfeeding to mother and infant alike. The second theme is comparing new and old recommendations for the safe resumption of breastfeeding after anesthesia. Providers knowing the pharmacological properties of medications and their effects on the breastfeeding patient and infant is the third important theme discussed in the literature. The fourth theme discussed ways in which the CRNA can provide adequate anesthesia for the mother and maintain safety for the breastfeeding infant postoperatively. The final theme identified reliable resources to guide healthcare professionals in providing accurate and consistent information to breastfeeding patients.

Importance of Breastfeeding for Mother and Infant

Breastfeeding is an excellent source of nutrition for infants and has benefits for the mother as well. Along with the child's growth and development, the infant's immune system is strengthened by breastfeeding. Mothers pass along antibodies to the infant through breastmilk

that protect against gastrointestinal, respiratory, and urinary tract infections (Noel-Weiss & Lepine, 2014). Mortality is reduced, and childhood cancer is less common in breastfed children. Disease rates for obesity and type 2 diabetes mellitus are lower, along with improved cognitive and motor development in breastfed children (Verstegen & Ito, 2019). Breastfeeding infants have a reduced incidence of SIDS, asthma, ear infections, and stomach viruses. Finally, the infant-maternal bond is strengthened by breastfeeding, benefiting the infant and the mother (CDC, 2021).

Breastfeeding conveys health benefits to the mother. The risk of diabetes mellitus type 2, hypertension, and breast and ovarian cancers is reduced in mothers who breastfeed. Breastfeeding is cost-effective and convenient compared to formula feeding. Mothers can breastfeed anywhere and at any time, without mixing formula or preparing bottles (CDC, 2021).

The World Health Organization (WHO) recommends six months of exclusive breastfeeding for infants, adding in solid foods at six months, and continuing breastfeeding up to age two, and beyond (WHO, 2021). For the health and protection of the mother and infant, breastfeeding should not be interrupted, and breastmilk should not be discarded after the mother had anesthesia for non-obstetric surgery (Noel-Weiss & Lepine, 2014). Mothers should not substitute formula when discarding breastmilk after anesthesia, as formula is not as beneficial for the infant. Disrupting the breastfeeding schedule can jeopardize the mother's milk supply, can lead to mothers being discouraged, and can halt the breastfeeding process altogether (Thomas, 2021). Quickly resuming breastfeeding after anesthesia prevents decreases in milk supply in the breastfeeding mother (CDC, 2021).

New vs Old Recommendations for Safely Resuming Breastfeeding After Anesthesia

Current, evidence-based data on safe perianesthetic medications disputes the former recommendation to “pump and dump” immediately after surgery (Mitchell et al., 2020). The continuation of breastfeeding can be encouraged with knowledge of the medications given in the perioperative setting. Providers should evaluate the risk of medications passing through breastmilk, even if the amount is subclinical (Hale, 2004).

After anesthesia, when the mother’s mentation and strength have returned to normal, medications will have redistributed from the milk compartment to the fat and muscle, suggesting it is safe to resume breastfeeding. Hence the new recommendation is to continue breastfeeding after anesthesia when the mother is awake and alert enough to hold her baby and breastfeed (Cobb et al., 2015). This is a significant change from the former recommendations of having postpartum mothers “pump and dump.” Infants should be monitored closely for behavioral changes, difficulty breathing, poor feeding, drowsiness, nausea, and diarrhea and the pediatrician should be notified if observed changes in the infant occur after breastfeeding. Providers can provide breastfeeding mothers with consistent recommendations on resuming breastfeeding after anesthesia if they are knowledgeable of current information on anesthesia medications and their transfer to breastmilk.

Pharmacological Properties of Medications

With an understanding of the pharmacokinetics of medications, CRNAs can provide adequate anesthesia for the mother and safely choose medications with a lower risk to breastfeeding infants. Medication transfer into breastmilk depends on several pharmacokinetic properties, including protein binding, lipid solubility, molecular weight, pKa, and maternal plasma concentration (Cobb et al., 2015). From the mother’s blood, medication transfers to

breastmilk passively, diffusing in proportion to medication concentration in maternal plasma. Highly protein-bound drugs transfer less to breastmilk, limiting the amount of the drug delivered to the infant through breastmilk. Lipid soluble medications cross cell membranes more readily and therefore transfer to breastmilk more easily. pKa is the pH where the drug is 50% ionized. Medicines with a higher pKa enter the breastmilk and are rapidly ionized. This prevents the medication from diffusing out of the breastmilk and the medication gets “trapped” in the medication’s ionized form, accumulating in the breastmilk (Marks & Spatz, 2003). CRNAs should use medications with low absorption and lipid solubility and have a large molecular weight, are highly protein-bound, and have a short half-life, to help reduce the transfer of medicines to breastmilk (Thomas, 2021).

