

IMPROVING THE KNOWLEDGE AND COMFORT LEVELS  
OF NURSES CARING FOR BREASTFEEDING  
MOTHERS

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### **Dedication and Acknowledgements**

The last three years have been more than challenging. I am so thankful to my friends, family, and classmates for their support. Thank you to the UNCG DNAP faculty, especially Dr. Terry Wicks, for his patience and guidance through this project. Thank you to my parents, Gray and Megan, for always supporting my dream of becoming a nurse anesthetist. And to my husband, Nick, your encouragement, understanding, and sense of humor have gotten me through the last sixteen years. I wouldn't be who I am or where I am without you. I am forever grateful. The eagle has landed.

## Abstract

**Background:** Nurses in the post-anesthesia care unit (PACU) infrequently provide care to breastfeeding patients. When PACU nurses provide care to this patient population they experience anxiety due to their lack of knowledge and experience.

**Purpose:** The purpose of this project is to enhance the quality-of-care breastfeeding patients receive in the PACU setting. This is accomplished by improving PACU nurses' knowledge and level of comfort when caring for breastfeeding patients and a self-reported change in their practice.

**Methods:** Providing education to PACU nurses on postoperative breastfeeding patients will help reduce their anxiety when caring for this population. A pre-education survey evaluated anxiety levels and knowledge deficits. An educational intervention and cognitive aid were developed and presented to PACU nurses. A post-educational survey evaluated the effectiveness of the education and if practice had changed as a result.

**Results:** Fifty-five percent of PACU nurses correctly answered knowledge-based questions after the educational intervention. Sixty-six percent of nurses reported that their practice had changed since education was provided. Only 33% of nurses utilized the cognitive aid in practice. Due to the low response rate to the post-intervention surveys, statistically significant inferences to practice changes could not be made.

**Recommendations and Conclusion:** The majority of PACU nurses reported a change in their practice after an educational intervention. Responses to knowledge-based questions were consistent in pre-and post-surveys. Although PACU nurses did not report anxiety when caring for these patients, many reported having minimal knowledge of the safety of breastfeeding after

anesthesia. Inconsistencies in the instructions given to patients regarding resuming breastfeeding indicate there is still a need for continuing education on this patient population.

*Keywords:* Breastfeeding, anesthesia, PACU, nurse

## **Background and Significance**

The need for anesthesia during pregnancy or while breastfeeding is often due to an urgent medical problem when delaying surgery is not safe. Elective and non-emergent surgeries are normally deferred until the parturient has given birth. For this reason, post-anesthesia care (PACU) nurses do not routinely care for women who are pregnant, have recently given birth, or are breastfeeding. Fear that the medications administered to breastfeeding patients will harm the baby causes apprehension for both the nurse administering the medications and the patients receiving them. Ignoring symptoms or undertreating a patient after surgery can be detrimental. Potential problems include infection, pain, and prolonged hospital stays (Cobb et al., 2015). To reduce these risks, nurses need to be knowledgeable of current practice guidelines for this patient population.

Medications are available to treat any of the patient's needs with minimal or no risk of transfer to breast milk. Healthcare providers prescribing and administering these medications may be less willing to treat the parturient or breastfeeding mother due to their lack of knowledge or inexperience with this patient population (Cobb et al., 2015). Providing a credible source of information that can be quickly referenced will improve the nurses' comfort when treating this patient population. As nurses become more confident, their practice will change, and ultimately improve the quality-of-care breastfeeding patients receive.

## **Purpose**

The purpose of this project is to improve the quality-of-care breastfeeding patients receive in the PACU setting. This will be accomplished by educating nurses on current recommendations for the postoperative care of these patients. If interventions are effective, PACU nurses will report reduced anxiety, improved knowledge, and a change in practice when caring for breastfeeding mothers.

## **Review of Current Evidence**

The postoperative care of breastfeeding women is challenging for many reasons and requires that nursing staff be knowledgeable, competent, and confident. Even experienced healthcare providers may lack the current knowledge to safely administer medications to breastfeeding women (Cobb et al., 2015). Mark & Spatz (2003) determined that nurses and advanced practice clinicians were supportive of breastfeeding. However, inconsistencies among provider recommendations and a lack of hospital-based policies make this difficult. A cohesive and comprehensive resource on breastfeeding after anesthesia would be beneficial.

