Implementing an Infant-Driven Feeding Practice Model

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DNP Comprehensive Project: Implementing an Infant-Driven Feeding Practice Model

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Abstract

Neonatal feeding practices have been the focus of many quality improvement studies due to large variations in care practices. Traditionally, the model for neonatal feeding has been a volume-based approach, one that focuses on a prescribed quantity consumed rather than the infant’s physiologic and developmental maturity (Fry et al., 2018). Recent literature has emphasized the benefits of a more developmentally supportive feeding approach in neonatal intensive care units (NICU), the infant-driven feeding model (IDF).

The IDF model focuses on individualized care, quality of the feed, and continuous assessment of feeding cues both before and during the feeding experience. Current literature has associated the infant-driven approach with numerous positive outcomes including shorter time to attainment of oral feedings, increased velocity of weight gain, shorter length of stay, increased caregiver satisfaction, and lower cost to the family and organization (Fry et al., 2018). This Doctor of Nursing Practice (DNP) quality improvement project herein details an evidence-based educational intervention to assist in transitioning clinical staff from a volume-based to an IDF approach. This intervention draws on the PRECEDE-PROCEED framework and Theory of Reasoned Action/Planned Behavior conceptual models for support. The Outcomes were measured via pre- and post-intervention surveys to measure the effectiveness of the educational intervention on staff attitudes, knowledge, and skills. In general, the pre- and post-intervention survey results were comparable demonstrating a <0.75 point deviation between intervals, however analysis and conclusions are limited due to a small sample size.

Keywords

Infant-driven feeding, cue-based feeding, neonatal intensive care unit (NICU), infant feeding model, patient-centered care, neonate.
Introduction

Background

Effective transition from nasogastric feeding to full oral feeding is one of the first challenges premature infants must overcome in order to satisfy criteria to be safely discharged home from the neonatal intensive care unit (NICU). A variety of clinical factors and interventions in the NICU setting can negatively affect the normal development of an infant’s suck-swallow-breath reflex including intubation, nasal or oral feeding tubes, and poor oral feeding experiences (Settle & Francis, 2019). Furthermore, the ability to feed orally requires maturation of physiologic, neurologic, and behavioral systems to coordinate an effective suck-swallow-breath technique without becoming physically exhausted or burning excessive calories during a feeding (Fry et al., 2018). The developmental requirements to feed orally have implications on time to attain oral feeding ability, weight gain, parental involvement, staff satisfaction, length of stay, readmission after discharge, and cost savings to both the healthcare institution and the patient’s family (Fry et al., 2018).

Problem Description

Traditionally, the feeding model for premature infants in the NICU has been a task-oriented, volume-based approach. This approach focuses on a prescribed quantity and frequency that is primarily dictated by gestational age or weight. This approach has gained criticism for its overlooking of the infant’s individual physiologic and developmental maturity. In contrast, the IDF approach, known also as infant-led, cue-based feeding, or co-regulated feeding, has received growing attention as a promising feeding model to replace the traditional volume-based approach. IDF is a practice that is comprised of continuous assessment of infant cues indicating readiness to feed. These cues include bringing hands to the mouth, rooting, and sucking on
fingers or a pacifier (Fry et al., 2018). Additionally, caregivers observe the infant’s coordination, suck pattern, swallowing ability, vital signs, and energy level during the feed. When the infant demonstrates signs of distress or fatigue manifested through oxygen desaturations, bradycardia, disorganized sucking, drowsiness or disengagement, the oral feed is ended and the remainder of the feed is given by feeding tube. Thus, the focus of IDF is the experience of feeding rather than volume alone. Implementation of the IDF model and its associated outcomes have been the topic of many quality improvement projects in NICUs throughout the United States and beyond. However, despite the promising findings of research, IDF is currently not the standard of nursing practice.

Setting

The goal of this Doctor of Nursing Practice (DNP) quality improvement project was to implement an IDF model at a level II NICU located in central San Francisco.

Specific Aim

By April 2023, this DNP student developed, implemented, and evaluated an infant cue-based feeding educational intervention for clinical staff at a San Francisco NICU.

Available Knowledge

PICOT Question

Using the Melnyk and Fineout-Overholt (2019) template, a PICO(T) question was formulated to develop a targeted research question and guide the literature search: Among infants in the NICU (P), what strategies (I) as compared to a volume-based feeding approach (C) improved oral feeding attainment, increased infant weight gain velocity, and reduced length of stay?

Search Methodology
A literature search was performed on the topic of IDF using the CINAHL (55 articles), PubMed (0 articles), and Scopus (89 articles) databases using the keyword searches: “cue-based AND feeding”, “infant-based AND feeding”, “infant-driven AND feeding”. The search was only inclusive of original peer-reviewed research articles published in English within the last ten years (2011-2021). Additional screening criteria included research studies conducted in infants with and without congenital anomalies, those who were born preterm, and either breastfed or formula fed. The titles of the resultant 144 articles were screened for relevance. The studies with relevant titles were furthered narrowed by a screening of abstracts. Among these remaining articles, nine studies were hand-identified for inclusion based on pertinence to the IDF model (i.e. cue-based feeding, infant-led feeding, co-regulated feeding, etc…) as opposed to the action of feeding or other feeding approaches not related to infant cues (i.e. breastfeeding). The nine studies included in this analysis reflect the most current and best existing evidence to evaluate the current body of knowledge regarding IDF and its outcomes. A summarized evaluation table of the nine studies is provided in Appendix A.

**Integrated Review of the Literature**

Nine studies in total were included in this literature review. All nine echoed the theme of IDF as the major independent variable as per the scope of this literature review. The articles studied the IDF model via either a literature review, quality improvement, or randomized controlled trial design. The quality of evidence for each article was appraised using the Johns Hopkins Nursing Evidence-Based Practice Appraisal Tool (JHNEBPT) (Dearholt & Dang, 2018). Of the nine articles, one article was level I and low quality; 3 articles were level III and moderate quality; and five articles were level V and moderate to high quality (see Appendix A).
**Cue-Based Feeding Versus Volume-Based Model.** The single randomized controlled trial yielded in this literature search was conducted by Morag et al. (2019) who sought to evaluate the effect of parental guided responsive feeding on the transition from nasogastric tube feeding to oral feeding. Their study included n=67 infants at a NICU in Ramat Gan, Israel; 32 infants were randomized to the parental guided feeding group and 35 infants were randomized to the traditionally fed group. In this study, the authors define “traditional” feeding as volume-based feeding based on a pre-planned volume of food given at scheduled intervals without regard to infant cues, whereas “parental guided” is defined as a responsive, sensitive, infant-driven or cue-based approach in which the caregiver understands and responds to the infant’s behavioral cues before and during a feed. Data gathered by retrospective review of medical records were analyzed using SPSS functions with special attention paid towards the number of days needed to achieve full oral feeding. Infants in the parental guided responsive feeding infants reached full oral feeding within less days (median 2 vs. 8 days), at an earlier age (median 34.28 vs. 35.14 weeks), returned to baseline weight gain at 35 weeks (1.77 vs 1.25 g/kg/day), were discharged earlier (36.34 vs. 36.86 days), were more likely to be fed by their parents, and experienced less apnea/bradycardia events at 34 weeks (median 3.5 vs. 9 per week) compared to the traditionally fed infants. All findings were statistically significant. The parental guided feeding infants were more likely to reach full oral feeding earlier. This study boasted strong positive outcomes among the parental guided feeding group, however this study had a major flaw. During the later phases of the project, the study was halted by investigators who noticed contamination of the traditionally fed study group which began to reflect feeding characteristics of the parental guided responsive feeding model secondary to parental or nursing requests. It should be noted that such a contamination effect on the traditionally fed group would
theoretically contribute to a less exaggerated effect than expected. At this point the nursing staff had requested to change the unit protocol to parental guided responsive feeding entirely. Thus, this while this was a well-designed study with randomization and blinding to outcomes, the study was limited by its relatively small sample size and study contamination.