The Relative Infant Dose (RID) is an estimate of the amount of medication the infant can be exposed to through breastmilk after the medication is administered to the mother. The RID accounts for the mother’s weight, infant’s weight, the concentration of medication in breastmilk, and the amount of breastmilk consumed by the infant. Medications with RID of less than 10% are considered safe to administer to a breastfeeding patient (Hale, 2004).

Ways CRNAs Can Provide Safe Anesthesia for the Breastfeeding Mother

CRNAs can provide adequate anesthesia for mothers without interfering with breastfeeding postoperatively. When caring for breastfeeding mothers, CRNAs must take into consideration the infant when planning anesthesia. The CRNA should have a thorough history and physical, a clear understanding of the mother’s breastfeeding plan, and attempt to administer medications with the lowest risk of transfer to breastmilk. Different surgical procedures require different types of anesthesia, but with knowledge of anesthetic medications, safe anesthesia care can be provided to breastfeeding mothers by CRNAs. The surgical procedure guides the choice

of anesthetic technique, but the goal is to promote the resumption of safe breastfeeding. A strategy to achieve this goal is to provide regional nerve blocks or neuraxial anesthesia when appropriate. This strategy will hasten the mothers' recovery and promote the timely resumption of breastfeeding. If regional techniques cannot be used, the use of short-acting medications should be considered to support the mother's rapid recovery. The use of longer-acting medications and medications with active metabolites should be avoided. When possible, non-narcotic, non-sedative analgesics should be prioritized along with local anesthetics to provide postoperative analgesic coverage (Dalal, 2013).

Reliable Resources

Healthcare providers throughout the organization should provide accurate and consistent information to breastfeeding patients. One of the best and most accurate resources for information to guide CRNAs' medication administration to the breastfeeding patient is the National Library of Medicine's LactMed. Providers can search the database for anesthetic medications, the appropriate medication levels for mother and baby, specific medication effects on the breastfed infant, and alternative medications to consider (Thomas, 2021). The CDC (Centers for Disease Control and Prevention), The WHO, and UpToDate also provide current recommendations. By using the most up-to-date and evidence-based anesthesia practice, CRNAs can encourage postpartum mothers to continue to breastfeed their babies (Cobb et al., 2015).

As anesthesia for breastfeeding patients becomes more common, further data on the influence of anesthesia medications on breastfeeding is being collected (Verstegen & Ito, 2019). An increasing amount of research is focusing on the importance of continuing breastfeeding after anesthesia with emphasis on the benefits for infants' health. With the latest evidence-based

practice information and knowledge of pharmacokinetics of medications and medication transfer through breastmilk, providers should be confident to make recommendations for resumption of breastfeeding when the mother is awake and alert enough to hold her baby (Cobb et al., 2015).

Evidence-Based Practice Model & Translational Framework

The Awareness to Adherence Model describes how to transition to guideline-based practice. The steps in this model are making people aware there is a problem, agreeing there is a problem, adopting guidelines for providing care, and using the established guidelines consistently in providing applicable care (Pathman et al., 1996).

The Johns Hopkins Nursing Evidence-Based Practice (EBP) Model (JHNEBP) uses a process of three steps called PET: Practice Question, Evidence, and Translation (PET) (Dang & Dearholt, 2017). This model is used to ensure the latest evidence-based research and best practices are rapidly being implemented into patient care. In the first step, interprofessional team members will be recruited, the problem will be defined, and the EBP question will be developed. In the second step, evidence, an internal and external search for evidence will be conducted, and the level and quality of the evidence will be appraised. The last step is translation, where the determination of fit, feasibility, and appropriateness of recommendations will be assessed for the translational path. This is where an action plan is created and supporting resources to implement the plan are solidified. Once the action plan is put into place, the outcomes are evaluated, the results are reported to the stakeholders, and the findings are distributed (Dang & Dearholt, 2017).

The Johns Hopkins Nursing EBP Model provides details on how to carry out the awareness to adherence model methods. By combining the awareness to adherence model with the JHNEBP, the DNP project used the methods outlined above to help direct the flow of the project.

