Treating Newborns in the PICU with Oropharyngeal Therapy with Colostrum

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Abstract

Problem: The 19-bed Pediatric Intensive Care Unit (PICU) at a large academic medical center did not include oropharyngeal therapy (OPT) with colostrum or mother's own milk (MOM) as a standard of care for critically ill infants. This is a modality for early human milk introduction recommended by the national authority for the WHO/UNICEF Baby Friendly Hospital Initiative. Chart audits found that documentation of oral care with breastmilk was below 20%.

Purpose: This quality improvement project aims to increase the number of critically ill infants who receive OPT with colostrum or MOM in the identified setting.

Methods: In-service style education and PowerPoint presentation was disseminated to the PICU care team including MDs, CRNPs, dietitians, as well as nursing staff. Education detailed the importance of the practice change and how to perform OPT safely. Similar information was made available for parents via handouts and visual aids. The multidisciplinary team assisted in the development of guidelines and eligibility criteria including all infants zero days to three months old, who have available mother's milk free from harmful substances. An order for OPT was added to the EHR for all eligible patients. Weekly audits were performed using a VPN-protected software called RED Cap, documenting the number of patients eligible to receive OPT and the number of patients receiving OPT. Data collected by RNs included: date, patient's MRN (that was de-identified), NPO status, milk availability, presence of an order for OPT, and if OPT was performed at least 6 times in the previous 24 hours.

Results: There were 41 audit responses over a 15-week period from 16 different patients. 65% of the patients audited received OPT 6 times in 24 hours. Overall OPT compliance increased from 12.5% in the pre-implementation phase to 67% compliance.

Conclusions: The goal of 100% compliance was not met but progress was achieved. This quality improvement (QI) project has provided valuable contributions to the setting by increasing the number of infants who received OPT. This QI has created a renewed focus on breastfeeding and its benefits in the critically ill patient population in the identified setting.

Keywords: Oropharyngeal therapy, OPT, Colostrum, Mother's Own Milk, Breastmilk

Treating Newborns in the PICU with Oropharyngeal Therapy with Colostrum

Breastmilk is recognized as the preferred nutrition for human infants. Colostrum is the initial milk produced within a few days postpartum (Ikuko Kato, et al., 2022). Colostrum and mother's own milk (MOM) is the best first immune stimulator in infants, featuring the "perfect species-specific nutrition" (Martín-Álvarez, et al., 2020), because it contains many types of protective agents that work to protect against infection through the provision of antimicrobial, anti-inflammatory, and immunomodulatory functions.

Critically ill newborns may have limited or no exposure to the protective, immune factors found in colostrum and human milk. Clinical instability and acuity can prevent infants from breastfeeding or receiving enteral feeding by mouth. Many of these critically ill neonates require feeding via a nasogastric or orogastric tube, although this allows the infants to be fed, it prevents the colostrum or MOM from passing through the oropharynx in the first few days to weeks of life (OuYang, X., Yang, CY., Xiu, WL. et al., 2021). This limited oropharyngeal exposure to colostrum or MOM can lead to many adverse outcomes including an increased likelihood of sepsis, Necrotizing Enterocolitis (NEC), and feeding dysfunction. These complications can increase the length of time patients receive nothing by mouth, prolong hospitalization, and lead to associated morbidity and mortality. Oropharyngeal administration of colostrum (OAC) or MOM is a simple therapy that involves the placement of drops of milk directly onto the oral mucosa, exposing the infant's oropharynx to protective (immune and trophic) biofactors (Rodriguez & Caplan, 2015). Colostrum is rich in various immunological substances that activate oral and intestinal immunity, protecting preterm and critically ill infants. It may serve as a potential preventative strategy against NEC, neonatal sepsis, ventilator-associated pneumonia (VAP), and a decrease in length of stay (LOS) (Tao, J., Mao, J., Yang, J. et al., 2020).

A 19-bed Pediatric Intensive Care Unit (PICU) does not include oropharyngeal therapy (OPT) with colostrum or MOM as a standard of care for eligible critically ill infants. Chart audits on two separate occasions showed that documentation of oral care with breastmilk compliance rates were below 20% and the therapy was performed inconsistently from shift to shift. Lack of education surrounding oropharyngeal therapy is a root cause in this setting. OPT for critically ill infants is a proven beneficial intervention that can be incorporated into standard nursing care in this unit. Which leads into the purpose of this quality improvement project; the purpose is to increase the number of infants who receive OPT with colostrum or MOM in a PICU.

The evidence reviewed, refer to Table 1, highlights the recommendations from the data retrieval about OPT with colostrum. All of the retrieved studies support the use of OPT with colostrum or MOM in hospitalized neonatal patients. The research details similar methods in which the intervention should be performed and shows statistically significant benefits associated with the therapy. The Johns Hopkins Nursing Evidence-based Practice Model (JHNEBP) was utilized for the determination of evidence level and quality rating (Dang, D., Dearholt, S., Bissett, K., Ascenzi, J., & Whalen, M., 2022).

All of the reviewed studies included the same intervention of OPT, or as some studies referred to it, oropharyngeal administration of colostrum (OAC), that was detailed as applying 0.1-0.4 cc of colostrum or MOM into each side of the buccal mucosa. This was compared with varying control groups- either no intervention or the application 0.1-0.4 cc of sterile water or saline into the buccal mucosa. All studies were evaluated for safety and feasibility by monitoring the infant. One study operationalized this by stating that all heart rate, respiratory frequency, cutaneous oxygen saturation, and arterial pressure were recorded if invasive monitoring was available. In the case of dermal oxygen desaturation maintained below 88%, bradycardia < 100

bpm, or tachycardia > 200 bpm, the procedure would be discontinued (Martín-Álvarez, et al., 2020).

In a randomized control trial (RCT) conducted by Lee, J et al. (2015) a reduction in the incidence of clinical sepsis was identified with the use of OPT with colostrum. A similar outcome was revealed in another study, a single centered-RCT, showing the incidence of late-onset sepsis and proven sepsis were lower in the OAC group than in the control group (OuYang, X., et al., 2021). Infants in the intervention group in an RCT, (level 1, grade B) by Martin Alvarez, E., et al., (2020) goal enteral nutrition sooner than the control group. This is consistent with the findings within the meta-analysis (grade 1, level A) where the OAC group tolerated goal enteral feedings sooner than the control group (Tao, J., Mao, J., Yang, J. et al., 2020). A third study (level II, grade B) that consisted of a combination of RCTs and quasi-experimental studies by Nasuf et al., (2018), found that of the six included studies all showed that infants who received OPT within 48 hours of birth reached their enteral nutrition goals earlier than those given placebo or no intervention. A high-quality QI project, (level V, grade A), was developed that protocolized the use of colostrum and MOM for oropharyngeal therapy. The successful data retrieval, mobilization, implementation, and evaluation of the QI project proved that this is a feasible and safe implementation. Refer to Table 1 for further insight into the research findings regarding OPT with colostrum and MOM.

In conclusion, there is high-level, good-quality data, that shows consistent evidence to support the safety, feasibility, and benefits associated with this practice change and to support the intervention fidelity.

The use of a framework was necessary to guide, execute, and sustain this quality improvement initiative. The Knowledge to Action (KTA) framework, adapted in Figure 1., is a

planned action theory within social constructivism that favors social interaction and the adaptation of knowledge, taking into account the local setting. The process model contains two interrelated components: knowledge creation and an action cycle (Graham, et al., 2006). Knowledge creation highlights the data retrieval which involves: identifying the problem and selecting available knowledge, in this case, OPT with colostrum or MOM was found to be beneficial and important in the care of hospitalized infants. The action cycle was then utilized to adapt the recommendations to the setting, then assessed barriers to and facilitators of the knowledge use. Next in the KTA framework came the planning and executing implementation, followed by monitoring knowledge use. Then the outcomes were evaluated to determine implementation success. Finally, strategies were developed to sustain knowledge utilization, which is the key to sustaining the practice change within this framework. (Ramos, M. J., Harillo, D., & Ruzafa, M., 2020). The evidence regarding OPT with colostrum or MOM went through the Knowledge-creation phase. Decreased compliance and consistency preforming and documenting OPT was identified as the problem. Lack of education surrounding OPT was a barrier among the nursing staff and mothers in the setting. Implementation strategies were identified, tailored to the context of the unit and patient population, and implemented. Continuous monitoring, encouragement, and outcome data analysis using the KTA framework allowed for the practice change and intervention of oropharyngeal therapy to be successful.

Methods

The target population included all patients 0 days to 3 months of age admitted to the PICU who were prescribed nothing by mouth (NPO) orders, and/or were being fed via a nasogastric (NG), orogastric (OG), or nasojejunal tube (NJ). Exclusion criteria was defined by data from high-level RCTs and systematic reviews and the following were excluded: neonates of

mothers prohibited from breastfeeding because of conditions including active tuberculosis, human immunodeficiency virus (HIV), treatment with radioisotopes, substance abuse, or treatment with special medications excreted in breast milk, such as antimetabolic anticarcinoma agents (e.g., azathioprine, methotrexate, rituximab) or antipsychotics (e.g., lithium carbonate, clozapine) and, declination of desire for the therapy by the family. Ideally, therapy continued until the eligible patients were feeding by mouth. (OuYang, X., Yang, CY., Xiu, WL. et al., 2021). Discussions with the site representative and key stakeholders occurred to develop these guidelines and eligibility criteria.

The setting for this practice change was a 19-bed Pediatric Intensive Care Unit (PICU) in a large academic medical center in the mid-Atlantic. The practice change impacted many members of the multidisciplinary team including bedside nurses, caregivers, nutritionists, lactation consultants, nurse practitioners, and physicians.

A review of the daily census at the project site revealed on average there were three infants meeting the inclusion criteria on any given shift. There were typically ten to fourteen nurses staffed per shift depending on acuity, and each RN had anywhere from one to three patients. Two visitors or family members were allowed at the bedside at all times and there was space for one parent to sleep in the room with the patient. Equipment for milk expression was readily available.

Previously the PICU had low compliance rates with oropharyngeal therapy with colostrum or MOM for many reasons. Refer to Figure 2, where barriers are detailed in a fishbone diagram. Barriers included: a lack of knowledge surrounding the importance and "why" behind the therapy, low MOM supply, forgetfulness, short staffing, lack of a protocol, and more. There was also a lack of education among parents and caregivers on performing oropharyngeal therapy.

Families needed to be educated on how to perform the therapy for their infants. It was important to incorporate OPT into routine nursing and medical care such as during rounding reports and change of shift reports.