**Increased Infant Weight and Decreased Length of Stay.** Fry et al. (2018) compared and contrasted approaches to implementation as well as findings of the studies, noting the varying breadth of project approaches. Studies included in their systematic review utilized multidisciplinary teams, IDF champions, and a Plan-Do-Study-Act design. Fry et al. (2018) found that the five of six studies that measured length of stay observed a decreased length of stay after implementation of IDF protocols. Of the three studies that monitored infant weight gain, two studies cited increased weight gain associated with the intervention group. Fry et al. (2018) implicated that cue-based feeding may be effective in increasing infant weight gain, time to full oral feedings and decreased length of hospital stay. Only one of the projects found favorable the outcomes associated with IDF to be accelerated attainment of full oral feedings, whereas the other two projects observed a reduction in length of stay. One of the studies did not observe any differences in initiation, achievement of oral feedings, or length of stay. They concluded that more research is needed to validate the use of the IDF model as the literature supporting positive outcomes is scant. In synthesizing the evidence, Fry et al. observed various improvements in caregiver and staff satisfaction, as well as an effective means for standardized evaluation of infant feedings. However, the studies in aggregate failed to provide sufficient evidence to support a specific IDF protocol based on weight gain or reduced length of stay outcomes.

Chrupcala et al. (2015) employed a continuous quality improvement project with the goal of increasing the number of neonates fed according to cues prior to discharge. They implemented
an IDF intervention at a level 4 NICU in Philadelphia, PA among both surgical and nonsurgical neonates of all gestational ages with particular outcomes of interest being length of stay and time to full oral feedings. Data was collected by means of retrospective review of medical records comparing pre-implementation and post-implementation data using descriptive statistics. They observed a decrease in length of stay by 6.63 days, concluding that neonates fed according to cues can become successful oral feeders and safely discharged home regardless of gestational age or diagnosis.

**Attainment of Full Oral Feeding Ability.** Gelfter et al. (2015) implemented an IDF protocol in a level II NICU in Houston, TX observing for effects on the age of initiation of oral feeds, attainment of full oral feeds, at time to discharge. Data was separated into two periods, pre-intervention and post-intervention. Descriptive statistics, t tests, and confidence intervals were performed to compare data from the two periods. They found that neonates in the IDF group achieved full independent oral feedings 0.6 weeks earlier than the pre-intervention data (p=0.008). There was no compromise in weight gain. Thus, based on their data, they suggested that premature infants can start developing oral feeding skills as early as 32 weeks gestation and early introduction of feeding according to cues can lead to accelerated attainment of full oral feedings.

Thomas et al. (2021) employed a quality improvement project design. Their study sought to assess the effects and implementation of a cue-based feeding protocol for preterm infants in a level III NICU in the Northeastern United States. During three discrete time periods of the study, pre-implementation, first year post-implementation, and second year post-implementation, they conducted a retrospective review of n=215 medical records. Descriptive statistics were performed to compare findings from each study period as well as among similar age groups. In
infants 23 0/7 weeks to 27 6/7 weeks gestation, time to achieve full oral feedings decreased by 7 days, length of stay decreased by 4.4 days, and parents’ involvement in the feeding process increased by 80% from before to after implementation. In infants 28 0/7 weeks to 31 6/7 weeks gestation, time to achieve full oral feedings decreased by 6.6 days, length of stay decreased by 2.7 days, and parents’ involvement in the feeding process increased by 49% from before to after implementation. Additionally, the organization cited a $103,950 savings per year due to decreased lengths of stay.

Davidson et al. (2013) utilized a quality improvement study design in their implementation of an IDF model at a level III NICU. This study differed from other quality improvement studies in this review by way of a more specific patient population consisting of neonates with bronchopulmonary dysplasia. This study organized their analysis of the data by the varying levels of bronchopulmonary dysplasia severity. Clinical outcomes of infants with varying severity levels of bronchopulmonary dysplasia were compared between the cue-based group and the baseline group. Parametric and non-parametric tests were performed on these groups of infants. The duration to achieve full oral feedings was significantly shorter in the cue-based group at all levels of bronchopulmonary dysplasia severity. Infants with mild bronchopulmonary dysplasia required 12 fewer days than infants in the control group. Infants with moderate bronchopulmonary dysplasia required 10 fewer days. Infants with severe bronchopulmonary dysplasia required 9 fewer days. The average weight velocity was 3 g/kg/day higher for the cue-based infants with moderate bronchopulmonary dysplasia compared with the control group. Additionally, weight velocity did not differ by feeding method for infants with mild or severe bronchopulmonary dysplasia.
The final quality improvement project included in this review was conducted by Wellington and Perlman (2015) at the New York Presbyterian Hospital NICU. This study also employed a retrospective chart review of n=153 practitioner-driven feeding infants and n=101 IDF infants. Wellington and Perlman (2015) separated data both by age of the study population into three subgroups as well as the study duration into three periods. Descriptive analysis was performed in SPSS, and linear regression analysis was used to correct for potential confounders. They found that the premenstrual age at attainment of full nipple feeds and at discharge was significantly lower in the IDF group than physician-driven feeding group. Infants <28 weeks gestational age in the IDF versus physician-driven feeding group reached full nipple feeds 17 days sooner and were discharged 9 days earlier. Infants 28–31 6/7 weeks gestational age reached full nipple feeds 11 days sooner and were discharged 9 days earlier in the IDF versus physician-driven feeding group. Infants 32–33 6/7 weeks gestational age reached full nipple feeds 3 days sooner and were discharged 3 days earlier in the IDF versus physician-driven feeding group. Additional outcomes noted in the IDF group was increased provider and parent satisfaction.

Summary/Synthesis of the Evidence

This literature review serves as moderate impetus for practice change considering the overall quality and strength of evidence appraised using the JHNEBPT. Seven of the nine articles demonstrated positive outcomes associated with the IDF approach. Two articles yielded neutral outcomes. No articles revealed negative outcomes. Many of the studies mirrored one other in regard to their outcomes of interest, which, in summary, included days to attain full oral feeding, weight gain velocity, total weight gain, parent involvement, staff satisfaction, and length of stay. It is an interesting finding to recognize that the literature reviews, representing a higher tier of evidence, noted inconclusive support for implementation of an IDF protocol. In contrast, each of
the quality improvement studies, individually representing a lower tier of evidence, but greater study quality and greater in number of studies, touted many positive results associated with IDF protocols. The randomized controlled trial, although representing the strongest level of evidence available, experienced contamination of the study group protocols, causing potentially invalidated positive findings.

**Rationale**

**Theoretical/Conceptual Framework**

First developed in 1974, the PRECEDE-PROCEED model as depicted in Appendix B (Figure 1) is a well-known structure utilized within the fields of health education and health promotion. The PRECEDE-PROCEED framework assists practitioners to plan, design, and implement health interventions at a community level (Glanz et al., 2008). The first step, PRECEDE, involves assessing the practice setting to determine needs or gaps, and matching appropriate interventions to encourage desired changes. The next step, PROCEED, involves identifying the desired outcomes through evaluation of the intervention.

The utility of the PRECEDE-PROCEED model relies on the Theory of Reasoned Action/Planned Behavior which is depicted in Appendix B (Figure 2). The Theory of Reasoned Action/Planned Behavior suggests that a person’s intention to perform a behavior is predicted by a person’s attitudes toward the behavior and the subjective norms surrounding the behavior (Glanz et al., 2008). The educational intervention highlighted in this project seeks to increase nurses’ knowledge and foster positive perceptions of the IDF model via presentation of existing evidence supporting the desired practice change, thereby enhancing one’s likelihood of performing the task and changing behavior. A comparison of the attitudes, knowledge, and skills among clinical staff before and after the intervention through surveys, as well as observation of
the IDF approach in practice will serve to measure the effectiveness of the educational intervention.

Methods

Context and Stakeholders

There are several stakeholders involved in this project and instrumental to the project’s success. These entities include the organization’s leadership team at the executive level (e.g. chief executive officer [CEO], chief medical officer [CMO], chief nursing officer [CNO], chief financial officer [CFO]) whose support is necessary to implement and fund the project. Other vital stakeholders are the members of unit-based leadership (e.g. nurse manager, clinical nurse specialist, nurse educator, charge nurses) whose leadership styles and enthusiasm for the project will shape the atmosphere that which the project is introduced. While clinical nurses are the target population of the educational intervention, other members of the care team (e.g. physicians, residents, nurses, technicians, occupational therapists, physical therapists) play a play a vital role in the larger acceptance of practice change. Technological support staff (e.g. information technology staff) may rank lower than the aforementioned parties in interest levels, however, their support and back-end contributions are valuable for data organization, aggregation, and analysis. Other pertinent stakeholders include patients whose health outcomes may be affected by the practice change, as well as families of the patients who are invested in the wellbeing of their infants. As such, it is important to engage all these stakeholders and involve them in communications of the project plan, established research, and anticipated outcomes to enlist their support for the project.