The literature search was conducted using the WorldCat Discovery database, accessed through the library of the University of North Carolina at Greensboro. The initial search terms included “*breastfeeding*”, “*lactation*”, “*medication transfer*”, “*post-operative*”, and “*perioperative*”, used alone or in combination with one another using the Boolean operator “and”. Inclusion criteria consisted of full-text articles written in English, published between 2000 to 2021. Articles were included if the focus of the research was on the transfer of a specific medication into breastmilk. Articles published before 2000 were included if they contained background information on medications or the lactation process. The abstracts of forty-three

articles were evaluated for details about the transfer of medications through breastmilk. Articles were excluded if they focused on pregnant patients, or placental transfer of medications, rather than breastfeeding patients. Articles were evaluated using the Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide (Appendix A). Nineteen articles were reviewed in full and found to contain applicable information.

## **Breastfeeding**

Breastfeeding has become more common over the past decade. Up to 90% of women worldwide report breastmilk as the main source of nutrition for their infants (Heird, 2007). The World Health Organization and the American Academy of Pediatrics have recommended that infants be breastfed exclusively for the first six months of life (Dalal et al., 2013). There are many benefits to breastfeeding for the infant, including infant-maternal bonding, immune system support, and balanced nutrition for the developing infant (Dalal et al., 2013). Infants who are exclusively breastfed have a lower incidence of childhood cancer, infectious diseases, type two diabetes mellitus, and overall mortality (Verstegen, & Ito, 2019).

Maternal benefits of breastfeeding include reduced cost of nutrition for the infant, rapid uterine involution, and lowered risks of reproductive cancers (Dalal et al., 2013). New research has correlated the duration of lactation with a reduced long-term risk of stroke and diabetes mellitus (Verstegen, & Ito, 2019). Websites, social media, television, and the opinions of friends or family can greatly influence an individual's healthcare decisions. These are not always reliable sources and may serve to provoke anxiety and fear in new mothers (Mitchell et al, 2020, p.1484). Many lactating women delay seeking treatment, refuse medications, or fail to report their signs and symptoms (Nitsun et al., 2006). This can lead to more serious health implications for the mother, both acutely and in the long term.



Healthcare providers have also reported uneasiness with the administration of medications to lactating women (Marks, & Spatz, 2003). This is often a reflection of insufficient knowledge of this patient population, lactation, or medications being administered. Inadequate knowledge leads healthcare providers to make inappropriate recommendations to patients. Marks & Spatz (2003) reported that breastfeeding mothers were routinely advised to withhold breastfeeding while they were taking prescribed medications. This unwarranted interruption of breastfeeding increases the infant's risk for viral infections and chronic digestive conditions. Another common recommendation, to "pump and dump" for twenty-four hours after receiving anesthesia, is a wasteful and unnecessary precaution (Nitsun et al., 2006). Educating healthcare providers with current, evidence-based breastfeeding information will enhance the care they provide for this patient population and support continued breastfeeding post-operatively (Cobb et al., 2015).

### **Pharmacology**

Due to the risk of harm to the infant, there is limited research available on the transfer of medications into breastmilk. Many of the current recommendations for medication administration while breastfeeding are based on the pharmacologic properties of specific agents, or are supplied by pharmaceutical manufacturers. It is difficult to decipher what information is up to date, accurate, and appropriate for practice. Calculating the relative infant dose (RID) helps estimate the amount of drug potentially ingested by the infant. The RID is determined by multiplying the drug concentration within breastmilk by the approximate volume of breastmilk the infant ingests in twenty-four hours. A drug with a RID below 10% is considered safe for use in a breastfeeding mother (Smathers et al., 2016).

Several factors affect the amount of medication entering breast milk. These factors include the concentration of the drug in the mother's blood, plasma protein binding, drug ionization,

molecular weight, and lipid solubility (Dalal et al., 2013). Medications are commonly administered intravenously in the post-anesthesia care unit. Intravenous administration allows drugs to enter breast milk through passive diffusion. Passive diffusion is the movement of a substance across cell membranes to reach an equilibrium between compartments (Wilbeck et al., 2008). In this circumstance, the drug will move from the area of high concentration in the blood to an area of lower concentration in the breast milk. This process is reversed when the drug level in the bloodstream begins to decrease, causing the drug to move out of the breast milk and back into the blood to be eliminated (Wilbeck et al., 2008).