Strategies and tactics to achieve compliance with the oropharyngeal administration of colostrum or MOM in the PICU began during the pre-implementation phase. The two-week pre-implementation phase consisted of verbal, virtual, and email communication with key stakeholders describing the practice problem, implementation plan, and respective roles and expectations.

Education was delivered to all available PICU staff in an in-service style, with a supplemental PowerPoint presentation, see Appendix A. The PowerPoint presentation was made available to staff, and it highlighted the "why" behind the practice change, eligibility criteria, how to perform oropharyngeal therapy safely, how to store the milk, how to document OPT, and how to complete a post-care audit. Similar information was made available for parents via an educational handout and visual aids to encourage family-centered care and baby-friendly practices as well as ensure compliance among nursing. The educational handouts highlighted what OPT or oral care with breastmilk was, its benefits, and how the family could safely perform the therapy. The information sheets were hung in the staff and family bathrooms, the staff breakroom, the family lounge, and other common areas.

During the implementation phase providers were required to place orders for OPT or oral care with breastmilk on all participating patients. The PICU residents, nurse practitioners, fellows, and licensed providers, received in-service style education via PowerPoint on oropharyngeal therapy as well as how to order OPT as a "Nursing Communication Order" for OPT-eligible patients in their electronic health record(s) (EHR). Based on feedback received in

the first few weeks of the implementation phase, to simplify ordering OPT, it was determined to be easiest, instead of a typed-out nursing communication order, providers searched for the "Oral Care" order and put a comment that stated, "with breastmilk". This pivot occurred 7 weeks into the implementation period and was a way to save providers time and facilitate oropharyngeal therapy compliance.

The intervention itself involved taking a syringe of colostrum or MOM, placing it along one side of the buccal mucosal tissue and instilling 0.1 ml over 1 minute, and then performing the same on the other side of the mouth, instilling 0.1 ml over 1 minute. The procedure was offered within a patient's first 48 hours of life while in the PICU and should continue to be carried out every 4 hours until the infant begins taking MOM by mouth. As mentioned, during the pre-implementation phase mothers were educated regarding oropharyngeal therapy and how to obtain the milk through hand expression and electric pumping of breastmilk every 2-3 hours. Mothers were given milk collection containers to collect their colostrum. A trained nurse or educated caregiver administered the colostrum or MOM utilizing oral syringes via the oropharyngeal route. The syringes were prepared with 0.2 mL of mother's colostrum, labeled, and stored at the appropriate temperature in a breastmilk-specific refrigerator.

The bedside nurse was responsible for documentation of the OPT within the patients EMR; There was a PICU Care's flowsheet in the charting system and within that section there was an option for mouth care with a dropdown where it allowed the nurse to select breastmilk amongst other options like sterile water, chlorohexidine mouth wash, suctioning, etc.

In addition to education, family participation, OPT orders, nursing participation, and documentation, "QI leadership" presence on a twice-weekly basis allowed for support, questions, and encouragement in an attempt to improve OPT compliance.

The project measures in place to evaluate the success of the intervention implementation consisted of structure goals, process goals, and outcome goals. The structure goal was that all bedside nurses receive evidenced-based education and training on the practice change. The process goal was the number of patients who were eligible to receive OPT versus how many patients had it ordered in their electronic health record. This was a metric that was audited to ensure compliance, see Appendix C. Eligibility criteria were determined first, as mentioned above, based on the patient's age and NPO and/or tube feeding status. Then, in a patient's EMR, nursing staff would check to ensure an order was placed, by going under the Manage Orders tab where "Oral Care: with breastmilk" should have been listed for those meeting criteria.

The outcome goal was defined as one hundred percent of eligible patients, NPO or being fed via NG/NJ, was zero days to three months of age, and admitted to the PICU, would receive oropharyngeal therapy, and have it appropriately documented 6 times in 24 hours. This was measured as the following equation: The number of patients 0 days to 3 months admitted to the PICU who meet inclusion criteria for oropharyngeal therapy and have it documented as performed every 4 hours, over, the number of patients 0 days to 3 months who meet inclusion criteria for oropharyngeal therapy. See Appendix B and C for reference, the data was collected with the assistance of staff nursing caring for the eligible patients, as well as the QI leader. Bedside staff who were caring for patients 0 days to 3 months old and who were able to receive oral care with breastmilk were instructed to complete a survey within the last four hours of their shift, as shown in Appendix B. There were small signs posted in the upper corner of each computer in the unit with instructions to complete a survey if their patient met the criteria. They were instructed to either scan the QR code with their personal device or if they were more

comfortable using a work computer, they could follow the URL on the sign to complete the survey.

The only patient information that was collected on the survey was the patient MRN, which was de-identified in the software system RedCap. All surveys were anonymous, and no staff information was collected. All the survey information was sent to the QI leader's personal RedCap account where the data was stored on a password and VPN-protected computer. The QI leader completed an eligibility and compliance survey twice weekly that requested the number of eligible newborns and how many were receiving the therapy. It was important to see who was getting the therapy compared to who was eligible to receive it; All of this gathered information provided numerical compliance statistics that were followed and analyzed for not only trends over the implementation period but for successful and sustainable implementation.

Quantitative data collection included the percentage of infants receiving OPT and the frequency of OPT administration as documented in the EMR. See Appendix B, in order to see what data was collected using the OPT audit tool. This data was crucial in determining the success of the QI Project at the end of the 15-week period. The goal was to have 100% of those patients who are eligible. Run charts were used to track and assess changes over the 15-week implementation period. They allowed assessment of OPT education utilization and facilitated reported errors as well. Run chart results were shared with stakeholders and participating members of the ICU team during the implementation period which allowed for incremental changes to promote project success and sustainability.

During the Summer of 2022, before the QI implementation, IRB recognition of this project as non-human subjects was obtained. This was done to ensure safe, non-research data was being collected or obtained in accordance with the rights and regulations of the patients, as

well as maintaining the principles of beneficence. This quality improvement initiative has involved chart audits. Information has been kept confidential and no patient identifiers were used in the collected numerical data. All data was stored within VPN-protected software on a password-protected computer.

Results

Data on oropharyngeal therapy and compliance in the identified PICU setting were collected over 15 weeks. Education sessions occurred throughout the first 4-5 weeks of implementation due to staff scheduling to accommodate and provide inclusion of both day and night-shift employees. There was no pre or post survey done to evaluate the structure goal and knowledge acquisition amongst staff, however, the overall increase in OPT compliance during the 15 week implementation period indicates an association amongst increased OPT compliance and increased education.

The process goal was the number of patients who were eligible to receive OPT versus how many patients had it ordered in their electronic health record. 61.8% of the 67% of patients who received OPT had orders in place in their EHR. This means that 41% of patients had orders for OPT. There was room for improvement within the process goal.

The results from the implementation period are based on 41 total audit responses from bedside nursing staff performed on 16 different de-identified patients. In Figure(s) 3-7, the categorical data retrieved by staff members from audits is shown. 85% of patients audited were NPO and 62% of patients were not being fed via a feeding tube. The 62% of infants who were reported to not have a feeding tube are assumed to be either patients who are NPO status on intravenous fluids (IVF) or patients who are NPO status receiving parenteral nutrition (TPN/PPN). 62% of the infants audited had an OPT order present in their EHR. 65% of the

patients audited received OPT 6 times in 24 hours. Overall, OPT compliance increased from 12.5% in the pre-implementation phase to 67% compliance. The run chart depicts a positive shift that occurred in the last 6 weeks of the implementation period Refer to Figure 8. Otherwise, there were no trends or runs in the data to discuss.

The goal of 100% compliance was not met but progress was achieved due to increased compliance. It is important to keep in mind that eligibility and compliance auditing was also collected by the QI leader one to two times a week and was a "snap-shot" of the previous twenty-four hours. This set of audit data provided limited information due to the fact that it was assessing whether eligible patients received OPT 6 times in the previous 24 hours. Performing the compliance auditing more frequently could have provided a greater insight into the context's overall performance. Along with increasing QI leader personal auditing, increased PICU staff encouragement and persuasion to perform the therapy and OPT audits may have aided or improved the outcomes. Anecdotally, feedback and reported barriers from PICU staff included having to hand type the OPT order into the HER, traveling with the patient off the unit, feeling 'worried' the patient wouldn't tolerate it due to acuity level, lack of available mother's milk, and lack of access to milk. Other barriers that affected the implementation phase include, a lack of eligible neonatal patients in the age range 0 days to 3 months of age, high acuity of the eligible patients, and subsequent staff avoidance of the therapy. Other barriers that have been identified include staffing shortages, and increased nurse-to-patient ratios, leading to time constraints. These proved to be barriers in both offering the therapy consistently and in remembering to fill out the audits at the end of shifts.

Discussion

The purpose of this QI project was to increase the number of critically ill infants who receive OPT with colostrum or MOM in the identified setting. The data collected throughout the implementation period determined the effectiveness of the education provided as the overall context compliance increased to 67%. The early implementation phase coincided with a period of decreased neonatal and infant census due to the vacation time of the program's cardiac surgeon. There was subsequently, during week 12, a surge in RSV cases in neonates and infants. This caused the setting to have a constantly fluctuating patient burden where multiple neonatal and infant patients would be admitted, quickly recover, and then transfer or discharge. There were also staffing shortages in the identified setting during this time. Many nurses resigned or decreased their scheduled work hours, and those that remained struggled with higher-than-normal nurse to patient ratios. OPT in this patient population was also difficult to track due to the quickly changing census as well as the fact that the RSV patients sometimes required only brief periods of NPO status. Nursing attrition led to the addition of many travel RNs for whom additional education was not provided to, which potentially contributed to a lack of adherence to the practice change.

These were unanticipated barriers that occurred. Factors that may have contributed to the validity of certain data points include compliance and eligibility audits. As mentioned, this data was taken on a weekly basis, and with an ever-changing census, there was room for error in assessing the correct number of eligible infants in a given week time frame. Efforts were made to include only OPT audits taken from staff RNs performing OPT themselves in hopes to verify the accuracy of results. Assistance was provided by QI leader during a handful of understaffed shifts in order to aid in drawing up milk syringes for busy RNs as well as educating and supporting parents in providing the OP therapy themselves.

It also is important to note that most of the research on OPT was completed on low birthweight or small-for-gestational-age (SGA) neonatal patients who required long-term intensive care. The decreased number of congenital cardiac and SGA patients throughout the implementation period must be noted. There were limited findings within the literature review surrounding patients within a Pediatric Intensive Care context. I think that this QI project has not only increased OPT amongst pediatric intensive care patients in the given context in a feasible and affordable way, it also has added to the body of work on OPT with colostrum and Mother's own milk in this patient population.