Intervention
The educational intervention in the form of an educational presentation was given during a mandatory staff skills day training wherein peer-reviewed literature was presented on the merits of IDF model in comparison to the volume-based model, as well as the outcomes of institutions already with IDF models in place. A baseline knowledge assessment was conducted. Immediately following the educational intervention, participants completed another knowledge assessment. In order to assess for retainment of the educational intervention, participants again completed the assessment immediately following the educational intervention. Pre- and post-assessment responses were measured. Respondents’ surveys were be anonymized to protect participant confidentiality. Assessments both before and after the intervention measured uptake in knowledge and level of comfort with the IDF will helped to guide implementation of the IDF model as the new practice change on the NICU unit.

**Gap Analysis**

A tabulated gap analysis can be found in Appendix C. The current practice among the majority of NICUs across the United States is a volume-driven feeding approach. This method of feeding gives an amount of volume that is dictated by the patient’s age or weight either by forced bottle-feedings or gavage. This approach has gained criticism for its lack of regard for the infant’s individual physiologic and developmental maturity. The result of this oversight is unsafe feeding practices for neonates resulting in physical exhaustion for the neonate, occurrences of bradycardia and desaturations, excessive calories expended during the feed, and overall a poor feeding experience (Fry et al., 2018).

The proposed future state is an IDF approach. The IDF model is one that is comprised of continuous assessment of infant cues both before and during the feed. Cues indicating readiness to orally feed include bringing hands to the mouth, rooting, and sucking on fingers or a pacifier
(Fry et al., 2018). During the feed, caregivers observe the infant’s coordination, suck pattern, swallowing ability, vital signs, and energy level during the feed. When the infant demonstrates signs of distress or fatigue manifested through oxygen desaturations, bradycardia, disorganized sucking, drowsiness or disengagement, the oral feed is ended and the remainder of the feed is given by gavage. Therefore, IDF focuses on the experience of feeding, rather than volume alone.

The primary gap identified between the current state and the future state is an individualized patient-centered approach to feeding that is tailored to an infant’s developmental cues and continuously assessed throughout the feeding for safety and experience of feeding. The intervention sought to develop, implement, and evaluate an infant cue-based feeding educational intervention for clinical staff as a transitional approach into IDF. The intervention took the form of an educational presentation which provided the audience with evidence-based research on the merits of IDF in comparison to the status quo. Pre-and post-intervention surveys were administered to measure changes in attitude, knowledge, and skills during this same timeframe to evaluate effectiveness of the intervention.

**Gantt Chart**

A Gantt chart is displayed in Appendix D which details the timeline for the project’s planning, execution, and evaluation phases. The project timeline began by identifying a gap in current practice. A literature review was conducted and results of the review were used to inform the intervention. A formal project plan or project charter was created and presented to stakeholders. Once obtaining approval and necessary funding from the organization, initial surveys were designed and executed to help tailor the material presented in the intervention. Following the intervention, a post-intervention survey took place to assess immediate changes in knowledge, skills, and attitudes from the initial survey. Finally once surveys were received, data
was entered into Excel and analysis of this data can be conducted. Outcomes of the analysis were written into an evaluation for presentation at a final meeting with unit and organization leaders.

**Work Breakdown Structure (WBS)**

The WBS is a project management tool that provides a framework for organizing the scope of work that a project entails. Thus, it ensures that all the tactical activities necessary for the project completion are identified (Swiatek et al., 2016). Using this tool, one can devise the IDF project into four major activities: (1) funding and approvals, (2) planning and logistics, (3) execution, and (4) data analysis and evaluation. A diagram of this WBS can be found in Appendix E. Each of these major tasks cascade into smaller work packages that can then be assigned to an owner or team who is accountable for the timely completion of the specific task.

As with all projects, funding and approvals must first be secured to ensure support for the project at the institutional level and unit level. A project charter was drafted detailing the entirety of the project – the need for the project, objectives, scope, stakeholders, risks and benefits, and budget. The finalized charter was presented to organization leaders to gain approval of the project as well as the necessary support and funding for the project. Simultaneous with this initial and principle task, the project manager or team conducted a literature review, read and analyzed the current body of knowledge, and organized the findings into a tabulated review. This literature review assisted the project team in exploring the project topic and informing the chartered project plan through a scientific and evidence-guided basis. Once permissions were obtained from organizational leadership, meetings were scheduled with the unit educator to keep in communication with the project timeline. Once a Gantt chart was made to timeline the project, a date, time, and location of the in-service was solidified.
In keeping with the PRECEDE-PROCEED framework, execution of the project began with a walking survey of the unit to observe feeding practices of the unit, which allowed for a better tailored educational presentation. The presentation was designed to address deficiencies in current feeding practices based on pre-intervention survey responses and highlight potential benefits of an IDF model as informed by the literature review. Immediately following the presentation, a survey was be administered to assess uptake of the educational material. In an ideal setting, walking surveys would happen continuously and indefinitely as the budget allows to ensure sustained practice change and address practice regression.

Finally, data analysis was performed evaluating the effectiveness of the educational intervention. The results of the pre- and post-surveys were be entered into an Excel spreadsheet and compared to measure the outcomes of the presentation. These findings were written into a discussion format for interested stakeholders or other parties within or outside of the organization.

**Responsibility/Communication Plan**

Several meetings were required to ensure progress towards the goals of this project. An initial stakeholder meeting took place to solicit support and funding for the project from organization leadership. At this meeting, the project plan proposal was presented detailing the aims of the project, conveying the necessity of the project based on existing literature, and providing anticipated expenses and return on investment. Clinical staff meetings took place on two occasions in order to administer the surveys as well as execute the intervention. Lastly, meetings with unit leadership allowed for intermittent check-ins to monitor the project’s progress and final project evaluation. A communication matrix is included in Appendix H.

**Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis**
The SWOT analysis is a strategic tool used by project managers to systematically explore ideas about business development or improvement projects (Blayney, 2008). The tool assesses the strengths, weaknesses, opportunities, and threats that a business idea may present. Appendix F showcases a SWOT matrix identifying the benefits and challenges, both internally and externally, of the IDF quality improvement project.

There are several strengths that this project offers to the institution. In the spirit of improving healthcare systems and processes, published quality improvement projects have suggested positive patient outcomes associated with the IDF approach. Many of these benefits are revealed through the literature and include a lower cost to the institution, shorter patient length of stay, greater caregiver satisfaction, and increased parental involvement with care (Fry et al., 2018). Additionally, no further equipment or technology is necessary to implement such a practice change.

The weaknesses of this project must also be considered. As with all practice change projects, implementation of a new feeding model is likely to cause a disruption in the unit culture and current workflows. Financial and human resources were deployed and the environment continuously reassessed in order to actively coach staff, measure patient outcomes, and monitor for acceptance or regression of the practice change among staff to ensure sustainability of the change. As the practice change is unit wide across multiple disciplines, the project team ensured that leaders from all disciplines (e.g. medical staff, nursing staff, therapy staff) are onboard with the practice change.

IDF is based on the principle of innovation and individualized care; integration of this feeding model aligned with the organization’s valuation of patient-centered care. As the literature has also revealed, reading an infant’s feeding cues involves recognizing bradycardic
events and desaturations, both of which increase patient safety. Results from literature have also demonstrated increased staff satisfaction.

The largest threat to the project was lack of financial support for the practice change as educational offering would impact the ability to implement this project. In assessing the strengths, weaknesses, opportunities, and threats of implementing the IDF approach, a thorough understanding of internal and external factors allows project planners and stakeholders to weigh risks and benefits associated with this project.