Many orally administered medications undergo a first-pass effect. As medication is absorbed and digested in the gastrointestinal tract, it may be broken down until only a small amount of active drug is available in the bloodstream. This also reduces the amount of active drug available to transfer into breastmilk. The most common classes of medications administered postoperatively are opioids, benzodiazepines, anti-emetics, and hypnotics. Each medication has different pharmacokinetic characteristics which contribute to the amount of drug in breastmilk. Smathers et al. (2016), determined the peak plasma concentration in breastmilk mirrored the peak plasma concentration in the mother's bloodstream. This allows us to predict when the administered medication will exert its maximal effects. Avoiding breastfeeding during this time will further reduce the relative infant dose (RID).

### **Theoretical Model**

The Awareness to Adherence Model by Pathman et al. (1996) is a four-step process used to facilitate the adoption of new evidence-based practices in the clinical setting. The first step is

“awareness” in which the practitioners are made aware of an issue. The next step is “agree”, current evidence is presented to help clinicians understand the issue and agree that a change in practice is necessary. The third phase is “adoption”. After gaining support from those involved, a plan for implementing the new guidelines is developed and employed. The final phase in the process is “adherence”. Long-term strategies are developed to help ensure sustained compliance with practice changes. This model has been successful in changing clinical practice. Involving the target audience, postoperative nursing staff, in each phase of the process helps keep them engaged in the plan and improves long-term compliance with practice change.

### **Methods**

Providing education to PACU nurses on postoperative breastfeeding will help reduce their anxiety when caring for these patients. This will give them trust in their practice and improve the quality of care they provide to this patient population.

Nurses working in the post-anesthesia care unit (PACU) at a large community hospital received the first survey through an emailed link. Survey questions were designed to evaluate the knowledge base and level of comfort in administering medications and educating breastfeeding women. Based on these results, gaps in knowledge were identified and a plan was developed utilizing evidence-based practice guidelines. This detailed information was presented to PACU nurses through a PowerPoint, accessible online. Cognitive aids were placed in highly visible locations to be used as a quick reference. After four weeks, PACU nurses received the second emailed survey. This survey assessed the nurses’ level of comfort in caring for breastfeeding patients and if their practice had changed.

## **Design**

The overall goal of this project is to improve the quality-of-care breastfeeding mothers receive after surgery. This can be achieved by improving the knowledge and comfort level of the nurses caring for these patients. A quantitative design allowed us to determine the effectiveness of the educational program. Online surveys collected information through Likert-scale responses.

### ***Translational Framework***

The Johns Hopkins Nursing Evidence-Based Practice model (2017) describes the process for developing a research plan. Utilizing this model and the associated template helped keep details organized throughout this process. Initially, the practice question should be clearly defined. Next, evidence is gathered, analyzed, and synthesized to construct evidence-based recommendations for practice. The final phase is translation, which is the implementation of recommendations and an evaluation of their effectiveness. This allows for the adaptation of guidelines and promotes long-term adherence to changes.

### ***Population***

The target population consisted of the forty-three full-time, part-time, per diem, float pool nurses, and nursing managers working in the PACU. Participants were male and female with ages ranging from 20 to 60 years. All communication with participants occurred through their hospital-affiliated email. The pre- and post- interventional surveys, and the educational presentation were distributed to all PACU staff by their nursing manager. The initial email described this project and addressed privacy protection for the respondents. The link to complete the first survey was attached.

### *Setting*

This project was conducted at a 900-bed community hospital in southeastern North Carolina. The large community hospital serves six rural counties and reports more than four thousand infants delivered annually.

### **Project Implementation**

The initial survey collected demographic information, including age, gender, level of education, and experience in nursing. The remaining multiple-choice questions were designed to evaluate the nurses' current level of comfort and knowledge regarding this patient population. Separate questions evaluated nurses' level of comfort when administering medications to patients and describing the side effects of medications to patients. Two multiple-choice questions were used to assess nurses' current knowledge. Participants were asked to select the Relative Infant Dose (RID) considered safe while breastfeeding and when they should instruct patients to resume breastfeeding. Nurses were also asked to identify a reliable electronic resource for information on breastfeeding. The final Likert-style question evaluated the consistency of instructions given to breastfeeding patients at this facility. Using these results, an individualized educational plan was developed to target the needs of the PACU nurses.