Methods

The knowledge and comfort level of CRNAs working in a large, regional medical center were evaluated regarding the provision of anesthesia care to breastfeeding patients. After an initial survey, the CRNAs were presented with evidence-based practice guidelines regarding appropriate anesthetic agents for breastfeeding patients and guidelines for the safe resumption of breastfeeding after surgery. Posters with the evidence-based information were created as a cognitive aid and served as a quick reference in highly visible perioperative areas. A post-education survey was completed four weeks after the education was presented. The post-education survey assessed the CRNAs' comfort level, knowledge retention, and practice changes following the education presentation and implementation of cognitive aids. The goals of the project were to provide knowledge, instill confidence, change practice, and reduce misinformation related to the safe administration of anesthetic agents to breastfeeding patients.

Design

This was a quality improvement project at a regional medical center carried out using a quantitative design. Likert scale survey questions were used to gather demographic data and assess the knowledge and comfort levels of CRNAs before and after the provision of cognitive aids and evidence-based education. The project's goals were for the quantitative data from the survey to show improvement in provider knowledge and comfort levels, and for CRNAs to make positive practice changes using current evidence-based guidelines for this unique patient population.

Setting

This project occurred at 916-bed, regional, level III trauma medical center in a growing metropolitan city in southeastern North Carolina. The hospital is a private, not-for-profit health system with a Board of Trustees made up of 22 members. The hospital is located in an urban

setting with a population of around 200,000 people and serves six counties. This location was selected for this project since it is a regional medical center specializing in heart care and cancer treatment, contains surgical facilities, and provides a full range of maternity services. The medical center performs more than fifteen thousand surgical procedures annually.

Sample

The medical center employs approximately 55 CRNAs, and staffs approximately 20 CRNAs per day. The inclusion criteria for participants were CRNAs working in the main regional medical center currently providing anesthesia to patients. This included full-time, part-time, per diem, and administrative nurse anesthetist staff. The project did not have specific exclusion criteria related to CRNA staff. A convenience sample was used and all participants who met inclusion criteria, volunteered to complete the surveys, and participated in the education presentation were included in the sample. Ages, gender, ethnicity, and years of nursing and CRNA experience varied throughout the sample. A target sample was at least 35 CRNAs completing both the pre-and post-education surveys and participating in the educational material provided.

Intervention

An evidence-based PowerPoint presentation (Picture 1) was created by SRNAs to present as an education intervention to the CRNAs. A cognitive aid in the form of a poster (Picture 2) was created to summarize the information. The poster was posted in highly visible perioperative areas of the medical center as a quick reference for the CRNAs. The information presented was created based on the knowledge gaps identified from the pre-education survey and referenced up-to-date literature and evidence-based practice guidelines. The CRNAs were provided

electronic access to the PowerPoint and the cognitive aid as a quick reference to reduce anxiety when providing anesthesia care to breastfeeding patients.

Data Collection

Custom pre- and post-education surveys were created by this author and another SRNA. The pre-education survey (Appendix A) included a total of 18 questions. The first seven questions described the demographics of the CRNAs, including age, gender identification, number of children, highest education level, years as a nurse, and total years of experience as a CRNA. The next ten questions assessed variables surrounding breastfeeding patients and CRNAs' knowledge and comfort level providing anesthesia to this population. These questions included how often they care for breastfeeding patients, how often they inquire about breastfeeding when caring for postpartum patients, and if caring for breastfeeding patients makes them anxious. The CRNAs were asked to rate their knowledge and comfort level on the safe administration of anesthesia medications and explaining medication side effects to breastfeeding patients. Knowledge questions were asked about when it is safe to resume breastfeeding after anesthesia, safe RID numbers, and reliable resources. CRNAs were surveyed about consistency among hospital providers when advising breastfeeding patients on safely resuming breastfeeding after anesthesia. The last question was open-ended, encouraging CRNAs to share thoughts, comments, and concerns needing to be addressed in the educational session. The post-education survey (Appendix B) included a total of 18 questions, the first 16 being the same questions as the pre-education survey. The last two questions asked if the CRNA's practice had changed because of the education material provided and whether the CRNA had referenced the education material for patient care in the previous four weeks since educational materials were provided.

The initial survey, educational materials, and post-education surveys were distributed via email to all CRNAs by the chief CRNA. The email containing the survey link explained to the CRNA that by beginning the survey, they were providing consent. The subjects were also notified that participation was voluntary, they could withdraw at any time, and they could omit questions without penalty. The email noted no incentives or monetary gifts were being provided for survey completion. The surveys were deidentified and all responses were kept secure and confidential.