**Budget**

The project expenses included the cost of a project manager, materials required to conduct the project, and staff wages. The estimated cost of a project manager was $80,000 which will be a salaried temporary position with an expected employment duration of ten months. The role of the project manager entailed facilitation of the stakeholder meeting, project planning, execution of the project, and evaluation of the project. Materials and office supplies (e.g. paper, toner, pens, etc…) will be needed. These expenses were expected to cost approximately $50. Other miscellaneous materials/supplies/services [e.g. internet, SPSS, Excel, etc…] provided by the organization were considered negligible. Attendance to meetings and trainings by staff was another expense to be anticipated. The cost for an hour-long stakeholder meeting should be budgeted at $1,500 for ten members. Wages paid to hourly staff was estimated to cost $100 per hour. These wages were allocated for survey time, the educational intervention time, and a staff member hired as a temporary observer/coach for the study duration. These expenses were expected to incur $18,980. In sum, the proposed budget total cost is approximately $99,030. A return on investment was expected in the form of shorter length of stay, fewer health complications, fewer readmissions, positive patient outcomes, and increased staff satisfaction as
demonstrated in the literature (Fry et al., 2018; Shaker, 2013). A tabulation of anticipated expenses associated with the IDF project can be found in Appendix G.

**Return on Investment (ROI)**

The business case for integrating IDF into the NICU also represents a potential area for significant ROI. The proportion of low-birth-weight infants has been growing over the last two decades in the United States due to advances in artificial reproductive technologies. Ten billion dollars were spent on neonatal care in 2003; more than half of that amount was spent on the 12.3% of infants born preterm (less than 37 weeks’ gestation). Many preterm and low birthweight infants experience many health challenges including developmental disabilities, chronic respiratory problems, vision and hearing impairments, and increased rates of rehospitalization and acute care visits during the first year of life. Although limited studies have been conducted in this realm, one study showed that small increases in birth weight can result in substantial costs savings to families and the organization: “for all infants weighing more than 750 g, an increase of 250 g in birthweight generated a savings of $12,000 to 16,000 In the first year, and an increase of 500 g in birthweight saved $28,000” (Cuevas et al., 2005, p. 2). Thus, integrating the IDF model is not only safe and efficacious approach to feeding, it has demonstrated increased weight gain among neonates, decreased length of stay, and decreased readmission rates all of which will result in significant cost savings to the organization.

**Outcome Measures**

The proposed education intervention seeks increase nurses’ knowledge and foster positive perceptions about the IDF approach. The presentation summarized existing evidence supporting the desired practice change, thereby enhancing one’s likelihood of performing the task and changing behavior. In keeping with the PRECEDE-PROCEED framework, execution of
the project began with a walking survey of the unit to observe feeding practices of the unit, which allowed for a better tailored in-service presentation. A baseline knowledge assessment was conducted in advance of the intervention to tailor the intervention to deficiencies in knowledge and skills. The educational presentation was created to address deficiencies in current feeding practices on the unit and highlight potential benefits of an IDF model as informed by the literature review. Following the educational intervention, participants completed another knowledge assessment to allow for comparison the attitudes, knowledge, and skills immediately after the intervention. Comparison of assessments before and after the intervention assessed the effectiveness of the educational intervention. In an ideal setting, walking surveys would continue after the in-service to evaluate the on-the-ground observation of practice change and support sustained practice change as the budget allows.

**Analysis**

This educational intervention was a quality improvement project that took place via staff meetings over the project duration of six months. Staff were asked to complete both pre- and post-intervention anonymous surveys on paper. Data gathered through the surveys included both Likert-scale and short answer style questions assessing familiarity, knowledge, comfort with the IDF approach. Respondents also indicated years of clinical RN experience. Collected data were organized in an Excel spreadsheet for analysis of descriptive statistics and trending of Likert-scale selections.

**Ethical and Policy Considerations**

This quality improvement project was focused on implementing evidence-based education to improve the process and delivery of care to neonates. As such, there was no hypothesis or untested method being trialed therefore disqualifying it as human subjects research
and was exempted from the formal Institutional Review Board (IRB) review process. This process of formal IRB exemption is made through a Statement of Determination by a University advisor and Chair through review of the quality improvement project design that does not entail patient data nor qualify as research (Appendix M). Patient privacy and HIPAA standards are both maintained and implied. The anonymity of surveys ensured confidentiality of staff responses. Inherent in that attribute of the project is American Nurses Association Ethical Standards Provision 3.1 which holds that nurses must protect the rights of patient privacy and confidentiality (ANA, 2015).

Furthermore, this project is in congruence with other ethical principles described within the American Nurses Association Code of Ethics (2015) which is evidenced by dissemination of evidence-based research through professional nursing care avenues as well as the promotion of interdisciplinary collaboration to reduce health disparities within a framework of both patient- and family-centered care especially among vulnerable populations such as premature infants. In the same way of protecting patient and staff confidentiality does it uphold the Jesuit values of the University of San Francisco (USF) by upholding a “culture of service that respects and promotes the dignity of every person” (University of San Francisco, 2021) and cura personalis – care for “whole” person – which embodies all aspects of health: intellectual, physical, and spiritual. Additionally, this project reflects magis or the principle of doing good in the world for the purpose of making the world a better place for the glory of God, which is a direct reflection of helping vulnerable mothers and infants (University of San Francisco, 2021).

However, the ethical principles reflected within this project extend far beyond the microcosmic Jesuit values of USF and the mesocosmic philosophies of the ANA; it speaks to many values within healthcare as a system and human morality. At its core, this project
highlights a moral obligation to favor the well-being of vulnerable neonates and their families, avoid harms caused by poor feeding practices, empower parents to be active with neonatal care, minimize neonatal health disparities, and upholds a duty to improve health through education. The aforementioned are but a few of the exemplifications the deontological ethical principles of beneficence, non-maleficence, autonomy, justice, veracity, and fidelity woven within this project.

**Results**

A paper pre-intervention survey using a mix of 5-point Likert response scale and several short answer questions was administered to registered nurses at the facility. With the support of the unit educator an electronically delivered in-service was provided to willing and available staff via a 20-minute digital educational presentation. Following the educational intervention (Appendix I), nurses completed a paper post-intervention survey (Appendix J) consisting of the same questions as the pre-intervention survey. The pre-intervention survey results were compared to the post-intervention results are shown in Appendix K and Appendix L respectively demonstrating the mean response for the 16 Likert-scale items (Q1, Q6 – Q21). Q1 asked “How familiar are you with IDF?” and responses increased from 4.3 to 4.5 after the intervention which achieves one major objective of the project.

In general the pre- and post-intervention survey results were comparable demonstrating a <0.75 point deviation between intervals. However, it was interesting to note that the post-intervention respondents favored neutrality as evidenced by responses closer to “3”. For some of the survey questions, comparisons showed an unexpected regression from pre-survey results. For example, Q13 stated “IDF increases parental involvement” which is a true statement based on the referenced evidence and was highlighted in the presentation. However the survey change
from 4.1 (pre) to 3.67 (post) could be gleaned as a lack of content understanding or small sample size.

The purpose of short answer style-questions (Q3-5, Q24-25) was to validate Likert-scale self-reported items. Participants on both pre- and post-surveys were able to adequately list indications of readiness to feed orally. Samples of these responses included present rooting reflex, alertness with feeds, and sucking on a pacifier. Participants were also able to list signs of infant fatigue during feeding such as oxygen desaturations, hands up in a “stop sign” position, dribbling, and falling asleep.

Discussion

Limitations

Due to internal challenges on the unit, it is notable that the pre-intervention survey had 31 participants whereas the post-intervention survey only had 6 participants alluding to limitations based on small sample size. Participants were also voluntary and based on convenience, and furthermore, some pre-intervention surveys were incomplete (no marks for some question items). This could have been attributed to the participant’s misunderstanding of the question, belief that the question was not applicable to the department, or low motivation to complete the survey. The forward looking step of this project should integrate an IDF coach would be present on the unit to observe and assess the hands-on practice of IDF (rather than relying on self-report alone) which would both support the acquisition of technical skills and as well as foster practice change sustainability.