Conclusion

Overall this QI project has provided a valuable contribution to the setting by increasing the number of infants who received OPT with MOM and colostrum. Finding a way to analyze and quantify the impact that oropharyngeal therapy with MOM will continue to have on family satisfaction, hospital experience, as well as mother-infant bonding will be an important marker of successful sustainability. Increasing OPT compliance has created a renewed focus on breastfeeding and its benefits in the critically ill neonatal and infant patient population in the identified setting. This project adds to the body of work that shows it is a safe and feasible practice. The addition of a protocolized plan to offer OPT routinely should be the next step in this context. Based on the success of this QI initiative it is feasible to expand this work to other PICUs and NICUs. Efforts of sustainability are currently being made to continue to place an increased focus on offering OPT in conjunction with enhancing support for our breastfeeding and milk-producing caregivers within the given context for the critically ill infant inpatient population.

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Project to Improve the Use of Mother's Own Milk (MOM) With Precision Oropharyngeal Therapy. *Advances in Neonatal Care (Lippincott Williams & Wilkins)*, *20*(2), E19–E30. https://doi-org.proxy-hs.researchport.umd.edu/10.1097/ANC.0000000000000691

Table 1.
Evidence Review Table

Citation: Lee, J., Kim, H. S., Jung, Y. H., Choi, K. Y., Shin, S. H., Kim, E. K., & Choi, J. H. (2015). Oropharyngeal colostrum administration in extremely premature infants: an RCT. *Pediatrics*, *135*(2), e357–e366. https://doi-org.proxy-hs.researchport.umd.edu/10.1542/peds.2014-2004					**Level and Quality (using JHNEBP Model) Level I , Grade C**
Purpose/ Hypothesis	**Type of Evidence Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
The aim of the study is to evaluate the immunological effects of oropharyngeal colostrum administration in infants that are premature.	Research: Randomized, double-blind controlled trial.	Sampling Technique: All newborns born before 28 weeks' gestation were enrolled. Each neonate was randomly assigned independently to colostrum or placebo group via a computer generated allocation sequence. Exclusion included those with congenital gastrointestinal or renal anomalies, maternal substance abuse, or HIV infected mothers. # eligible: 75 infants # accepted: 48 infants were included and randomly assigned. 42 of the 48 completed the study protocol. # in control: 21 in control group # in intervention: 21 in intervention or colostrum administration group.	Control: Administration of 0.1 sterile distilled water on each side of the buccal mucosa. Intervention: Administration of 0.1 mother's colostrum on each side of the buccal mucosa. Intervention fidelity was ensured via the following process: Tuberculin syringes were used to administer colostrum or placebo via the oropharyngeal route. One unblinded investigator prepared 48 syringes with 0.1 mL of mother's colostrum or sterile distilled water using aseptic techniques. These syringes were then labeled and wrapped with opaque covers Beginning at 48 to 96	DV: improved or increased immunologic effects as evidence by increased concentrations of secretory immunoglobulin A, lactoferrin, and several immune substance. Secondary outcomes included sepsis, NEC, BPD, and VAP. As well as time to reach full feeds and hospital duration. DV Measure: Urine and Saliva obtained during the first 24 hours of life and at day 8 and 15. Urine was obtained by using a sterile attachable urine bag for neonates. Unstimulated whole saliva was collected in a sterile container using weak suction.	Statistical Results: The colostrum group had less clinical sepsis (50% vs 92%, P = .003) and shorter total antibiotic duration (6 vs 9.5 days, P = .014) Salivary TGF-b1 (39.2 vs 69.7 mg/mL, P = .03) and IL-8 (1.2 vs 4.9 ng/mL, P = .04) were significantly reduced in the colostrum group at 2 weeks compared with the placebo group. These markers initiate inflammatory cascades that occur in the immature intestinal cells. Conclusions: The study show reduction of clinical sepsis by colostrum might reflect its capacity

		Power analysis: 80% power with 5 % significance level required a sample size of 21 infants per group which was met. Group Homogeneity: Groups were equal in size, Approximately half of the enrolled infants were NPO before the study, and 18 (37.5%) infants did not start enteral feeding during the first week of life. There were no differences in the baseline characteristics of the study population or in the number that received formula before starting the protocol	hours after birth, each neonate received 0.2 mL of his or her mother's colostrum or sterile water every 3 hours for 72 consecutive hours, regardless of whether the infant was being fed enterally.	All specimens were centrifuged, aliquoted, and stored at –70°C until biochemical analysis. specimens were measured using enzyme-linked immunosorbent assay kits	to downregulate immature, excessively exaggerated inflammatory responses to a variety of stimuli in newborns. Due to the limiting study size and power there wasn't clinically significant results drawn from this research study alone. This study was too small to draw conclusive statements regarding the clinical benefit of colostrum, however it contributes to the collective body of evidence suggesting that oropharyngeal administration of colostrum can enhance immune function in sick neonates.

Citation: Martín-Álvarez, E., Diaz-Castro, J., Peña-Caballero, M., Serrano-López, L., Moreno-Fernández, J., Sánchez-Martínez, B., Martín-Peregrina, F., Alonso-Moya, M., Maldonado-Lozano, J., Hurtado-Suazo, J. A., & Ochoa, J. J. (2020). Oropharyngeal Colostrum Positively Modulates the Inflammatory Response in Preterm Neonates. *Nutrients*, *12*(2), 413. https://doi-org.proxy-hs.researchport.umd.edu/10.3390/nu12020413					**Level and Quality (using JHNEBP Model) Level I, Grade B**
Purpose/ Hypothesis	**Type of Evidence Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
The aim of this study is to assess the effects of oropharyngeal mother's milk administration in the inflammatory signaling of premature infants.	Research: non-randomized interventional study	Sampling Technique: Consent was obtained and the subsequent subjects were assigned to either group based on the availability of colostrum. Inclusion criteria were extremely preterm infants in the Neonatal Intensive Care Unit with <32 weeks' gestation and/or with a weight below 1500 g at birth. Exclusion criteria were chromosomopathies or congenital abnormalities, consumption or intake more than 10 mcg/kg/min of vasoconstrictive drugs, and/or HIV-positive mother. # eligible: 100 # accepted: 100 (13 dropouts mid study) # in control: 52-46 # in intervention: 48-41	Control: Not preforming oropharyngeal therapy with colostrum. Intervention: Syringe of colostrum was placed along the buccal mucosal tissue and 0.1 ml over 2 minutes was placed on each side of the mouth. The procedure was carried out every 4 hours for 15 days Intervention Fidelity: Investigators met the mothers and educated them about hand-expression and electric pumping of breastmilk every 2-3 hours. Mothers were given instructions and pre-labeled sterile milk collection flasks to collect their colostrum by using a sanitary hand-expression method. A trained nurse administered this colostrum by means of	DV: decrease incidence of the following: Necrotizing enterocolitis (NEC) is defined according to modified Bell's criteria stage ≥ 2 with clinical signs and radiologic evidence including any of the following: pneumatosis intestinalis; portal venous gas with or without pneumoperitoneum; proven sepsis was operationalized via (symptoms or clinical signs of infection, biologic markers of systemic inflammatory response syndrome (SIRS) (altered leukocyte count, CRP > 12 mg/L), and positive blood culture); analytics (IgA, IgM, IgG1, lactoferrin, and	Statistical Results: Infants in the colostrum group reached full enteral feedings sooner at an average of 7.2 ± 0.6 days compared to 9.1 ± 0.7 days for the control group, and this was the only characteristic that was statistically significant ($P < 0.05$). Conclusions and Clinical Significance: Although limited by smaller sample size, In this study, it has been observed that in the preterm neonates who received oropharyngeal colostrum, they reached full enteral nutrition before those that did not receive it. This could indicate a metabolic advantage for the underdeveloped GI tract and reduce the presence co-morbidities that

		Power analysis: Data with a relative efficacy of 90% power was considered significant. A value of $P < 0.05$ was considered significant.	sterile tuberculin syringes via the oropharyngeal route. The syringes were prepared daily with 0.1 mL of mother's colostrum, labeled, and stored at 4°C in a specified breastmilk refrigerator. During the procedure, heart rate, respiratory frequency, cutaneous oxygen saturation, and arterial pressure were recorded if invasive monitoring was available. In case of dermal oxygen desaturation maintained below 88% or bradycardia < 100 bpm or tachycardia > 200 bpm, the procedure would be discontinued.	resistin). To assess the immunologic effects of administration of the oropharyngeal colostrum, 4 blood samples were collected during the first month of life.	compromise gastrointestinal perfusion and that typically preclude enteral feedings during this period. The prolonged inability to feed enterally can lead to intestinal atrophy, which increases the risk of localized inflammation, feeding intolerance, NEC, and nosocomial infections and this proves clinically significant for the purposed of providing OPT to benefit the critically ill neonatal population.

Citation: Nasuf, A., Ojha, S., & Dorling, J. (2018). Oropharyngeal colostrum in preventing mortality and morbidity in preterm infants. *The Cochrane database of systematic reviews*, *9*(9), CD011921. https://doi.org/10.1002/14651858.CD011921.pub2					**Level and Quality (using JHNEBP Model)** **Level II, Grade B**
Purpose/ Hypothesis	**Type of Evidence Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**

The purpose of this study is to determine if early (within the first 48 hours of life) oropharyngeal administration of mother's own fresh or frozen/thawed colostrum can reduce rates of NEC, late-onset invasive infection, and/or mortality in preterm infants compared with controls.	Research: Systematic review and meta-analysis	Sampling Technique: Two review authors independently screened retrieved articles for inclusion and independently conducted data extraction, data analysis, and assessments of 'Risk of bias' and quality of evidence. Selection criteria included preterm infants in early neonatal period (first 48hrs of life) . Gestational ages of infants included in the studies ranged from 25 to 32 weeks gestation and weighing 410 to 2500 g. # eligible: 6 studies were included that compared early OPC versus water, saline, placebo, or donor, or versus no intervention # accepted: There were 335 preterm infants	Control: Control groups that included administration of water, oral formula, donor breast milk (to the oral buccal cavity), or no intervention were considered. Intervention: Oropharyngeal administration of the mother's own colostrum to her preterm infant consists of placing a small amount (0.1 to 0.5 mL) of colostrum directly onto the buccal mucosa at least once and usually repeatedly within the first 48 hours of life Intervention fidelity varied between studies however studies that included any technique of oropharyngeal administration, such as instillation by syringe, direct application to the oral mucosa by swab, or any other means such that the fluid could be absorbed by the buccal mucosa were used.	DV: Incidence of NEC, infection, and death before discharge were quantified. Secondary outcomes included VAP, CLD, length of stay, time to full feeds and more. The interventions within each study were evaluated based on the number of treatments, time, technique, dose, and duration and any additional interventions. There is high level of heterogeneity that was assessed between effect sizes of included studies.	Statistical Results: In terms of the primary intervention the Meta-analysis did not show an effect on the risk of NEC (typical risk ratio (RR) 1.42, 95% confidence interval (CI) 0.50 to 4.02; six studies, 335 infants; P = 0.51. Two studies had no cases of NEC so the estimate is based on four studies including 290 participants. Due to the unclear risk of bias and the heterogeneity between studies this outcome wasn't statistically significant. Meta-analysis of the six included studies showed that infants who received OPC within 48 hours of birth achieved full enteral feeds earlier than those given placebo or no intervention (mean difference (MD) -2.58, 95% CI -4.01 to -1.14; P *= 0.0004*; Conclusions: Infants who received OPC established full enteral feeding sooner than those who received placebo or no

					intervention. All other outcomes had inconclusive findings. Clinical Significance: The effect of OPC is uncertain regarding all other outcomes because of small sample sizes, bias risk, and imprecision in study results (low-quality evidence) However the fact that infants who received OPT achieved full feeds sooner is clinically significant.