Following surgery patients often require medications to keep them comfortable. Commonly administered medications include opioids, anxiolytics, antiemetics, and antibiotics (Verstegen, & Ito, 2019). With few exceptions, only a minimal amount of these drugs is transferred into breast milk (Dalal et al., 2013). Sixty percent of PACU staff surveyed rated their knowledge of the safety of administering medications to breastfeeding patients as "minimal". However, only

10% said they were uncomfortable administering medications to these patients. This revealed an opportunity to improve the staff's knowledge and was included in the later education.

Evidence-based guidelines no longer recommend “pumping and dumping”, or the disposal of breast milk after receiving anesthesia. Twenty percent of PACU nurses indicated they still instruct patients to pump and dump at least once after surgery. Only 30% of those initially surveyed selected the correct response; it is safe to resume breastfeeding as soon as the mother feels awake enough to do so (Dalal et al., 2013). Half of the responses indicated that the surgeon or anesthesiologist would determine when it was safe to resume breastfeeding. Although this response may be appropriate, it highlights the need for further education on pharmacology and breastfeeding.

Results from the first survey emphasized the need for revised education specific to caring for this patient population. This guided the development of a PowerPoint presentation and a correlating poster. The PowerPoint contains detailed information on breastfeeding benefits and medication specifics. The posters display generalized information about breastfeeding after anesthesia for nurses as a quick reference. With easy access to accurate information, nurses can feel comfortable and confident caring for breastfeeding patients.

### ***Instruments***

The surveys were developed by this author and a co-team member. The initial survey was a series of eighteen questions (Figure A1). The first six questions collected demographic information including gender, age, and the highest level of education completed. Three questions were designed to assess variables potentially influencing the nurses' current knowledge on caring for breastfeeding patients. Experience as a nurse, PACU nurse, and PACU nurse at the current

facility were evaluated separately. Another significant consideration was believed to be the presence of children at home. Nurses who are parents may have personal experiences influencing their knowledge or attitudes towards breastfeeding. The remaining questions used a Likert-type scale with five response categories. These questions were created to evaluate nurses' level of comfort when caring for breastfeeding patients. One open-ended question allowed participants to communicate questions or topics of interest to be addressed in the educational presentation.

The post-educational survey (Figure B1) was used to determine the effectiveness of the education provided to PACU nursing staff. To allow for comparison, many of the questions were repeated in both surveys. This included demographic information, knowledge-based questions, and level of comfort inquiries. The final survey differed in two questions which were designed to address changes in practice after the education was provided. It was also important to determine whether the posters were utilized as intended, or as an unnecessary adjunct.

### ***IRB approval***

Approval from UNCG and the hospital's internal review board was sought, but this project was exempt. There are no direct benefits to participants in the form of incentives or monetary gifts for completion of the survey. There were also no costs to the participants.

The surveys were developed through the Qualtrics software available through UNCG. This allowed participants to access surveys through an emailed link, sent by the PACU manager. Completion of the surveys was anonymous and not associated with the email address containing the link. No other identifying information was required for the completion of the surveys. Investigators had no direct contact with participants due to COVID pandemic restrictions implemented after the initiation of this project.

### ***Data Collection***

The manager of the PACU distributed the surveys to staff through their hospital-affiliated email address. The first email contained a cover letter with a brief overview of the project and addressed the participant's privacy. The email included a link to the electronic survey through UNCG's Qualtrics platform. All participants who proceeded to open the survey link were aware that this implied consent, and they were able to exit the program at any time. Barriers to data collection included the inability to complete the survey, inability to access email, and insufficient time to complete the survey. The survey link remained active for one month. Reminders to complete the survey were emailed two weeks after the survey began, and the day before it closed. The PACU manager also provided verbal reminders each week, requesting that staff complete the survey.

Responses to the initial survey guided the development of the educational plan and materials. Education was presented to staff through a narrated slide presentation that was accessible through email. A simplified version of the information was available on posters, which were hung throughout the PACU for easy reference. One month after the dissemination of educational materials, the final survey was distributed. The emailed link to the post-educational survey remained active for two weeks. An emailed reminder to complete the survey was sent by the PACU manager the day before the survey closed. After two weeks the survey was closed, and final data analysis began.

### **Data Analysis**

An analysis of survey results was conducted using Microsoft Excel software. Due to response rates on the post-education survey, the sample was of insufficient size to allow inferential



correlations to be made. Initial survey results were analyzed to determine the knowledge deficits of PACU nurses. The post-intervention survey results were analyzed to determine the effectiveness of education, and any remaining gaps in knowledge. Qualtrics enabled statistical analysis of the survey results, ensuring unbiased transcribing and analysis of the survey data.