In the broader picture, there are several limitations to the success of this project. As with all practice changes, resistance or willingness of staff to adopt the practice change was be one major determinant of success. An attempt to measure readiness for practice change was included
in this project. This risk can be minimized by enthusiasm by leadership, involvement of clinical staff to voice concerns and suggestions, open communication throughout duration of the project, and active coaching to ensure that clinical staff feel supported and motivated. Similarly, clinical staff may have perceived biases about the practice change which may skew staff survey responses. Designing a high quality, engaging, evidence-based intervention combined with supportive coaching helped to mitigate these risks. Resource limitations such as time and funding are another threat to the project’s effectiveness. This risk could be minimized through buy-in with organizational leadership highlighting anticipated outcomes and return on investment. All the aforementioned challenges may result in regression to the status quo or resistance, so employing the strategies mentioned above helped to ensure long-term sustainability of the practice change.

Conclusion

The shift towards a more patient-centered model of neonatal feeding is gaining interest and momentum within the neonatal care community. The current body of knowledge suggests that IDF is a safe, efficacious, and patient-centered approach to neonatal feeding that promises superior outcomes to the traditional volume-based model. The majority of the studies highlighted in this literature review observed positive outcomes associated with implementation of the IDF model, an approach that is based on recognition of developmental maturity and readiness to orally feed. The literature surrounding IDF has found associations with positive outcomes such as time to attainment of oral feeding ability, weight gain, parental involvement, staff satisfaction, length of stay, readmission after discharge, and cost savings to the institution and family. This project demonstrated one approach to implementing an IDF model onto a neonatal intensive care unit setting. Interventions aimed at integrating infant-driven strategy to feeding in NICUs are an
evidence-based practice change that will serve to promote feeding competency and, ultimately, the health and well-being of neonates.
References


https://doi.org/10.1097/anc.0000000000000577


## Appendix A

### Literature Matrix

<table>
<thead>
<tr>
<th>Article</th>
<th>Purpose of Article or Review</th>
<th>Design/Method</th>
<th>Sample/Setting</th>
<th>Major Variables Studied (and their Definitions)</th>
<th>Measurement of Major Variables</th>
<th>Data Analysis</th>
<th>Study Findings</th>
<th>Level of Evidence (Critical Appraisal Score)/ Strengths and Weaknesses/ Conclusion(s)/ Recommendation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrupcala et al. (2015)</td>
<td>To increase the number of neonates who were fed according to cues prior to discharge and potentially decrease length of stay</td>
<td>Continuous quality improvement project</td>
<td>Surgical and nonsurgical neonates of all gestational ages at a level IV, 85-bed NICU in Philadelphia</td>
<td>Independent variable Staff education in the form of a 2-day, 16-hour course, monthly team meetings, reeducation of staff throughout duration of project, patient-family education.</td>
<td>Retrospective review of medical records. Separation of data into two time periods: pre-implementation, and post-implementation.</td>
<td>Data included: patient name, date of birth, date of admission, date of discharge, gestational age, primary diagnosis, date of first oral feeding, corrected age at time of first oral feeding, the feeding cues demonstrated, and total LOS.</td>
<td>Baseline data were collected on 20 neonates with a mean gestational age of 36 0/7th weeks and a mean total length of stay of 43 days. Postimplementation data was collected on n=150 neonates: mean gestational age of 36 1/7 weeks and mean total length of stay of 36.4 days. The quality improvement project observed a mean total length of stay decrease by 6.63 days.</td>
<td>Level of Evidence Strengths and Weaknesses/ Conclusion(s)/ Recommendation(s)</td>
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<td>Level of Evidence: Level V and moderate quality</td>
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<td>Strengths: Background included a thorough literature review. Inclusion of a diverse and medically complex patient population not previously studied.</td>
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<td>Limitations: Baseline data using n=20 neonates is a small sample size on which to compare outcome data. QI study design does not allow for analysis of the effect of confounders. Single NICU in one hospital.</td>
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<td>Conclusions: Premature infants fed according to cues can become successful</td>
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to full oral feedings

performed to determine: gestational age, length of stay, and exclusivity of oral feedings. Pre- and post-implementation data were compared.

oral feeders and can be safely discharged home regardless of gestational age or diagnosis.
<table>
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<tr>
<th>Article</th>
<th>Purpose of Article or Review</th>
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<tbody>
<tr>
<td>Davidson et al. (2013)</td>
<td>To evaluate the effectiveness and safety of experimental cue-based versus health care provider-driven feeding strategies in infants with bronchopulmonary dysplasia</td>
<td>Quality improvement study with a retrospective case-controlled design</td>
<td>28-bed level III NICU</td>
<td><strong>Independent variable</strong> Implementati on of a cue-based feeding protocol consisting of staff training  <strong>Dependent variable</strong> Number of days from first to full oral feedings, total weight gain, and average weight velocity.</td>
<td>Retrospective review of medical records of preterm infant admits</td>
<td>Parametric and non-parametric tests: Cohen effect sizes Power analysis and one-tailed independent t tests Chi-squared analyses Pearson correlation Mann-Whitney U Spearman correlation</td>
<td>Clinical outcomes of infants with varying severity levels of bronchopulmonary dysplasia were compared between the cue-based group and the baseline group. The duration to achieve full oral feedings was significantly shorter in the cue-based group at all levels of bronchopulmonary dysplasia severity. Infants with mild bronchopulmonary dysplasia required 12 fewer days than infants in the control group. Infants with moderate bronchopulmonary dysplasia required 10 fewer days. Infants with severe</td>
<td>Level V and high quality  <strong>Strengths</strong> Thorough literature review including appraisal of research, noting gaps in neonatal populations previously excluded from cue-based feeding studies Thoughtful review of threats to internal and external validity  <strong>Limitations</strong> QI study design does not allow for analysis of the effect of confounders. Single NICU in one hospital.  <strong>Conclusions</strong> Cue-based fed infants required significantly fewer days to achieve full oral feedings regardless of severity of bronchopulmonary dysplasia. The cue-based feeding group infants observed shorter lengths of stay.</td>
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<td>Bronchopulmonary dysplasia required 9 fewer days.</td>
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<td>Average weight velocity was 3 g/kg/day higher for the cue-based infants with moderate bronchopulmonary dysplasia compared with the control group. Weight velocity did not differ by feeding method for infants with mild or severe bronchopulmonary dysplasia.</td>
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<td>Cue-based feeding protocol was safe for preterm infants with bronchopulmonary dysplasia as supported by average weight velocity was comparable to the baseline group.</td>
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<td>Fry et al. (2018)</td>
<td>To review and synthesize the findings of quality improvement initiatives related to the use of a cue-based feeding model among preterm infant populations.</td>
<td>Systematic review of quality improvement studies</td>
<td>CINAHL and PubMed peer-reviewed articles published in the English language between 2000 and 2017 related to cue-based feeding of preterm infants in the NICU setting</td>
<td><strong>Independent variable</strong>&lt;br&gt;Titles included any form of the term feeding combined with any of the following: bottle, breast, cue-based, demand, infant, neonate, newborn, oral, or responsive.&lt;br&gt;&lt;br&gt;<strong>Dependent variable</strong>&lt;br&gt;7 studies in total, synthesizing the findings of the articles: hospital</td>
<td>Quality Improvement Minimum Quality Criteria Set (QI-MQCS) framework&lt;br&gt;Tabulated findings included: descriptions of participants, numbers of participants, infant weight gain (mean and standard deviation), NICU length of stay (mean and standard deviation), attainment of full oral feedings</td>
<td>Reviewed studies varied in approach and breadth: five studies utilized multidisciplinary stakeholder teams to assess their NICU environments and facilitate project completion. Two studies utilized feeding “champions”. One study used a Plan–Do–Study–Act approach emphasizing process over outcome. In</td>
<td>Weight gain, time to full oral feedings, and hospital length of stay may be improved with the use of cue-based feeding.</td>
<td>Level of Evidence Level III and moderate quality Implications Results of quality improvement projects reviewed in this article indicate that weight gain, time to full oral feedings, and hospital length of stay may be improved with the use of cue-based feeding.</td>
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</table>
LOS, infant weight gain, and attainment of full oral feedings, infant weight gain, inclusion of parents,