Surveys were completed electronically through uncg.qualtrics.com. This platform securely stored information electronically with no identifying information, so privacy and confidentiality were maintained for the survey participants. The pre-education survey was distributed to CRNAs on September 28th, 2021, through their work email by the Chief CRNA and the survey was open for five weeks. An email was sent out on October 18th, 2021, to remind the CRNAs about the project due to low survey response. The data from the initial survey was collected on November 1st, 2021. The initial survey results were analyzed to determine the current level of knowledge and comfort level of CRNAs and to identify knowledge gaps. An evidence-based education intervention was developed from the initial survey data analysis and areas of need were addressed in the education presentation. Cognitive aids were displayed throughout the perioperative areas for a quick reference on December 12th, 2021. The education information was distributed in the form of a PowerPoint presentation on November 13th, 2021.

The post-education survey was sent to CRNAs on January 10th, 2022, four weeks after education distribution. This allowed the CRNAs ample time to integrate the information presented to them into their practice before assessing changes in knowledge, comfort level, and practice. On January 25th, 2022, the post-education survey closed, and the data were analyzed

for changes in CRNAs' comfort level, knowledge retention, and anesthesia practice since the education materials were distributed.

Data Analysis

The quantitative data collected in the pre-and post-education surveys were analyzed in Microsoft Excel independently. Because of the low number of post-education survey responses, the pre-and post-education data sets were not able to be compared using inferential statistics to determine a statistically significant difference in responses. The pre-education data was analyzed for comfort level and knowledge gaps in CRNAs providing care for breastfeeding patients. The post-educational data was analyzed for the effectiveness of the educational materials and CRNAs' practice change.

Results

The sample of post-education survey responses was insufficient to allow for comparison of pre-and post-education data. The pre-educational results are provided below, followed by the post-education results analyzed separately.

Pre-Education Results

Table 1 displays the demographic characteristics from the pre-education survey results. Twelve CRNAs responded to the pre-education survey, eight females and four males. The age ranges were from 26 to greater than 61 years old, with the average age range of 35-44. Not everyone participating in the initial survey had children as four participants reported not having any children. Two participants had one child, four had 2-3 children, two had 4-5 children and no participants had more than 5 children. Out of the 12 participants, 42% had Doctorate degrees, and 58% had master's degrees. For years of experience in nursing, there were no participants

with less than five years in nursing. The average years of nursing experience was 16-20 years. The average years practicing as a CRNA was 6-10 years.

When evaluating how often CRNAs care for patients who are breastfeeding, one CRNA stated they care for breastfeeding patients weekly, four CRNAs said monthly, and four surveyed said every six months. Three CRNAs said they never care for breastfeeding patients at the medical center. Seven CRNAs reported they always inquire about breastfeeding when caring for postpartum patients, two said only sometimes, two said occasionally, and one CRNA reported never inquiring about breastfeeding when caring for postpartum patients.

When surveyed about knowledge regarding safely administering medications to breastfeeding patients, half felt somewhat knowledgeable, and half felt neutral. One CRNA reported feeling not comfortable describing side effects of medications to breastfeeding patients, five reported feeling neutral, five reported feeling somewhat comfortable, and one felt very comfortable. Six CRNAs felt very comfortable administering medications to breastfeeding patients, four felt somewhat comfortable, and two felt neutral administering medications to breastfeeding patients. When asked if providing care for a breastfeeding patient makes them feel anxious, all but one CRNA responded no, and one CRNA responded yes to feeling anxious.

When asked what RID percentage of a medication was safe to give a breastfeeding patient, three CRNAs responded 10%, seven responded 15%, one responded with 25%, and one left the answer blank. When asked what to tell a breastfeeding mother about safely resuming breastfeeding after surgery, two CRNAs responded “you should pump and dump for at least 24 hours after surgery”, two CRNAs responded “you should pump and dump at least once before breastfeeding again,” and eight CRNAs responded “when you feel awake enough to breastfeed, it is usually safe.” When asked to identify a reliable resource for evidence-based

recommendations for breastfeeding patients, four CRNAs responded with “UpToDate”, six with “LactMed”, none with Womenshealth.org, and two with “U.S. National Library of Medicine TOXNET.”

For the open-ended question asking CRNAs to share thoughts, comments, and concerns to be addressed in the educational session, only one CRNA asked for the standard of care practices and acceptable and unacceptable medications for breastfeeding patients to be included.