Citation: OuYang, X., Yang, CY., Xiu, WL. *et al* (2021). Oropharyngeal administration of colostrum for preventing necrotizing enterocolitis and late-onset sepsis in preterm infants with gestational age ≤ 32 weeks: a pilot single-center randomized controlled trial. *Int Breastfeed J* 16, 59. https://doi.org/10.1186/s13006-021-00408-x					**Level and Quality (using JHNEBP Model)** **Level I, Grade B**
Purpose/ Hypothesis	**Type of Evidence Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
The objective of the study is to evaluate the role of OAC (oropharyngeal administration of colostrum) in the early prevention of NEC and late-onset sepsis in preterm infants.	Research: Single-centered Randomized Controlled Trial	Sampling Technique: NICU preterm infants GA less than or equal to 32 weeks were randomly divided into two groups using a random number table at admission by the appointed person. The exclusion criteria were as follows: (1) mothers prohibited from breastfeeding because of	Control: The control group included preterm infants who received normal saline buccally. Intervention: The OAC group included infants who received 0.4 ml of maternal colostrum every 3 hours for 10 days beginning within the first 48 hrs after birth	DV: The primary outcome included is the incidence of NEC, classified according to the modified Bell classification. Late-onset sepsis including proven and clinical sepsis defined as occurring at > 72 hrs of life and a positive blood or CSF culture that	This RCT showed lower incidence of NEC in those infants who received the OAC intervention. The incidences of late-onset sepsis and proven sepsis were lower in the OAC group than in the control group. This study showed that the incidence of late-onset sepsis was potentially lower in the OAC group among

		conditions including active tuberculosis or AIDS, treatment with radioisotopes, substance abuse, or treatment with medications excreted in breast milk, such as antimetabolic anticarcinoma agents or antipsychotics; (2) birth complicated with severe gastrointestinal malformations, or fatal disabling congenital chromosomal abnormalities and (3) any infant with congenital cytomegalovirus infection. # eligible: 271 # accepted: 260 # in control: 125 were enrolled in the control group # in intervention: 127 in the OAC group Power analysis: A P-value of less than 0.05 was considered significant. Group Homogeneity: was not discussed in this study however in terms of size they were similar and all met the same	Intervention Fidelity: The nurses were not blinded to the intervention. However to ensure intervention fidelity in the control group, the primary nurse used the same methods and frequencies of treatment as noted in the OAC group, but breast milk was replaced with normal saline. Parents were also required to pass the training and demonstration before starting to collect and deliver the breastmilk.	yielding a traditional neonatal pathogen. Infection related clinical manifestations were also used such as an abnormal WBC or elevated CRP. Secondary outcomes include the age of achieving full enteral feeds, operationalized as (160ml/kg.day), full oral feeds, rate of weight gain (g/kg/day) Adverse events were monitored as well defined as HR < 90, tachycardia > 180, and desaturation defined as < 88%.	preterm infants with GA ≤ 32 weeks (from 13.6 to 4.7%), and there was some evidence of this result in ELBW infants (from 36.4 to 0.0%). Furthermore, the late-onset sepsis reduction may be associated with the shorter time to achieve full enteral feeding in this study. However, there was no difference in the incidence of proven sepsis between groups as determined by adjusted analyses. In addition there was a lower incidence of IVH and time to achieve full enteral feeding in the OAC group than the control group. No adverse events were reported however the data quantified or reported numerically within the study. This study is clinically significant because it strengthens the notion that OAC is simple, feasible, low cost treatment that can contribute to positive outcomes/decrease poor

		inclusion criteria.			outcomes in critically ill infants.

Citation: Tao, J., Mao, J., Yang, J. *et al.* (2020). Effects of oropharyngeal administration of colostrum on the incidence of necrotizing enterocolitis, late-onset sepsis, and death in preterm infants: a meta-analysis of RCTs. *Eur J Clin Nutr* 74, 1122–1131. https://doi.org/10.1038/s41430-019-0552-4					**Level and Quality (using JHNEBP Model)** **Level I, Grade A**
Purpose/ Hypothesis	**Type of Evidence Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
In this review the effects of OAC (oropharyngeal administration of colostrum) on preterm infants is assessed.	Research: Meta-analysis of RCTs	Sampling Technique: Eligible studies included RCTs, preterm with GA < 34 weeks or BW < 1500 g, and compared OAC as monotherapy with either a no intervention group or control group. Excluded studies included non-human studies, reviews, abstracts, or case reports. Validity and quality of each of the studies was evaluated using Cochrane risk of the Bias Assessment Tool. # eligible: 114 studies retrieved # accepted: 38 excluded based on title or abstract. 11 excluded for not meeting inclusion criteria. 9 RCTs met the criteria and were included in the quantitative synthesis with an overall sample size of 689 preterm infants.	Control- saline or sterile water administration in the buccal area or no intervention (normal feeding or NPO status) were the control groups within included studies. Intervention- OAC as monotherapy. In all studies 0.2 ml of mothers colostrum was applied as single administration. Intervention fidelity: the intervention had a feeding time ranging from 24 h after postnatal life to up to 7 days of life and were giving oral colostrum on set intervals between 2- 6 hrs. Due to heterogeneity of the studies in terms of differences in frequency and duration of intervention therapy intervention fidelity is low.	DV: The primary outcomes were the incidence of NEC (operationalized using Bell's staging tool > 2), rate of LOS, and all-cause mortality rates. Secondary outcomes included time to reach full enteral feeding and duration of hospital stay. State the instrument, reliability, and measurement procedure:	Statistical Results: The pooled results showed statistical significance in time to reach full enteral feeds between the OAC group and the control group ($p = 0.02$, MD = −3.60, 95% CI = −6.55–0.64). The results of duration of hospital stay also showed statistical significance between the OAC group and the control group ($p = 0.01$, MD = −10.38, 95% CI = −18.47–2.29). Conclusions: The risk of developing NEC in the OAC group was 41% lower than in the control group and the NEC rate was 4.7% in the OAC group compared with 7.7% in the control group. However, the pooled result showed no statistical significance between the OAC group and the control group. The time to reach full enteral feedings included 417 preterm infants and there was statistically significant in that the

		Power analysis: For all outcomes 95% CI was considered. All studies were single-center studies and had relatively small sample size therefore they presented with limited power.			OAC group reached full feeding sooner than the control group. The difference amongst the intervention and control group showed statistically significant information that OAC decreased duration of stay as well. Despite the varying outcomes with the use of colostrum oral therapy to decrease incidence of NEC, this study helps add to the body of evidence saying that OAC has a beneficial effect on preterm and critically ill infants with minimal to no reported risks.

Citation: Wetzel, C. M., Davis, L., Grohler, N., Oprondek, D., Ruff, D., Lowery, K., Heuer, J., Mullvain, M., Wolff, J., Zukowsky, K., & Harris-Haman, P. A. (2020). A Quality Improvement Project to Improve the Use of Mother's Own Milk (MOM) With Precision Oropharyngeal Therapy. Advances in Neonatal Care (Lippincott Williams & Wilkins), 20(2), E19–E30. https://doi-org.proxy-hs.researchport.umd.edu/10.1097/ANC.0000000000000691					**Level and Quality (using JHNEBP Model)** **Level V, Grade A**
Purpose/ Hypothesis	**Type of Evidence Research Design**	**Sample – Population, Size, Setting**	**Intervention/Procedures**	**Primary Outcome/Measures**	**Results/Conclusions**
The purpose of this QI project	Quality Improvement	48 bed Level 3 NICU with a practice gap.	Intervention: QI methods were used to implement	Primary outcome of this QI project was safe	After changing processes to longer-term precision OPT, the percentage of

was to increase the use of Mothers Own Milk (MOM)-Oropharyngeal Therapy (OPT) in premature infants in the first week of life.		Targeted Population: Infants born less than 30 weeks' gestational age were the target population for precision MOM-OPT. Multidisciplinary team comprised stakeholders from multiple departments including 2 staff nurses (one who is also an International Board-Certified Lactation Consultant), a neonatal nurse practitioner, a registered dietician, a speech therapist, the NICU educator, a member of the NICU management team, a healthcare technician (who is also a milk technician), and a parent.	precision dosing of OPT. Using the literature the team developed a new process for precision OPT. The practice implementation required the involvement of Information Technology (IT) to create electronic order sets for the providers, new Medication Administration Record (MAR) rows, OPT MAR stickers for labeling and bedside scanning, and new electronic medical record (EMR) rows (documenting parent or nurse given and whether the dose was frozen milk or fresh milk). Received approval for new 1-mL sterile oral syringes that involved the purchasing department and a group called the Value Analysis Team.	implementation of precision dosing of OPT with 100 % of the doses given safely. The second OPT aim was that infants would receive at least 70% of ordered doses. The target was to impact RN behavior through improving OPT practice by replacing the infrequent practice of short-term colostrum immune therapy with the consistent daily practice of longer-term OPT protocol.	ordered doses administered to infants in the first week of life increased from 24% to 64%. There was also an increase in the number of infants who received MOM from 50-65% at discharge. There were no reported adverse events related to OPT administration.