(p value of t tests), and comments of interest.
six studies, researchers measured hospital length of stay, which decreased in five intervention groups. Three studies measured infant weight gain, which increased in two intervention groups. Two studies monitored weight gain velocity.
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<tr>
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<tr>
<td>Gelfter et al. (2015)</td>
<td>To implement an IDF model and to assess its effects on infants born at ≥30 weeks gestation.</td>
<td>Quality improvement project</td>
<td>Level II NICU in Houston, Texas inclusive of all healthy premature infants born at &gt; 30 weeks’ gestation</td>
<td><strong>Independent variable</strong> Implementati on of an IDF model, educational training for the nurses and parents, a chart audit tool, and practice guidelines.  <strong>Dependent variable</strong> Post-conceptual age at initiation of oral feedings, at ad libitum, and at discharge.</td>
<td>Retrospective review of n= 64 medical records pre-intervention and n=60 medical records post-intervention. Separation of data into two time periods: pre- and post-intervention.</td>
<td>Descriptive statistics performed on before- and after-implementation data using t tests; 95% confidence intervals for difference.</td>
<td>Infants in the IDF group achieved full oral independent feedings earlier (35.0 ± 1.1 vs. 35.6 ± 1.1 weeks’ post-conceptual age, p = 0.008) compared to pre-intervention data without compromising weight gain.</td>
<td>Level of Evidence Level V and high quality  <strong>Limitations</strong> QI study design does not allow for analysis of the effect of confounders. Single NICU in one hospital. <strong>Conclusions</strong> The clinical protocol was developed based on research evidence suggesting that premature infants start developing oral feeding skills as early as 32 weeks’ gestation. The research also demonstrated that early introduction of oral feedings may accelerate the transition from tube to full oral feeding.</td>
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<td>Article</td>
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<td>Morag et al. (2019)</td>
<td>To evaluate the effect of parental guided responsive feeding on the transition from nasogastric feeding to oral feeding</td>
<td>Randomized control trial</td>
<td>N=67 infants &lt;32 weeks of gestation (parental guided responsive feeding n=32, traditional feeding n=35) at the NICU of the Chaim Sheba Medical Center in Israel</td>
<td>Independent variable Parental guided responsive feeding intervention performed by parents and guided by the infants’ behavioral cues of hunger and satiety. The control group was traditionally fed per pre-planned volumes of intake and at given scheduled intervals.</td>
<td>Retrospective review of medical records</td>
<td>Data were analyzed using SPSS. Parental guided responsive feeding and traditionally fed infants were compared by independent sample t test Or Mann Whitney test for continuous variables, or chi-square tests for categorical variables. Multivariate analysis with Bonferroni correction to calculate the level of evidence.</td>
<td>Parental guided responsive feeding infants reached full oral feeding within less days, at an earlier age, returned to baseline weight gain at 35 weeks, were discharged earlier, were more likely to be fed by their parents, and experienced less apnea/ bradycardia events at 34 weeks compared to the traditionally fed infants. All findings were statistically significant.</td>
<td>Level of Evidence Level I and low quality</td>
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**Strengths**
Participants were randomization to the parental guided responsive feeding and traditional feeding groups. The participants and medical team were not blinded for the study arm assignment, however, they were blinded to outcome measures.

**Limitations**
Relatively small sample sizes in both parental guided responsive feeding and traditional feeding groups. Study conducted at one NICU outside of the United States.

**Conclusions**
Parental guided responsive feeding was observed to be a safe and effective model of feeding associated with short-term advantages, higher...
<table>
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<tr>
<th>Dependent variable</th>
<th>Number of days needed to achieve full oral feeding</th>
<th>Outcome measures using repeated measure analysis with interaction effect</th>
<th>Parental engagement, and earlier discharge</th>
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<tr>
<td>Settle et al. (2019)</td>
<td>To identify and summarize the existing evidence on the use of the IDF method at initiation of oral feeds, time to attainment of independent oral feedings, and length of stay in the newborn intensive care unit or level II nursery for preterm infants.</td>
<td>Literature review</td>
<td>Four databases including CINAHL, Medline/ PubMed, Ovid Nursing, and Embase. Inclusion criteria included only research articles written in English within the past 10 years (2008-2018)</td>
<td><strong>Independent variable</strong> Keywords searched: “infant guided feedings,” “infant-driven feeding,” “cue-based feeding,” and “co regulated feeding.”</td>
<td>Data collected included: numbers of participants among each study, NICU length of stay, attainment of full oral feedings, and other comments of interest.</td>
<td>Tabulated comparison and synthesis of 3 quality improvement projects with regard to design, protocol, results, and other comments/ limitations.</td>
<td>No randomized control trials, quasi-experimental, or retrospective studies were found utilizing the IDF model. There were 3 quality improvement projects utilizing the IDF model. The findings were inconclusive: one project found the IDF model favorable in the achievement of full oral feedings, whereas two projects found the IDF model favorable for reducing length of stay. One project did not find differences in initiation, achievement of oral feedings, or length of stay.</td>
<td>Level of Evidence Level III of moderate quality</td>
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<td><strong>Dependent variable</strong> 32 articles were reviewed to identify experimental, quasi-experimental, or retrospective design to assess the</td>
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<td>Limitations No framework or tool used to standardize appraisal of the literature.</td>
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<td>Conclusions There is scant evidence to support the use of the IDF model. Existing literature is limited to quality improvement projects.</td>
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<td>Research is needed to empirically validate the IDF model and to inform practice related to the initiation and advancement of oral feeding for infants in the NICU.</td>
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<td>evidence related to cue-based feeding.</td>
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| Swant & Fairchild (2014) | To systematically review the available literature related to a “cue-based” feeding approach for initiating and advancing oral feedings in premature infants. | Systematic review of literature                    | Cochrane Database of Systematic Reviews, CINAHL, MEDLINE, and PubMed | **Independent variable**  
Keywords searched: cue based feeding, demand feeding, oral feeding, feeding cues, feeding readiness, and infant.  
**Dependent variable**  
One systematic review of eight randomized controlled trials, and three quality improvement project | Length of stay, weight gain, and caregiver satisfaction | Discussed comparison and synthesis of search yield with regard to design, protocol, results, and other comments/limitations. | Insufficient evidence to support the implementation of a specific cue-based feeding protocol based on improving weight gain or shortening length of stay. However, there are numerous projects that have been demonstrated on to display improvement in caregiver and staff satisfaction and provided a means for standardized evaluation of infant feedings. | Level of Evidence  
Level III of moderate quality  
Limitations  
Does not employ a standardized framework to appraise the literature reviewed  
Conclusions  
The studies reviewed in this article demonstrated that best practice entails individualization of care and consideration of the infant experience during feeding interventions to promote the successful development and attainment of full oral feedings. However, not enough data is available to support implementation of a specific algorithm for cue-based feeding. |
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</table>
| Thomas et al. (2021) | To implement a cue-based feeding program for pre-term infants | Quality improvement project | A level III 51-bed NICU in a quaternary hospital in the Northeastern U.S. | **Independent variable** Practice change Staff education and training in the form of a paid 4-hour web-based interactive self-learning module.  
**Dependent variable** Time to achieve full oral feedings, length of stay, and parental involvement in the feeding process | Retrospective review of n=215 medical records of preterm infant admits (GA 23 0/7 weeks up to 31 6/7 weeks) to the NICU from September 2014 to September 2017.  
Separation of data into three time periods: pre-implementation baseline (September 2014 through Sept 2015), first year post-implementation baseline (September 2015 through Sept 2016), and second year post-implementation baseline (September 2016 through Sept 2017). | Data included: gestational age at birth, first oral feeding date, first oral feeding volume, last tube feeding date, person feeding the first oral feeding, birth weight, discharge weight, and LOS.  
Descriptive statistics performed to determine: mean number of days to attainment of in infants 23 0/7 weeks – 27 6/7 weeks gestation: time to achieve full oral feedings decreased by 7 days, length of stay decreased by 4.4 days, and parents’ involvement in the feeding process increased by 80% from before to after implementation.  
In infants 28 0/7 weeks – 31 6/7 weeks gestation: time to achieve full oral feedings decreased by 6.6 days, length of stay decreased by 2.7 days, and parents’ involvement in the feeding process increased by 49% | In infants 23 0/7 weeks – 27 6/7 weeks gestation: time to achieve full oral feedings decreased by 7 days, length of stay decreased by 4.4 days, and parents’ involvement in the feeding process increased by 80% from before to after implementation.  
In infants 28 0/7 weeks – 31 6/7 weeks gestation: time to achieve full oral feedings decreased by 6.6 days, length of stay decreased by 2.7 days, and parents’ involvement in the feeding process increased by 49% | Level of Evidence Level V and high quality  
Strengths Thorough literature review including appraisal of research to inform intervention  
Appropriate choice to analyze intervention periods and gestational age separately  
Limitations QI study design does not allow for analysis of the effect of confounders.  
Single NICU in one hospital.  
Conclusions Cue-based feeding decreased time to achieve full oral feedings, decreased length of stay, increased parental involvement in the feeding process, and resulted in cost savings for the institution. |
<p>| feeding process | implementation (October 2015 through September 2016), and second year post-implementation (October 2016 through September 2017). Separation of data for extremely preterm (232 0/7 to 27 6/7 weeks) and very preterm (28 0/7 to 31 6/7 weeks) infants to help distinguish outcomes. | full oral feeding, mean length of stay, and percentage of parents’ involvement. | from before to after implementation. Organization saved $103,950 per year by decreasing LOS |</p>
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<tr>
<td>Wellington &amp; Perlman (2015)</td>
<td>To determine whether using infant feeding cues would shorten the time to full nipple feeds and lead to earlier discharge</td>
<td>Quality improvement project</td>
<td>NICU at New York Presbyterian Hospital</td>
<td>Independent variable Implementati on of an IDF protocol and staff training</td>
<td>Dependent variable Time to full nipple feeds and time to discharge</td>
<td>Retrospective chart review of n=153 in the practitioner-driven feeding model group and n=101 in the IDF model group</td>
<td>Separation of study population into three subgroups: &lt;28 weeks gestational age, 28–31 6/7 weeks gestational age, and 32–33 6/7 weeks gestational age. Separation of study duration</td>
<td>The premenstrual age at attainment of full nipple feeds and at discharge was significantly lower in the IDF group than physician-driven feeding group. Infants &lt;28 weeks gestational age in the IDF versus physician-driven feeding group reached full nipple feeds 17 days sooner and were discharged 9 days earlier. Infants 28–31 6/7 weeks gestational age reached full nipple feeds 11 days sooner and were discharged 9 days earlier in the IDF versus physician-driven feeding group.</td>
</tr>
</tbody>
</table>
into three periods: baseline (September 2010–December 2011), development and phasing in (July 2012–May 2013), and implementation (June 2013–May 2014). used to correct for potential confounders. Infants 32–33 6/7 weeks gestational age reached full nipple feeds 3 days sooner and were discharged 3 days earlier in the IDF versus physician-driven feeding group.
Appendix B