Post-Education Results

Table 2 displays the demographic characteristics from the post-education survey results. Three female and two male CRNAs responded to the post-education survey. The age ranges were from 35 to 60, with the average age range of 45-54. Only one participant did not have children. Out of the five participants, two had Doctorate degrees and three had master’s degrees. Four CRNAs had greater than 21 years of nursing experience, and the other CRNA had 11-15 years of nursing experience. Out of the five participants, three had 2-5 years of CRNA experience, one had 11-15 years of experience and one had 16-20 years of CRNA experience.

When evaluating how often CRNAs care for patients who are breastfeeding, one CRNA stated they care for breastfeeding patients weekly, two CRNAs said monthly, and two surveyed said they care for breastfeeding patients every six months. One CRNA reported they always inquire about breastfeeding when caring for postpartum patients, while one reported sometimes, two said occasionally, and one CRNA reported never inquiring about breastfeeding when caring for postpartum patients. When surveyed about knowledge of safely administering medications to breastfeeding patients, one felt very knowledgeable, two felt somewhat knowledgeable, and two felt neutral. Two CRNAs reported feeling very comfortable describing side effects of medications to breastfeeding patients, one felt somewhat comfortable, and two felt neutral.

Three CRNAs felt very comfortable administering medications, and two felt neutral administering medications to breastfeeding patients. When asked if providing care for a breastfeeding patient makes them feel anxious, all but one CRNA responded no, and one CRNA responded yes to feeling anxious.

Four CRNAs responded under 10% and one responded under 15% was a safe RID number of a medication to give a breastfeeding patient. When asked what to tell a breastfeeding mother about safely resuming breastfeeding after surgery, one CRNA responded “you should pump and dump for at least 24 hours after surgery”, and four CRNAs responded “when you feel awake enough to breastfeed, it is usually safe”. Two responded with UpToDate, one with LactMed, one with Womenshealth.org, and one with U.S. National Library of Medicine TOXNET when asked to indicate reliable resources for evidence-based recommendations for breastfeeding patients.

One CRNA reported their practice did not change because of the provided educational materials, and four CRNAs reported their practice did change. Two CRNAs did reference the educational materials for patient care in the previous four weeks, while three CRNAs did not reference the provided materials.

Discussion

The project did not have a sufficient sample size to statistically analyze the project’s hypothesis. The limited number of post-education survey responses and the pre-and post-education data sets not being linked hindered the numerical data analysis. The results of the comfort and anxiety questions were combined along with combining the results of the knowledge questions to be analyzed as overall comfort and overall knowledge.

The pre-education survey results for the overall comfort questions combined resulted in 69% of CRNAs feeling comfortable taking care of breastfeeding patients and 64% provided the correct answer for the knowledge questions. In the post-education survey, the overall comfort questions resulted in 65% of CRNAs reporting being comfortable providing anesthesia care for breastfeeding patients, and 80% answered correctly to the knowledge assessment questions. The knowledge of CRNAs' appeared to increase from the pre-education survey to the post-education survey, but the overall comfort percentage dropped slightly. The comparison of this project's pre-and post-education data sets is for reference for this project only, as these findings cannot be used as a generalization of the whole population at the medical center since the sample size was very small.

The results to determine the effectiveness of the project's intervention were evaluated by the survey question inquiring if the CRNAs' practices changed because of the provided education and the provision of a cognitive aid. Of the five CRNAs responding to the post-education survey, four CRNAs felt like their anesthesia practice changed since the distribution of educational materials for the DNP project.

In the pre-education survey, 60% of CRNAs reported caring for breastfeeding patients every month to every six months. In the post-education survey, 40% reported caring for breastfeeding patients monthly and 40% also reported every six months. The project allowed four weeks for CRNAs to incorporate the education and visual aids from the intervention. CRNAs could have encountered the barrier of not providing anesthesia care for many breastfeeding mothers during the project time frame due to infrequent surgical procedures performed on breastfeeding patients.

Another barrier to changing the CRNAs' anesthesia practice could have been due to their many years of practice and their development of strong opinions and attitudes towards the care of breastfeeding mothers. The post-education survey was completed by CRNAs who are older (the average age range was 45-54 years old) and the majority had more than 11 years of nursing experience.

The CRNAs were asked in the initial survey if they felt like there was consistency at the medical center with instructions given to breastfeeding patients. Fifty-eight percent reported inconsistency at the medical center with instructions given to breastfeeding patients. The lack of a protocol or evidence-based guidelines at the medical center for providers to use when giving recommendations to this unique patient population could be the cause of inconsistency among anesthesia providers. Cobb et al. (2015) described the inconsistency with recommendations and medical practice amongst physicians, policies, and the FDA regarding safe medication administration, time between anesthesia and resumption of breastfeeding, and if the breastfeeding patient is advised to "pump and dump." The Awareness to Adherence Model was used in this project to identify a problem in current practice, recommend evidence-based guidelines for providing care, and encourage implementing evidence-based guidelines when providing care to breastfeeding mothers. The transition to guidelines based on evidence can have barriers, but with continued education, and implementation of a protocol or practice guidelines, practice change can be implemented.