Table 2.
Evidence Synthesis

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings
Level 1 - Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis	1 double-blind RCT 1 single center RCT 1 non-randomized experimental study 1 meta-analysis of RCT's	A	The RCT conducted by Lee, J, et al. (2015) showed a reduction in development of clinical sepsis by colostrum, which may reflect the milks capacity to downregulate exaggerated inflammatory responses to a variety of stimuli in newborns. This finding was discovered in another study that was a single-centered RCT OuYang, X. et al.. (2021). There was a relatively large sample size that showed the incidences of late-onset sepsis and proven sepsis were lower in the OAC group than in the control group. This same study was one few studies that was able to collect data to prove there was a lower incidence of NEC in those infants who received the OAC intervention. group than in the control group. Infants in the study conducted by Martín-Álvarez, E. et al. (2020) reached full feeds sooner in the intervention OPT group than the control group. This aligns with the finding of the meta-analysis conducted by Tao, J., Mao, J., Yang, J. *et al.* (2020), which found that OAC group reached full feeding sooner than the control group as well. These studies both compared oropharyngeal therapy with colostrum- administered 0.1-0.2cc in each cheek , however it was compared with the control of no intervention in one study and the meta analysis by Tao, J., Mao, J., Yang, J. *et al.* (2020), had a varied control group of the use of saline, sterile water, or no intervetntion similar to Martín-Álvarez, E. et al. (2020).

			The difference amongst the intervention and control group showed statistically significant information that OAC decreased duration of stay as well in both studies. Together these studies have a very large sample size and despite no statistically significant results in the reduction of NEC, these high level, good quality studies help to contribute to the body of knowledge surrounding the safety, feasibility, and improved outcomes that are a result of oropharyngeal therapy.
Level II · Quasi-experimental studies · Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis	1 systematic review and metanalysis of a combination of RCT's and quasi-experimental studies	B	The robust findings in the meta-analysis conducted by, Nasuf et al. (2018). Show that of the six included studies showed that infants who received OPC within 48 hours of birth achieved full enteral feeds earlier than those given placebo or no intervention. This is clinically significant due to the very large sample sizes. This aligns with the findings of the studies presented above by Tao, J., Mao, J., Yang, J. *et al.* (2020) and Martín-Álvarez, E. et al. (2020). In the Nasuf et al., (2018) meta-analysis, the effect of OPC was uncertain regarding all other outcomes in this study; however if these patients were able to tolerate full feeds sooner it means that they most likely weren't slowed down due to the development of NEC, Sepsis, VAP, or other barriers to reaching full enteral feeding tolerance..
Level III · Non-experimental study · Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis · Qualitative study or systematic review of qualitative studies with or without			

meta-synthesis			
Level IV · Opinion of respected authorities and/or reports of nationally recognized expert committees/consensus panels based on scientific evidence			
Level V · Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence	1 QI	A	This QI study although Level 5 is grade A and provides intervention fidelity in the form of education and caregiver participation with resultant improvements in compliance and sustained practice change. According to this quality improvement effort, it was discovered that there are large variations at many institutions with compliance, terminology, and procedures surrounding oropharyngeal therapy (OPT) with colostrum or mother own milk which leads to inconsistencies in offering the milk routinely as a means of immune therapy.
Recommendations Based on Evidence Synthesis: There is good and consistent evidence and high quality data to support the safety, feasibility, and benefits associated with this practice change as well as intervention fidelity found through previous QI work. More research is needed on critically ill, immunocompromised, newborn populations, i.e those with congenital heart malformations or those newborns requiring mechanical ventilation.			