Conceptual and Theoretical Frameworks

Figure 1: The PRECEDE-PROCEED Model

Note. A diagram of the PRECEDE-PROCEED Model from Porter (2016).

Figure 2. The Theory of Reasoned Action/Planned Behavior

### Appendix C

#### Gap Analysis

<table>
<thead>
<tr>
<th>Current State</th>
<th>Future State</th>
<th>Gap</th>
<th>Actions to Close Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap Analysis</td>
<td>Volume-driven feeding model</td>
<td>IDF model</td>
<td>Develop, implement, and evaluate an infant cue-based feeding educational intervention for clinical staff as a transitional approach into IDF.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>An individualized patient-centered approach to feeding that is tailored to an infant’s developmental cues and continuously assessed throughout the feeding for safety and experience of feeding</td>
<td>The intervention will take the form of a presentation providing evidence-based research on the merits of IDF in comparison to the status quo.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>A discussion after the presentation will allow for enhanced learning and address any outstanding questions to promote the practice change.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Pre- and post-intervention surveys will be administered to measure changes in attitude, knowledge, and skills during this same timeframe to evaluate effectiveness of the intervention.</td>
</tr>
</tbody>
</table>

*Note.* The gap analysis displays the current state of practice surrounding neonatal feeding practices, the future intended state, the gaps present, and actions to close the gap provided by the project.
Appendix D

Gantt Chart

<table>
<thead>
<tr>
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</table>

Note. This Gantt chart displays a timeline of activities for the IDF project through the planning, execution, and analysis phases.
Appendix E

Work Breakdown Structure (WBS) Diagram

Note: This figure displays the work breakdown structure for an IDF educational intervention project.
Appendix F

Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>Lit. demonstrates:</td>
<td>Disruption of current unit culture</td>
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<tr>
<td>Lower cost to institution</td>
<td>May require increased staffing</td>
</tr>
<tr>
<td>Shorter patient length of stay</td>
<td>Acceptance and sustainability of practice change</td>
</tr>
<tr>
<td>Greater caregiver satisfaction</td>
<td>Requires interdisciplinary alignment in practice</td>
</tr>
<tr>
<td>Increased parental involvement w/</td>
<td>change</td>
</tr>
<tr>
<td>care</td>
<td>Requires financial and human resources to train</td>
</tr>
<tr>
<td></td>
<td>staff and implement project</td>
</tr>
<tr>
<td>Focus on quality improvement</td>
<td>Patient and family attitudes about practice change</td>
</tr>
<tr>
<td>No additional technology necessary</td>
<td>IDF is not yet status quo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment with individualized</td>
<td>Lack of financial support for the practice change</td>
</tr>
<tr>
<td>patient-centered care</td>
<td>as educational offering would impact the ability to</td>
</tr>
<tr>
<td></td>
<td>implement</td>
</tr>
<tr>
<td>Positive outcomes for behavioral,</td>
<td></td>
</tr>
<tr>
<td>physical, emotional development</td>
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<tr>
<td>Alignment with evidence-based</td>
<td></td>
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<tr>
<td>practices</td>
<td></td>
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<tr>
<td>Improves patient safety and staff</td>
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<td>satisfaction</td>
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Note: This figure displays the strengths, weaknesses, opportunities and threats for an IDF educational intervention project.
## Appendix G

**Proposed Budget**

<table>
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<tr>
<th>Expense</th>
<th>Itemized Cost</th>
<th>Cost</th>
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<tr>
<td>Project manager</td>
<td>Facilitator of stakeholder meeting</td>
<td>$80,000</td>
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<tr>
<td></td>
<td>Planning</td>
<td>(salaried work to be completed over 8 months)</td>
</tr>
<tr>
<td></td>
<td>Execution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analysis</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Office supplies (paper, toner, pens, etc…)</td>
<td>$50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(other miscellaneous materials/supplies/services [e.g. internet, SPSS, Excel, etc…] provided by organizations considered negligible)</td>
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<tr>
<td>Staff time</td>
<td>Stakeholder meeting (10 members, $150/hour)</td>
<td>$1,500</td>
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<tr>
<td></td>
<td>Staff training (75 staff members, $100/hour)</td>
<td>$3,750</td>
</tr>
<tr>
<td></td>
<td>- 1st survey: 0.5 hours</td>
<td>$7,500</td>
</tr>
<tr>
<td></td>
<td>- Intervention and 2nd survey: 1 hour</td>
<td>$3,750</td>
</tr>
<tr>
<td></td>
<td>- 3rd survey: 0.5 hours</td>
<td>$480</td>
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<td></td>
<td>Check-in meetings with unit leadership (4 hours, $120/hour)</td>
<td>$2000</td>
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<td></td>
<td>Hired staff observer/training coach (20 hours, $100/hour)</td>
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</table>

**Total cost:** $99,030

*Note:* This figure displays the anticipated costs for implementation of the IDF project.
### Appendix H

#### Communication Matrix

<table>
<thead>
<tr>
<th>Communication</th>
<th>Purpose</th>
<th>Medium</th>
<th>Frequency</th>
<th>Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder meeting</td>
<td>Solicit support and funding for the project</td>
<td>In-person</td>
<td>Once</td>
<td>Stakeholders</td>
</tr>
<tr>
<td>Clinical staff meetings</td>
<td>Execute the intervention and use surveys to evaluate outcomes</td>
<td>In-person or through online training system</td>
<td>Three occasions</td>
<td>All clinical staff</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Pre-survey</td>
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<td>- Intervention</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Post-survey</td>
<td></td>
</tr>
<tr>
<td>Check-ins and project evaluation</td>
<td>Touch base with progress of project with unit leadership</td>
<td>In-person or remotely via Microsoft Teams</td>
<td>Monthly</td>
<td>Unit leadership and project manager</td>
</tr>
</tbody>
</table>