Limitations

The COVID-19 pandemic restricted access to in-person education and recruitment in hospitals. To overcome this barrier, the pre-and post-education surveys, along with the educational materials were distributed via email to all CRNAs by the chief CRNA.

The low number of CRNA responses to the surveys was a limitation of the project because it does not provide an accurate representation of the entire CRNA population at the medical center. The limited number of responses prevented statistical analysis to be performed on the data set. The data set being very small limits the project since the results cannot be generalized to the whole CRNA population at the medical center. The small sample size could be from COVID-19 restrictions limiting the SRNAs' ability to recruit and present the educational intervention in-person at the medical center.

The answers from the CRNAs' pre-and post-education survey results were not linked, limiting the statistical data analysis. Before sending out the initial survey, a secure and confidential method to link the data responses from both surveys should have been implemented. This would have linked the responses from each individual's results to compare pre-and post-education results, especially if practice changed as a result of the project's intervention.

Conclusion

The perioperative time around surgery for breastfeeding patients can be confusing when it comes to a safe anesthesia plan and clear recommendations for when the patient can resume breastfeeding. Breastfeeding patients can safely undergo anesthesia. It is safe to resume breastfeeding after anesthesia when the mother is awake enough to hold the infant and there is no need to "pump and dump" breastmilk before the mother resumes breastfeeding. Uninterrupted breastfeeding has benefits for both the infant and mother and it is the responsibility of the CRNA to promote safe practices to encourage uninterrupted breastfeeding. Anesthesia providers have the knowledge to give evidence-based recommendations to breastfeeding patients and provide safe care.

The goals of the project were to provide knowledge, instill confidence, change practice, and reduce misinformation related to the safe administration of anesthetic agents to breastfeeding patients. Even with the small sample size, practice change was noted. Further research could be done with more time for a project, with interventions to increase the sample size. It would be beneficial in the future for the SRNA to carry out the DNP project while participating in clinical at the medical center. Having a face to associate with a name on a DNP project could help with recruiting participants and make the CRNAs more willing to help students complete DNP projects. Other questions to be included in future studies would be to evaluate CRNAs' thoughts on practice guidelines and why or why they would not make changes to their current practice.

To sustain the education provided in this project, future SRNAs or current CRNAs should continue educating anesthesia providers and help facilitate the implementation of a protocol or practice guidelines for the medical center regarding this patient population. CRNAs have the means to make an impact by using current evidence-based guidelines when caring for and providing recommendations to breastfeeding patients.

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Appendix A

Pre-Education Survey Questions:

1. Select your age:
 - A. <25
 - B. 26-34
 - C. 35-44
 - D. 45-54
 - E. 55-60
 - F. >61

2. What gender do you identify as?
 - A. Male
 - B. Female
 - C. _____
 - D. Prefer not to answer

3. Do you have children?
 - A. No Children
 - B. 1
 - C. 2-3
 - D. 4-5
 - E. >5

4. Highest level of education you have completed?
 - A. Associate degree
 - B. Bachelor's Degree
 - C. Master's Degree
 - D. Doctorate Degree
 - E. Prefer not to say

5. Years in nursing practice total
 - A. <1
 - B. 2-5
 - C. 6-10
 - D. 11-15
 - E. 16-20
 - F. >21

6. Which department do you work in?
 - A. Anesthesia
 - B. PACU
 - C. Other

7. Years in current CRNA practice (CRNA/PACU)?
- A. <1
 - B. 2-5
 - C. 6-10
 - D. 11-15
 - E. 16-20
 - F. >21
8. How often do you care for patients who are breastfeeding?
- A. Daily
 - B. Weekly
 - C. Monthly
 - D. Every 6 months
 - E. Never
9. Do you inquire about breastfeeding when caring for postpartum patients?
- A. Always
 - B. Often
 - C. Sometimes
 - D. Occasionally
 - E. Never
10. How would you rate your knowledge on the safety of administering medications to breastfeeding patients?
- A. Very knowledgeable
 - B. Somewhat knowledgeable
 - C. Neutral
 - D. Minimal knowledge
 - E. No knowledge
11. How comfortable are you administering medications to breastfeeding patients?
- A. Very comfortable
 - B. Somewhat comfortable
 - C. Neutral
 - D. Not comfortable
12. How comfortable are you describing the side effects of medications to breastfeeding patients?
- A. Very comfortable
 - B. Somewhat comfortable
 - C. Neutral
 - D. Not comfortable
13. Does providing care for a breastfeeding patient make you feel anxious?
- A. Yes
 - B. No