## **Results**

### **Pre-Intervention Survey**

A total of ten responses were collected from the initial survey. The majority were females (90%, n = 9), employed as nurses in the PACU (80%, n = 8). Two respondents (20%) were employed as nursing managers. The youngest respondent was less than twenty-five and the oldest ranged in age from fifty-five to sixty years (20%, n = 2). The majority of nurses who responded were between the ages of thirty-five and forty-four (60%, n = 6). All respondents reported having at least one child at home, eighty percent (n = 8) had two or three children. Ninety percent of respondents (n = 9) had been in the nursing field for more than five years, and seventy percent (n = 7) had more than ten years of experience working in the PACU setting. Education levels ranged from an Associate degree (20%, n = 2), Bachelor's degree (60%, n = 6), to a Master's degree (20%, n = 2).

Results show that most respondents (90%, n = 9) cared for breastfeeding patients less than once per month. Sixty percent (n = 6) indicated that they always inquire about breastfeeding when they care for postpartum patients, but twenty percent (n = 2) reported never inquiring. When asked to rate their knowledge of the safety of administering medications to breastfeeding patients, sixty percent (n = 6) reported having minimal knowledge. However, only thirty percent (n = 3) claimed they were uncomfortable discussing the side effects of medications with

breastfeeding patients. Sixty percent reported feeling very comfortable discussing the side effects. When asked to evaluate their level of comfort when administering medications to breastfeeding patients, twenty percent (n= 2) reported feeling very comfortable, the majority (n = 4) responded neutrally. All the respondents denied feeling anxious when providing care for breastfeeding patients.

Most respondents (80%, n = 8) selected the correct response regarding the definition of safe relative infant dose (RID). Thirty percent (n = 3) correctly identified “when the patient is awake enough to do so” when asked when to resume breastfeeding after anesthesia. Fifty percent (n = 5) reported that it was up to the surgeon and anesthesia provider. Twenty percent (n = 2) responded that patients should pump and dump for twenty-four hours after surgery before resuming breastfeeding. Sixty percent (n = 6) correctly identified reliable resources for further information on breastfeeding after anesthesia. There were no requests for specific topics or medications to cover in the educational presentation.

### **Post-Intervention Survey**

A total of three female PACU nurses completed the post-intervention survey. Respondents ages ranged from less than twenty-five (n = 1), thirty-five to forty-four (n = 1), and forty-five to fifty-four (n = 1). Experience in nursing ranged from two to five years (n = 1), six to ten years (n = 1), and eleven to fifteen years (n = 1). Experience as a PACU nurse also varied. One participant had less than one year of experience, one participant had two to five years of experience, and one had six to ten years of experience. Two participants reported having a Bachelor’s degree, while one participant reported having an Associate’s degree. Two participants indicated that they had two to three children at home.

One respondent reported caring for breastfeeding patients daily, the two others provided care less often than every six months. When asked how often they inquire about breastfeeding in postpartum patients, only one selected “always”. One response was “occasionally” and the other was “never”. When asked to rate their knowledge of the safety of administering medications to breastfeeding patients, responses were as follows: very knowledgeable (n = 1), somewhat knowledgeable (n = 1), and neutral (n = 1). When asked to rate their level of comfort describing the side effects of medications and their level of comfort administering medications, the responses were: very comfortable (n = 1), somewhat comfortable (n = 1), and neutral (n = 1). Again, all respondents denied feeling anxious when caring for a breastfeeding patient.

All three respondents correctly identified a reliable resource online. One participant selected the correct response of when to resume breastfeeding. The remaining two participants would recommend that patients pump and dump before resuming breastfeeding. One respondent correctly identified an appropriate RID for medications. Two PACU nurses reported that their practice had changed since this project was implemented. Only one participant indicated that they had referenced the poster in practice.

## **Barriers**

Numerous barriers were encountered in the implementation of this project, requiring an amended timeline. Communication between team members and the hospital's administration was often delayed due to the demanding schedules of both parties. The pre-intervention survey was left open for six weeks, rather than four weeks, due to the low initial response rates. An additional email with a link to the survey was sent to notify PACU staff of the extended deadline. This produced an additional four responses to the initial survey.