Figure 1.
KTA Framework

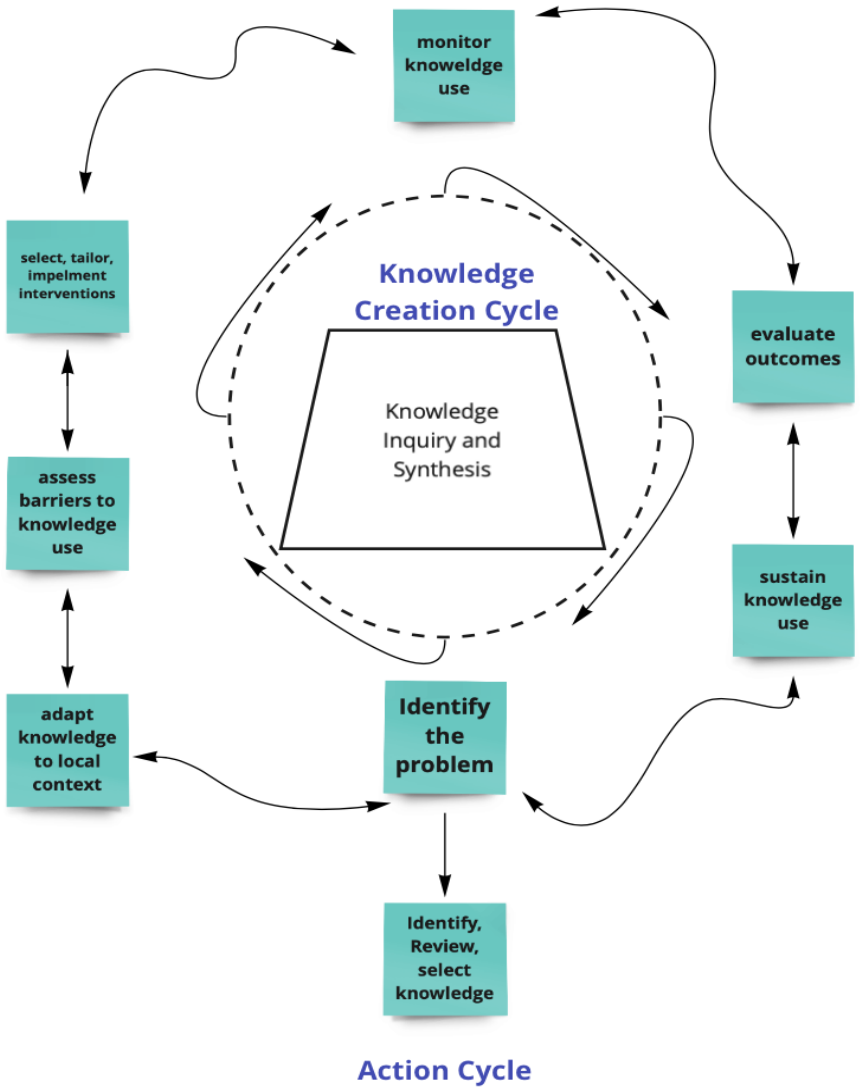


Figure 2.
Fishbone Diagram

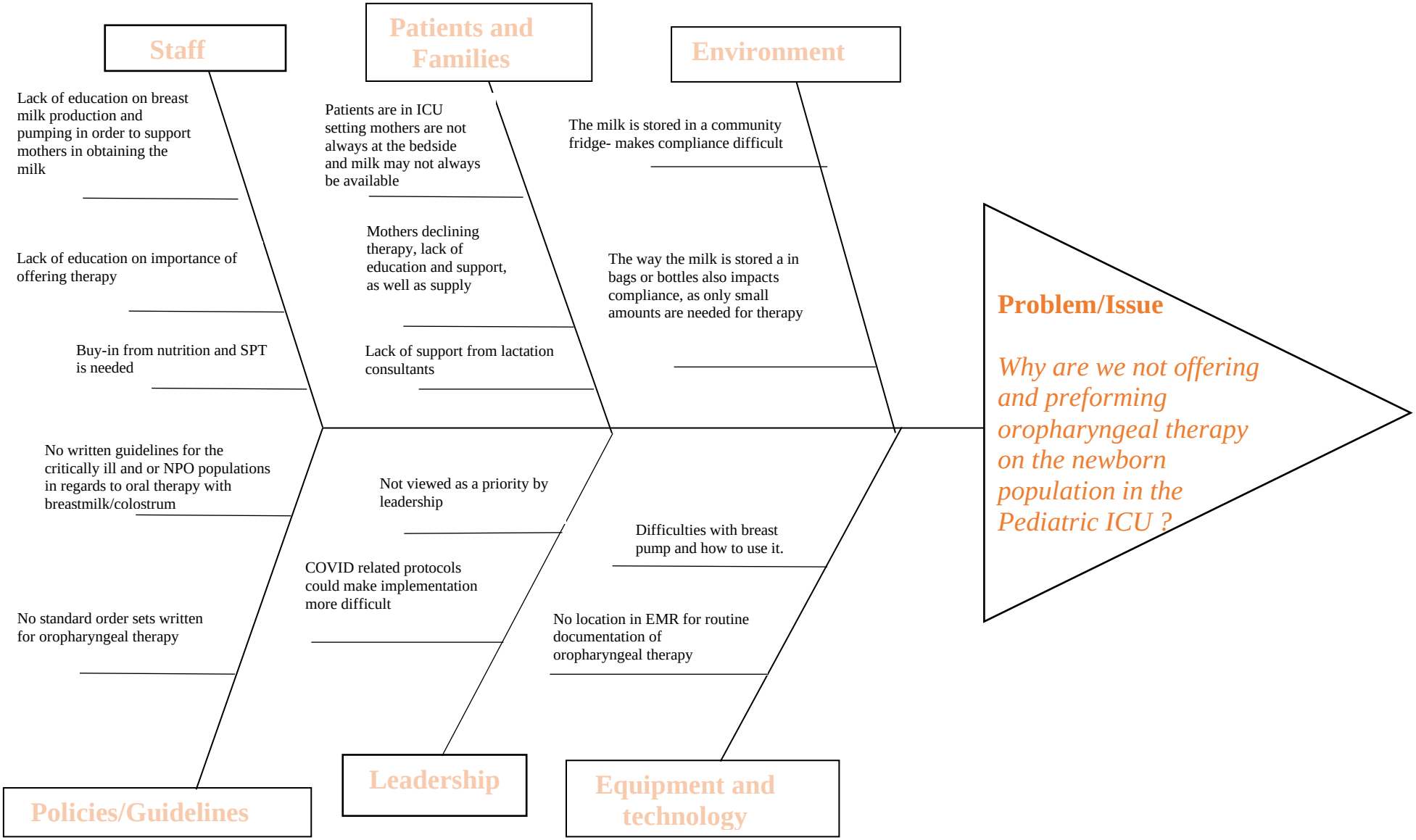


Figure 3.
Categorical Data

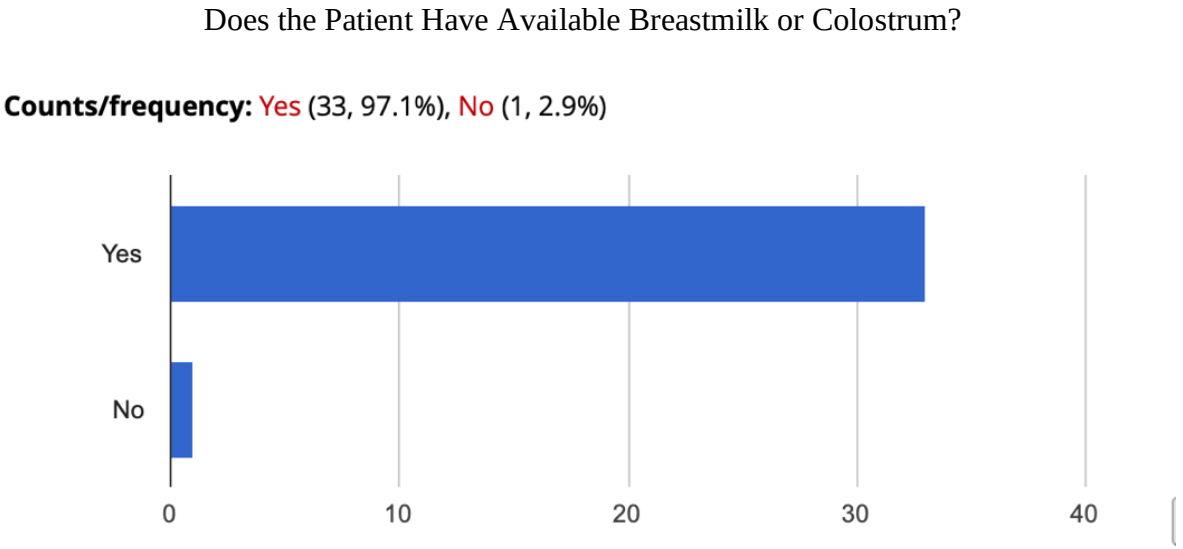


Figure 4.
Categorical Data

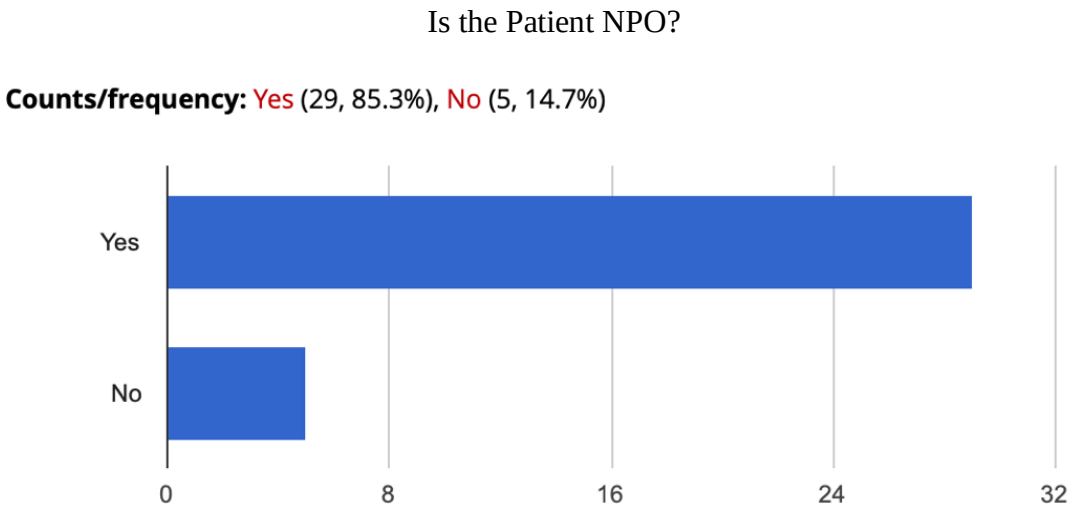


Figure 5.

Categorical Data

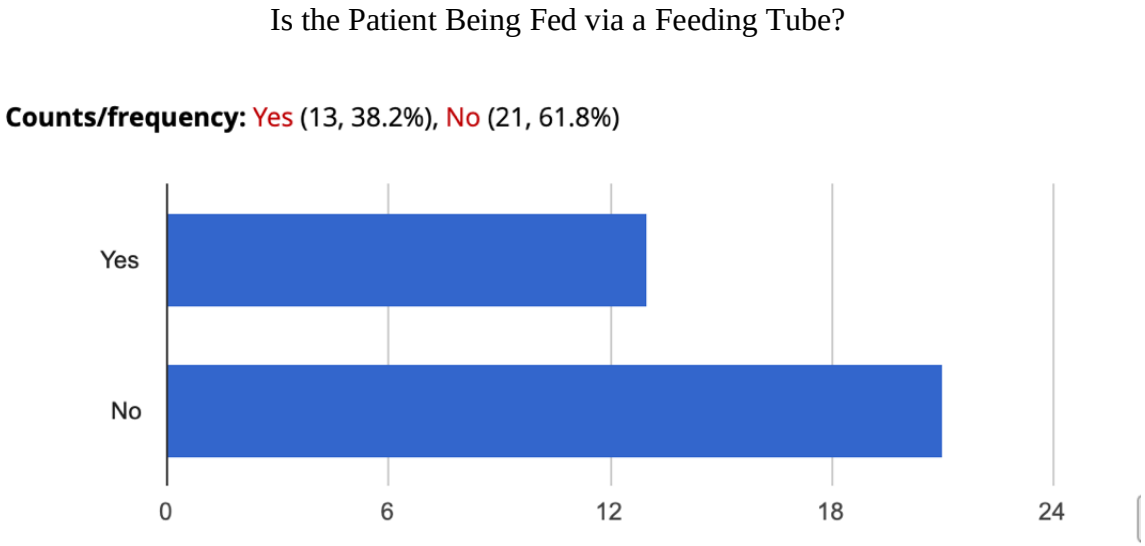


Figure 6.

Categorical Data

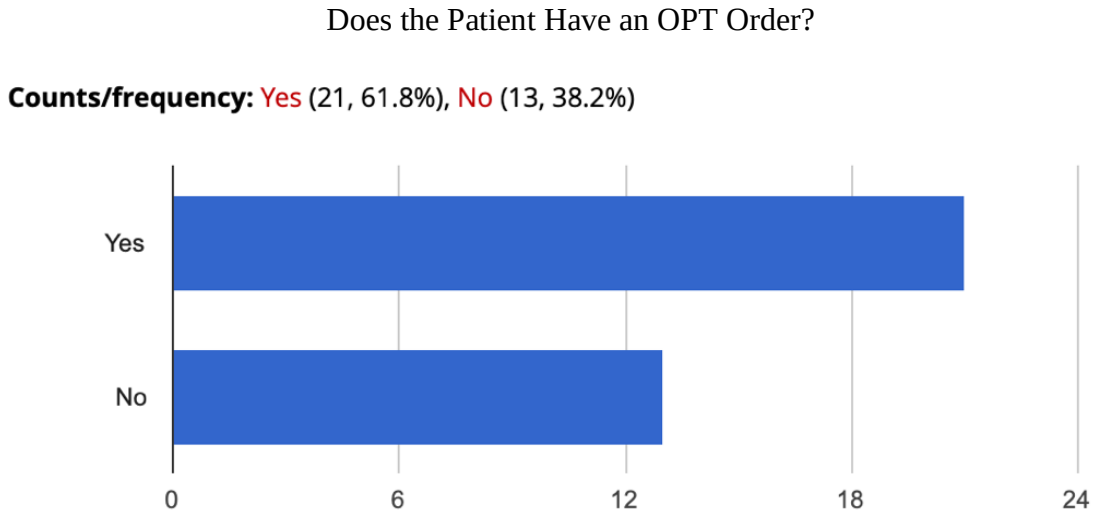


Figure 7.

Categorical Data

Did the Patient Received OPT at Least 6 Times in the Previous 24 Hours?

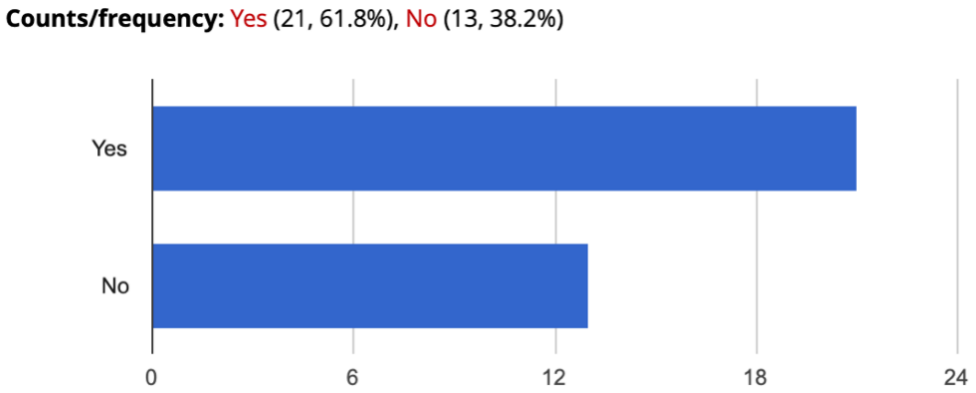
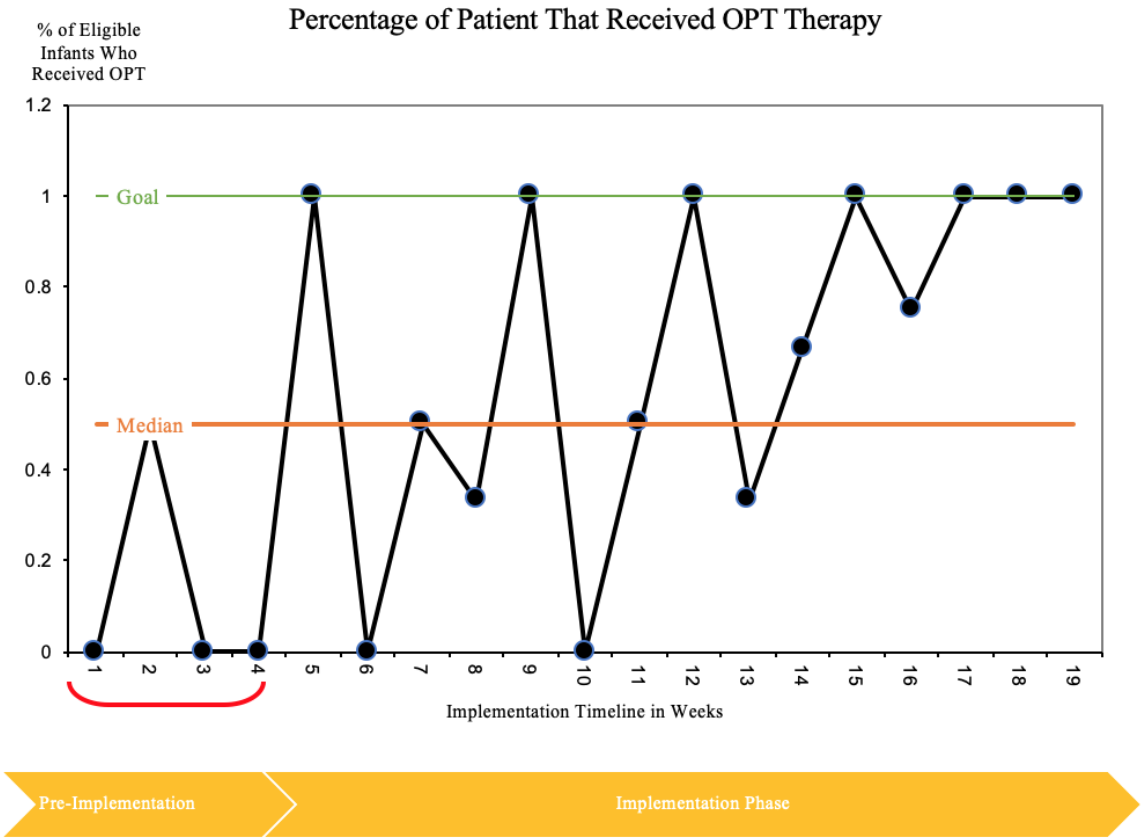