14. How would you answer if a breastfeeding mother asked when they can safely resume breastfeeding after surgery?

- A. You should pump and dump for at least 24 hours after surgery.
- B. You should pump and dump at least once before breastfeeding again.
- C. Your surgeon and the anesthesiologist will make that decision.
- D. When you feel awake enough to breastfeed, it is usually safe.

15. A medication with an RID number of less than _____ is considered safe to administer to breastfeeding patients?

- A. 10%
- B. 15%
- C. 25%
- D. 50%

16. A reliable resource for evidence-based recommendations on medications for breastfeeding patients is _____.

- A. U.S. National Library of Medicine TOXNET
- B. UpToDate
- C. WomensHealth.org
- D. LactMed

17. Do you feel there is consistency at CFV with instructions given to breastfeeding patients?

- A. Always
- B. Often
- C. Sometimes
- D. Occasionally
- E. Never

18. Please share thoughts, comments, or concerns that should be addressed in the educational session.

Appendix B**Post-Education Survey Questions:**

1. Select your age:
 - A. <25
 - B. 26-34
 - C. 35-44
 - D. 45-54
 - E. 55-60
 - F. >61

2. What gender do you identify as?
 - A. Male
 - B. Female
 - C. _____
 - D. Prefer not to answer

3. Do you have children?
 - A. No Children
 - B. 1
 - C. 2-3
 - D. 4-5
 - E. >5

4. Highest level of education you have completed?
 - A. Associate degree
 - B. Bachelor's Degree
 - C. Master's Degree
 - D. Doctorate Degree
 - E. Prefer not to say

5. Years in nursing practice total
 - A. <1
 - B. 2-5
 - C. 6-10
 - D. 11-15
 - E. 16-20
 - F. >21

6. Which department do you work in?
 - A. Anesthesia
 - B. PACU
 - C. Other

7. Years in current CRNA practice (CRNA/PACU)?
- A. <1
 - B. 2-5
 - C. 6-10
 - D. 11-15
 - E. 16-20
 - F. >21
8. How often do you care for patients who are breastfeeding?
- A. Daily
 - B. Weekly
 - C. Monthly
 - D. Every 6 months
 - E. Never
9. Do you inquire about breastfeeding when caring for postpartum patients?
- A. Always
 - B. Often
 - C. Sometimes
 - D. Occasionally
 - E. Never
10. How would you rate your knowledge on the safety of administering medications to breastfeeding patients?
- A. Very knowledgeable
 - B. Somewhat knowledgeable
 - C. Neutral
 - D. Minimal knowledge
 - E. No knowledge
11. How comfortable are you administering medications to breastfeeding patients?
- A. Very comfortable
 - B. Somewhat comfortable
 - C. Neutral
 - D. Not comfortable
12. How comfortable are you describing the side effects of medications to breastfeeding patients?
- A. Very comfortable
 - B. Somewhat comfortable
 - C. Neutral
 - D. Not comfortable
13. Does providing care for a breastfeeding patient make you feel anxious?
- A. Yes
 - B. No

14. How would you answer if a breastfeeding mother asked when they can safely resume breastfeeding after surgery?
- A. You should pump and dump for at least 24 hours after surgery.
 - B. You should pump and dump at least once before breastfeeding again.
 - C. Your surgeon and the anesthesiologist will make that decision.
 - D. When you feel awake enough to breastfeed, it is usually safe.
15. A medication with an RID number of less than _____ is considered safe to administer to breastfeeding patients?
- A. 10%
 - B. 15%
 - C. 25%
 - D. 50%
16. A reliable resource for evidence-based recommendations on medications for breastfeeding patients is_____.
- A. U.S. National Library of Medicine TOXNET
 - B. UpToDate
 - C. WomensHealth.org
 - D. LactMed
17. Do you feel your practice has changed as a result of provided educational materials?
- A. Yes
 - B. No
18. Have you referenced the educational materials for patient care in the last 4 weeks?
- A. Yes
 - B. No