Alterations in hospital policies and procedures due to the Covid-19 pandemic also caused delays in implementation. New policies prevented any in-person meetings and limited gatherings. For this reason, the educational session and poster presentation were completed online. Providing information in person would have enhanced the discussion of the topics and allowed for clarification when needed. There is also no way to determine if the participants in the survey accessed and reviewed the presentation or poster. The number of participants would likely be higher as well.

## **Discussion**

In contrast to recent findings, the responses to pre-and post- interventional surveys indicate that PACU nurses in this facility do not experience anxiety when caring for breastfeeding patients. The lack of reported anxiety does not necessarily reflect nurses' level of comfort when caring for these patients. Responses to the post-education survey indicate that 33% of nurses do not feel comfortable medicating or educating breastfeeding patients. As expected, 90% of PACU nurses reported caring for these patients less often than every six months. The rarity of caring for this patient population in the PACU setting contributed to the reported comfort and knowledge

deficits. Nurses with at least one child at home reported greater comfort and perceived knowledge levels on both pre- and post-intervention surveys. Although these respondents felt comfortable administering and describing side effects of medications, these responses did not reflect their level of knowledge. Only 55% of knowledge questions were answered correctly in the post-educational survey. This highlights the remaining knowledge deficit and the need for more thorough education on breastfeeding after anesthesia. PACU nurses also reported inconsistencies in the instructions provided to patients on when to resume breastfeeding. This suggests that other healthcare professionals would benefit from the educational materials developed for this project. Additional in person presentations emphasizing current evidence-based practice could help reinforce new guidelines.

Although results cannot be generalized, two nurses reported that their practice had changed because of the educational presentation. The sample size was too small to determine whether this presentation would be effective in changing the practice of other PACU nurses. The cognitive aid was created to be an easily accessible reference for nurses and patients, however; only one nurse reported utilizing the cognitive aid during patient care. This low response may reflect the infrequency with which PACU nurses care for breastfeeding patients or the location of the posters. An additional survey could be used to evaluate the use of the cognitive aid in practice.

### **Conclusion**

The purpose of this project was to improve the knowledge and comfort level of PACU nurses caring for breastfeeding mothers after surgery and to improve the quality of care these patients receive. Breastfeeding mothers are cared for infrequently in this setting and many nurses report caring for them less often than every six months. As a result, PACU nurses in this setting

may be uncomfortable caring for these patients and will likely be unfamiliar with the current recommendations for continuing or resuming breastfeeding. Tailoring an educational plan to meet the needs of the target audience should result in improvements in both knowledge and comfort.

Although no statistically significant conclusions were able to be drawn, some correlations were made that can help steer future educational efforts. The survey and educational materials were created specifically for this project at this facility but could be utilized in other settings. Nurses reported a lack of consistency in the instructions given to breastfeeding mothers within their facility. This suggests that other healthcare providers would likely benefit from this type of education as well. Developing and implementing an evidence-based policy within this facility would allow cohesive management of these patients, improving their quality of care.

This project identified a need for continued education of PACU nurses and other providers caring for breastfeeding mothers. Lack of current information and infrequent exposure to this patient population have made PACU nurses apprehensive. As nurses become more knowledgeable and confident, it will be reflected by a change in their practice, and ultimately improve the quality-of-care breastfeeding patients receive.

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## Appendix A

### Pre-Intervention Survey

Figure A1. Pre-Intervention 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-Intervention Survey

Figure B1. Post-Intervention 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



## Appendix C

### Educational Materials

Figure C 1. PowerPoint Presentation



# Perioperative Care for Breastfeeding Patients

Katie Robertson & Cat Chantrill

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## Benefits of Breastfeeding

Mother	Infant
<ul style="list-style-type: none"> <li>• Improved infant–maternal bonding</li> <li>• Ease of access</li> <li>• Affordable</li> <li>• Reduces risk of breast &amp; ovarian cancer, DM 2 and HTN</li> <li>• Quickly resuming breastfeeding prevents decreases in milk supply after surgery</li> <li>• May help mom return to pre–pregnancy weight</li> </ul>	<ul style="list-style-type: none"> <li>• Improved infant–maternal bonding</li> <li>• Promotes healthy growth and development</li> <li>• Stimulates immune system</li> <li>• Provides antibodies to infant</li> <li>• Reduces incidence of:               <ul style="list-style-type: none"> <li>• Asthma</li> <li>• Obesity</li> <li>• Type 1 DM</li> <li>• SIDS</li> <li>• Ear infections</li> <li>• Stomach viruses</li> </ul> </li> </ul>