Figure 8.

Run Chart



Appendix A.

Educational PowerPoint

Oropharyngeal Therapy with Colostrum or Mother's Own Milk in the PICU

Margaret Johnson
Liliana Simon
Mary Ellen Connolly

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Appendix A. (Continued)
Educational PowerPoint

Practice Problem

- Our 19-bed Pediatric ICU does not include oropharyngeal therapy (OPT) with colostrum or mothers' own milk (MOM) as a standard of care on critically ill infants
- Chart audits show documentation compliance is below 50%
- Many critically ill newborns have limited or even no exposure to the protective immune factors found in colostrum and human milk

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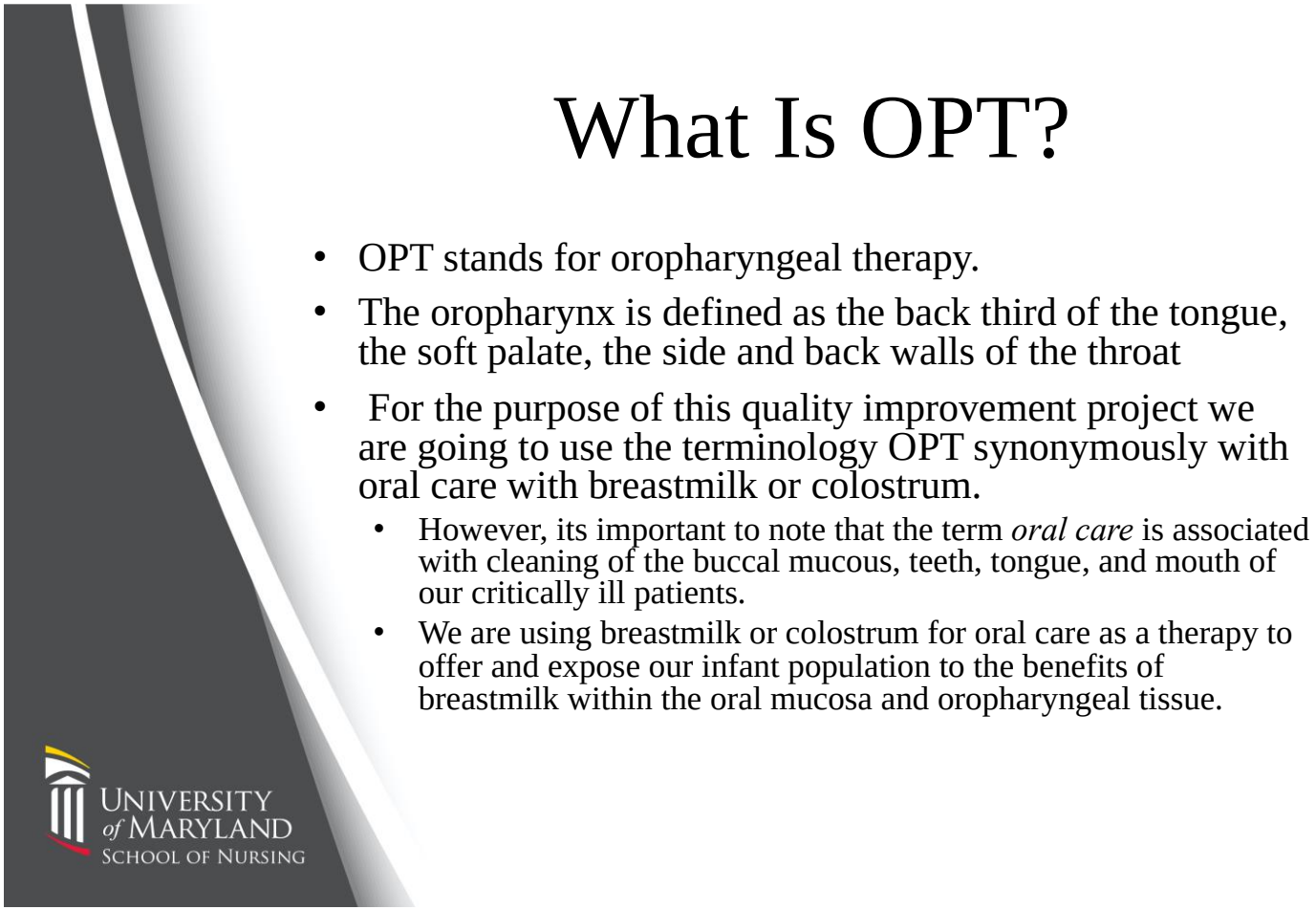
Appendix A. (Continued)
Educational PowerPoint



Appendix A. (Continued)
Educational PowerPoint

Why?

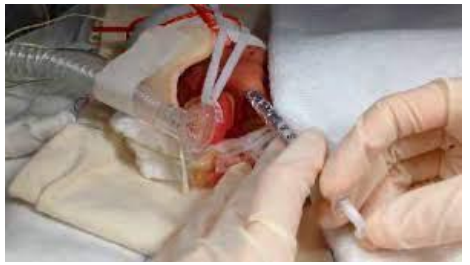
https://familyandconutrition.com/breastmilk/

- Colostrum and mother's own milk (MOM) is the best first immune stimulator in infants, featuring the "perfect species-specific nutrition" because it contains many types of protective agents that work to protect against infection through the provision of antimicrobial, anti-inflammatory, and "immunomodulary" functions (Martín-Álvarez, et al., 2020).
- Clinical instability and acuity can prevent infants from breastfeeding or receiving enteral feeding by mouth, many require feeding via a nasogastric or orogastric tube. Although this allows the infant's to be fed, it prevents the colostrum or mother's milk from passing through the oropharynx in the first few days to weeks of life.
- Limited oropharyngeal exposure to colostrum or mothers own milk can lead to many adverse outcomes including an **increased likelihood of sepsis**, **Necrotizing Enterocolitis (NEC),** and **feeding dysfunction**. These complications can **increase NPO days**, **prolong hospitalization,** and lead to **associated morbidity and mortality**.

Appendix A. (Continued)
Educational PowerPoint

How do I perform this therapy?

OPT is an easy procedure. The colostrum or breastmilk required is a very small volume (0.2 ml divided into two cheeks). The volume of milk is instilled in each cheek, in the babies mouth and eventually comes in contact with the oral mucosa and oropharyngeal tissue.



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https://www.slhd.nsw.gov.au/RPA/neonatal%5Ccontent/pdf/Nursing%20Guidelines/Oral_Care_RPAH_GL2017_021.pdf

Appendix A. (Continued)

Educational PowerPoint

Special Considerations

OPT should be offered for all infants with available breastmilk between zero days of life and three months of age who are NPO or tube fed and admitted to the PICU. The therapy should continue until they are feeding by mouth.

Contraindications:

- Mothers prohibited from breastfeeding because of conditions including: active TB, AIDS , treatment with radioisotopes or other medications excreted in breast milk
- Active substance abuse
- Birth complicated with severe gastrointestinal malformations
- Declination of desire for the therapy by the family.

Evidence has shown that this therapy is safe and likelihood of adverse events are low however…

Things to watch for:

- Acute Hypoxia
- Bradycardia
- Tachycardia
- Coughing or Sputtering

If a patient experiences any of these things stop the therapy and document appropriately