Table 1

Pre-Education Demographic Data (N = 12)		
		N (%)
Age		
	<25	0 (0%)
	26-34	2 (17%)
	35-44	6 (50%)
	45-54	2 (17%)
	55-60	1 (8%)
	>61	1 (8%)
Gender		
	Male	4 (33%)
	Female	8 (67%)
Number of Children		
	No Children	4 (33%)
	1	2 (17%)
	2--3	4 (33%)
	4--5	2 (17%)
	>5	0 (0%)
Highest Level of Education Completed		
	Master's Degree	7 (58%)
	Doctorate Degree	5 (42%)
Total Years in Nursing		
	<1	0 (0%)
	2--5	0 (0%)
	6--10	2 (17%)
	11--15	4 (33%)
	16--20	2 (17%)
	>21	4 (33%)
Total Years as CRNA		
	<1	1 (8%)
	2--5	4 (33%)
	6--10	3 (25%)
	11--15	1 (8%)
	16--20	1 (8%)
	>21	2 (17%)

Table 2

Post-Education Demographic Data (N = 5)		
		N (%)
Age		
	<25	0 (%)
	26-34	0 (%)
	35-44	1 (20%)
	45-54	3 (60%)
	55-60	1 (20%)
	>61	0 (%)
Gender		
	Male	2 (40%)
	Female	3 (60%)
Number of Children		
	No Children	1 (20%)
	1	1 (20%)
	2--3	2 (40%)
	4--5	1 (20%)
	>5	0 (0%)
Highest Level of Education Completed		
	Master's Degree	3 (60%)
	Doctorate Degree	2 (40%)
Total Years in Nursing		
	<1	0 (0%)
	2--5	0 (0%)
	6--10	0 (0%)
	11--15	1 (20%)
	16--20	0 (0%)
	>21	4 (80%)
Total Years as CRNA		
	<1	0 (0%)
	2--5	3 (60%)
	6--10	0 (0%)
	11--15	1 (20%)
	16--20	1 (20%)
	>21	0 (0%)

Picture 1



Perioperative Care for Breastfeeding Patients

Katie Robertson, BSN, SRNA
Cat Chantrill, BSN, SRNA

Benefits of Breastfeeding

Mother <ul style="list-style-type: none"> Improved infant-maternal bonding Ease of access Affordability Reduces risk of breast & ovarian cancer, DM 2 and HTN Quickly resuming breastfeeding prevents decreases in milk supply after surgery May help mom return to pre-pregnancy weight 	Infant <ul style="list-style-type: none"> Improved infant-maternal bonding Promotes healthy growth and development Stimulates immune system Provides antibodies to infant Reduces incidence of: <ul style="list-style-type: none"> Allergy Diarrhea Type 1 DM SIDS Ear infections Stomach viruses
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Relative Infant Dose (RID)

- Estimates amount of medication the infant can be exposed to through breastmilk after administered to mother
- Accounts for mother's weight, infant's weight, concentration of medication in breastmilk, and the amount of breastmilk consumed by the infant
- Medications with RID less than 10% are considered safe

General Recommendations

- Only small amounts (clinically insignificant) of anesthetic and analgesic medication transfer to breastmilk
- Mothers do not need to "pump and dump"
- It is considered safe to resume breastfeeding when the mother feels awake enough to do so
- While still considered safe, narcotics have higher RIDs than other drugs
- Incorporate non-narcotic analgesics for pain relief when possible
- Utilize regional techniques to aid in postoperative pain relief

If Mom Received Narcotics, Monitor Infant For:

- Difficulty breathing
- Poor feeding
- Behavioral changes
- Drowsiness
- Nausea
- Diarrhea

*Contact your pediatrician if you observe these changes in your infant after breastfeeding

Common Perioperative Medications



Reliable Resources

- National Institute of Health's LactMed database
- Centers for Disease Control and Prevention (CDC)
- World Health Organization (WHO)
- UpToDate

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Picture 2

Breastfeeding After Anesthesia



It is safe to breastfeed when mom feels awake enough to do so

There is no need to "pump & dump"

*Consult your anesthesia provider for any concerns



Only small amounts (clinically insignificant) of anesthetic and analgesic drugs transfer to breastmilk

Relative Infant Dose (RID) less than 10% is considered safe

Narcotics have higher RIDs than other drugs

Transition to non-narcotic analgesics for pain relief when possible



When narcotics are used, monitor infant for these side effects:

- Difficulty breathing
- Poor feeding
- Drowsiness
- Behavioral changes
- Nausea
- Diarrhea

**Contact your pediatrician if you observe these changes in your infant after breastfeeding