## 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

Medication Class	Relative Infant Dose (%)	Presence in Breastmilk	Other Concerns
<b>Benzodiazepines</b>			
Midazolam	0.3	Present 4hrs after single IV dose	Caution if nursing newborns or preterm
Diazepam	0.3	Prolonged due to half-life	Active metabolite
<b>Hypnotics</b>			
Etomidate	0.5	Not present after 4hrs	
Inhaled Anesthesia Gases	Unknown	Unknown	Considered safe due to rapid excretion
Ketamine	Unknown	Minimal information	No changes in full term infant fed 2hr after administration
Propofol	0.5		May discolor milk blue/green
<b>Analgesics</b>			
Acetaminophen	0.8	Not present after 12hr	Safe for use in infants
Codine	1		
Hydrocodone	3		Active metabolites
Hydroxymorphone	3	Present up to 12hr after single dose	
Fentanyl	1	Present up to 4hr after single dose	
Ibuprofen	0.65	Minimal transfer to breastmilk, not present after PO dose	Safe for use in infants
Ketorolac	0.2	Not present after oral dose	
Meprobidine	Unknown		Avoid if exclusively breastfeeding
Morphine	9	Present	Active Metabolites Reduced willingness to feed Single dose safe in older infants
Oxycodone	3		Active metabolites
Remifentanyl	Unknown, considered safe		Decreased elimination in young infants
Tramadol	1		Considered safe due to short half-life
<b>Paralytics</b>			
NMBAs	Considered safe		Considered safe due to short half-life and reversal
Succinylcholine	Considered safe		Considered safe due to rapid hydrolysis
<b>Reversals</b>			
Anticholinergics (Atropine)	Unknown, considered safe		
Anticholinesterases (neostigmine & pyridostigmine)	0.5		Considered safe for single dose Multiple maternal doses may cause stomach upset in baby
Sugammadex	Unknown	Minimal transfer into breastmilk	Poor oral absorption by baby
<b>Antiemetics</b>			
Dexamethasone	Unknown, considered safe		Temporary decrease in milk supply after local injection
Metoclopramide	Unknown, considered safe		May increase milk supply May cause stomach upset in baby
Ondansetron	Unknown, considered safe	Minimal transfer into breastmilk	
<b>Local Anesthetics</b>			
Artifolics	0.5		Not orally absorbed by baby
Artifol	Unknown, considered safe	Minimal transfer to breastmilk	May cause stomach upset in infant
Chondamylol	Unknown, considered safe	Minimal transfer to breastmilk	May cause stomach upset in infant
Vancomycin	Unknown, considered safe	Minimal transfer to breastmilk	
<b>Miscellaneous</b>			
Celecoxib	0.3	Minimal transfer to breastmilk	
Dexmedetomidine	Unknown	Minimally present due after administration, not present after 24hr	
Diphenhydramine	Unknown		May reduce milk supply after large doses
Gabapentin	6.5	Minimal transfer to breastmilk	Multi-dose infant may have drowsiness or weight loss

## Reliable Resources

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

## References

American Society of Anesthesiologists (ASA). (n.d.). *Statement on resuming breastfeeding after anesthesia*. American Society of Anesthesiologists (ASA). <https://www.asahq.org/standards-and-guidelines/statement-on-resuming-breastfeeding-after-anesthesia>

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Cobb, B., Liu, R., Valentine, E., & Onuoha, O. (2015). Breastfeeding after anesthesia: A review for anesthesia providers regarding the transfer of medications into breast milk. *Translational peroperative and pain medicine*, 1(2), 1-7.

Dalal P, Bosak J, Berlin C. (2014). Safety of the breastfeeding infant after maternal anesthesia. *Pediatric Anesthesia*; 24(4):359-71. doi: 10.1111/pan.12331.

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Ito, S. (2018). Opioids in Breast Milk: Pharmacokinetic Principles and Clinical Implications. *The Journal of Clinical Pharmacology*, 58(S10), S151-S163. <https://doi.org/10.1002/jcph.1113>

Figure C 2. Cognitive Aid

## Breastfeeding After Anesthesia

The cognitive aid is presented as three baby bottles. The first bottle is yellow and sits on a green base. The second is a standard baby bottle with a purple cap and a white body with measurement lines. The third is a baby bottle with a green cap and a white body with measurement lines.

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

**There is no need to "pump & dump"**

**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**

\*Consult your anesthesia provider for any concerns