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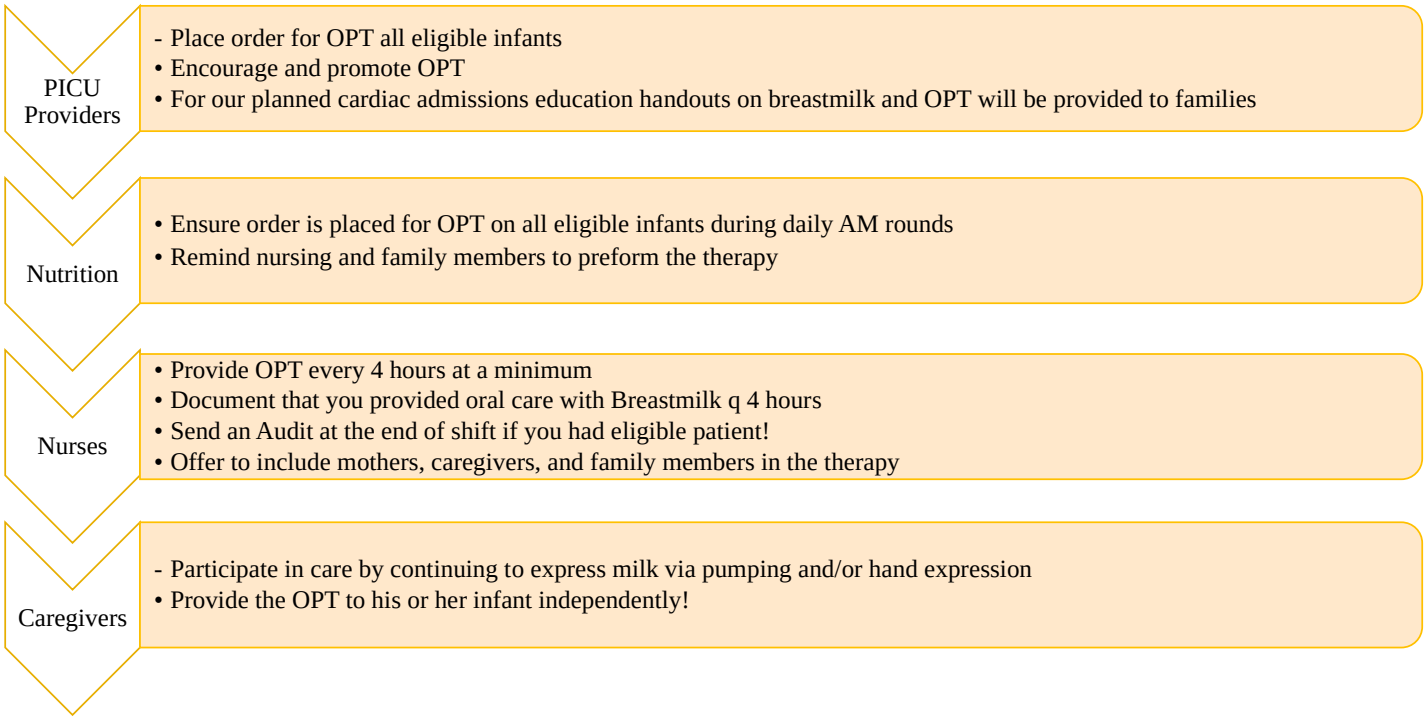
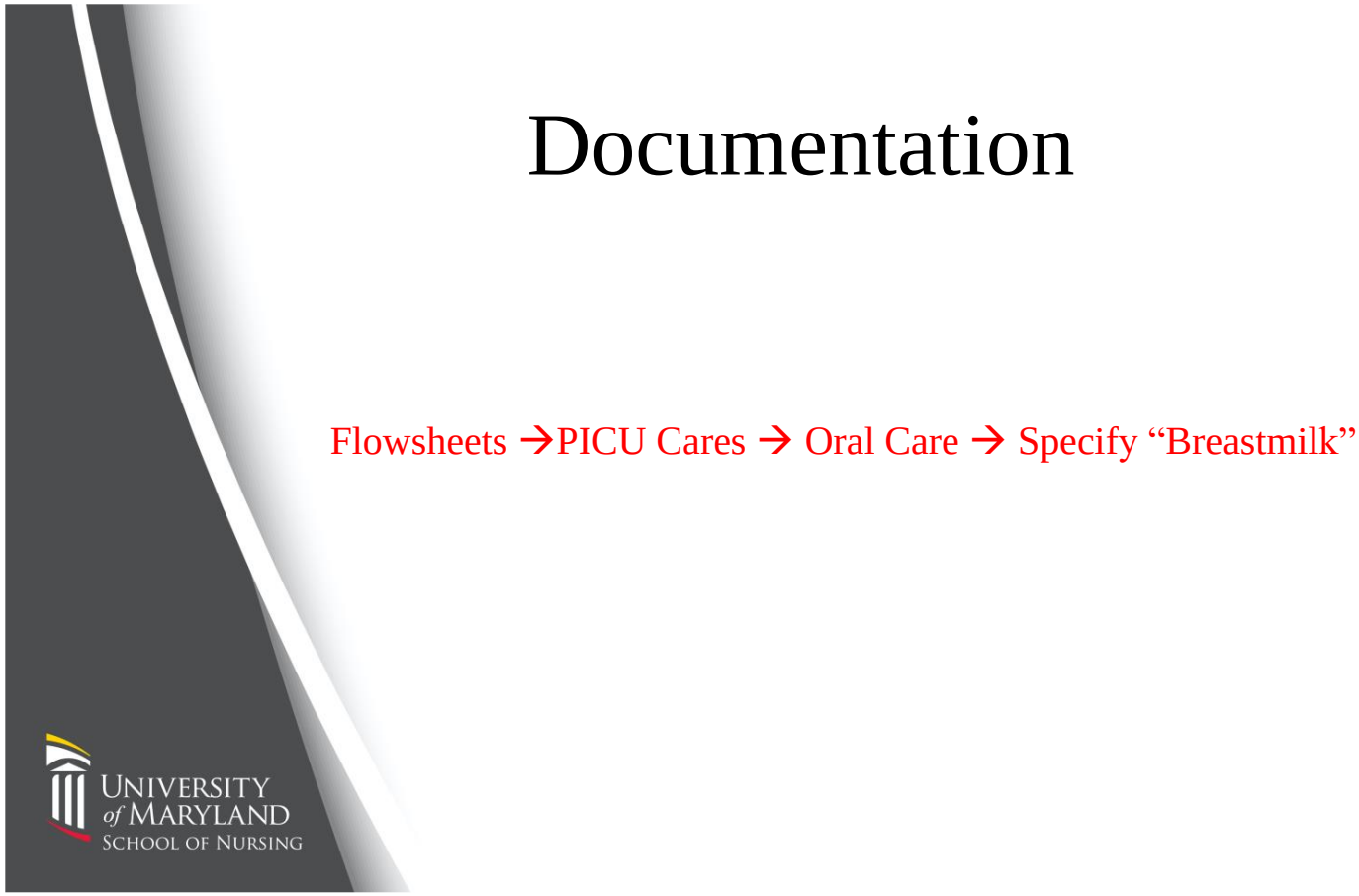
Appendix A. (Continued)
Educational PowerPoint

Roles of Multidisciplinary Team



Appendix A. (Continued)
Educational PowerPoint



Appendix A. (Continued)

Educational PowerPoint

Data Collection

- If you are a bedside nurse caring for an eligible neonatal patient ages 0 days to 3 months of age, please scan the QR code at your computer station, and answer the 5 brief questions prior to the end of your shift.
- All answers and submissions are anonymous!
- Nursing staff will hear results during weekly huddle and when we hit 60% compliance, 70%, 80%, and 100% (our goal) **REWARDS** and **PRIZES** will be provided ☺
- Your participation will not only benefit our neonatal patient population AND hopefully improve our family satisfaction as we continue to always strive for patient centered care!

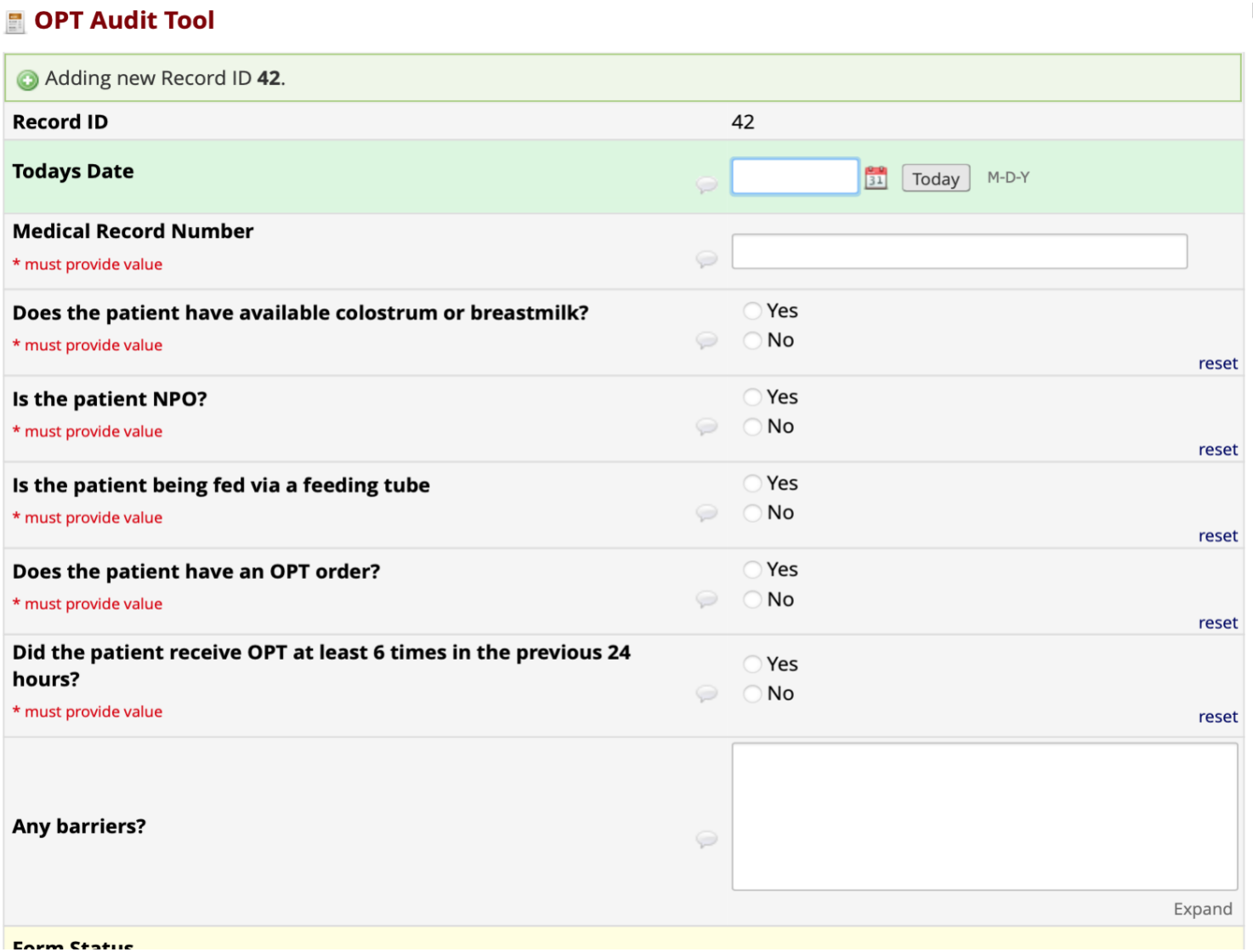
Scan the QR Code

The survey link has been converted into a QR code, which can now be scanned by a device that has an app capable of reading QR codes. Once the QR code below is scanned, it should take the respondent directly to the survey in a web browser.

UNIVERSITY of MARYLAND SCHOOL OF NURSING

Appendix B.

OPT Audit Tool



Appendix C.

Eligibility and Compliance Audit