*Note.* The communication matrix showcases the types and modes of meetings that will be employed to design, implement, refine and evaluate the IDF project.
Appendix I

Infant-Driven Feeding Educational Presentation

OBJECTIVES
- To understand what infant-driven feeding is
- To highlight the transition from a volume-based model to an infant-driven model
- To describe infant-driven feeding cues at initiation of oral feeding to assess readiness and during the feed to assess quality of feed and determine the end of the feed
- To explain the benefits of an infant-driven feeding model for infants, clinical staff, and parents
- To integrate evidence-based literature into this presentation to promote staff practice and practice sustainability
- To standardize the practice of infant-driven feeding at Kaiser San Francisco

BACKGROUND
- An effective oral feeding pattern must be demonstrated in order to be discharged safely
- Clinical factors in the NICU setting can negatively affect the normal development of a suck-swallow-breath reflex
  - Interruption, nasal or oral feeding tubes, poor oral feeding experiences, etc.
- Successful oral feeding requires maturation of physiologic, neurologic and behavioral systems in order to coordinate a suck-swallow-breath reflex without physical exhaustion or burning excessive calories
- Impacts on parent-infant relationship
  - Feeding experiences in the NICU can impact an infant and family’s relationship with feeding long after discharge
- An infant’s ability to feed well is closely related to the caregiver’s ability to understand and sensitively respond to the infant’s physiology and behavioral communications

VOLUME-DRIVEN TO INFANT-DRIVEN
- Traditionally, nasogastric feeding has been a volume-based approach, one that focuses on the prescribed quantity based on gestational age or weight
  - Criticized for overlooking of the infant’s individual physiologic and developmental maturity
  - Promotes feeding results in poor feeding experiences, risk of aspiration, stress, and physical exhaustion
- Literature has emphasized the need for a more developmentally supportive feeding approach
  - Traditionally, nurses begin oral feeding of infants at 34 weeks gestational age, the time when most babies develop the suck, swallow, breathe reflex
  - Using gestational age as a benchmark does not account for the physical and neurologic development of each individual
- Infant-driven feeding has been the focus of many quality improvement studies in the last two decades and has been implemented in many organizations across the country
WHAT IS INFANT-DRIVEN FEEDING

Infant-driven feeding is a feeding approach based on continuous assessment of care before the feed, during the feed by subjective interpretation and during the feed by subjective interpretation and evaluation.

The aim of an infant-driven approach is to help infants learn to eat. Not to get them to eat or ‘get it all in.’ Safety becomes the primary goal. (Ludwig & Waltzman, 2007).

BENEFITS AN INFANT-DRIVEN APPROACH

- Based on consistent and relevant assessment tools and feeding techniques to support an infant’s individual needs
- Promotes positive oral feeding experiences
- Associated with earlier achievement of full oral feeding, increased weight gain, increased parental involvement and staff satisfaction, shorter length of stay, decreased readmission after discharge, decreased medical costs, and decreased maternal stress
- Places emphasis on individualized, patient-centered, developmentally appropriate care accounting for the infant’s physiologic maturity levels, skills, and capabilities
- Supports organization goals of quality of care, safety, cost-effectiveness, and patient satisfaction

DEVELOPMENTAL TIMELINE

- **12-13 weeks**: Sucking and swallowing abilities
  - Begin assessing oral feeding readiness around 31 weeks.
  - Challenges to feeding success:
    - Physiologic instability
    - Poor endurance
    - Decreased motor tone
    - Oral structures are small, weak, and uncoordinated
    - Inadequate suck-inhalation-breathe pattern
    - Inadequate brain development
  - Attributes for feeding success:
    - Physiologic stability
    - Good motor tone
    - Oral structures are effective for sucking
    - Demonstrate coordinated suck-inhalation-breathe pattern
    - Term brain development

- **30-33 weeks**: “True” suck and inhalation

- **34 weeks**: Coordinated SIB pattern
**Readiness to Feed Cues**
- Awakens spontaneously at feeding times
- Hands to mouth
- Mouthing or sucking movements
- Rooting for a pacifier
- Turning head side to side
- Good muscle tone and maintaining alertness

**Assessing the Feed**
- Hands for engagement cues
- Feeding efficiency and effort expanded
- Apneic episodes (≥ 3 seconds without a breath) or a disorganized suck-swallow-breathe pattern
- Drooling or dribbling

**End of Feed Cues**
- Gasping or fatigue
- Aklep or slowness
- Distracted or disengagement with head
- No longer swallowing
- Turning head away, facial grimaces, and putting hands up in a “stop sign” exhibit
- Attempts to “escape the bottle” by extending arms and legs or arching the back or body
- Resistency in the face or limbs
- Persistent or sustained changes in vital signs (e.g. tachycardia, tachypnea, apnea, oxygen desaturations)
- Sustained disengagement, disinterest and Laura feeding posture

**Benefits for Parents**
- Interaction during feeding provides the opportunity for the caregivers to learn their infant’s cues
- The ability to respond to the infant’s needs increases attachment, confidence, and involvement
- Alleviate the stresses placed on parents related to feeding
- Recognizing and attending to the infant’s cues to responding effectively
- Proactively promoting safety awareness throughout feeding

**Benefits for Clinical Staff**
- Eliminates pressure to complete a prescribed volume
- Eliminates pressure of feeding a disengaged infant
- Supports neurodevelopment of the infant
- Application of evidenced-based practice
- Opportunity to educate parents about behavior responses and involve parents in care for their infant
- Training provides consistency in feeding practices across all caregivers
SUMMARY

Infant-driven feeding is a new-based feeding approach involving assessment of cues before the food is introduced, and ongoing assessment of cues during feeding. This approach emphasizes the infant’s role in feeding, with the goal of promoting healthy feeding patterns. The early feeding skills assessment for preterm infants is a key component of this approach, as it helps identify infants who may benefit from early intervention. The early feeding skills assessment is a tool used to evaluate an infant's ability to respond to hunger cues and engage in feeding behaviors. This tool is important for identifying infants who may require additional support to develop healthy feeding patterns, and it can help guide the implementation of feeding interventions. The early feeding skills assessment is a valuable tool for neonatal nurses and feeding therapists to use in the assessment of preterm infants. It is an essential component of the infant-driven feeding approach, as it helps promote healthy feeding patterns and supports optimal growth and development in preterm infants.
Appendix J

Pre- and Post-Intervention Survey

Infant-Driven Feeding Survey

1. How familiar are you with the Infant-Driven Feeding model?
   - Not at all familiar
   - Somewhat familiar
   - Very familiar

2. Have you received any training on infant-driven feeding? Y or N
   If yes, where?

3. What does infant-driven feeding mean or look like to you?

4. What are the advantages of infant-driven feeding?

5. What are the disadvantages of infant-driven feeding?

6. I feel comfortable with the time/volume-based feeding model.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree

7. I feel comfortable feeding a preterm infant.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree

8. I have experience with the infant-driven feeding model.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree

9. I feel I have the knowledge to determine “what the infant is telling me” during feeds.
   - Strongly disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree

10. I feel that infant-driven feeding is safe for infants.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

11. I feel comfortable and ready to teach staff and parents about infant-driven feeding.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

12. I feel that infant-driven feeding would be a difficult to implement on my unit.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

13. Infant-driven feeding increases parental involvement.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

15. Infant-driven feeding leads to faster attainment of full oral feeding.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

16. Infant-driven feeding increases medical costs.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

17. Infant-driven feeding promotes infant oral feeding experiences.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

18. Infant-driven feeding supports neurologic development.
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

21. Gestational age is the primary determinant in readiness to do oral feedings.

22. Infant-driven feeding is patient-centered care.

23. I feel that I need a refresher course on infant-driven feeding.

24. What are three examples of an infant’s readiness to do oral feedings?
   a. 
   b. 
   c. 

25. What are three examples of infant fatigue while feeding?
   a. 
   b. 
   c. 

26. How many years have you worked in the NICU as a RN? _____

27. How many years in total have you worked as a RN? _____
Appendix K

Pre-Intervention Survey Results (n=31)

<table>
<thead>
<tr>
<th>Yes or No Questions</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2. Have you received any training on IDF?</td>
<td>Yes: 24</td>
</tr>
<tr>
<td></td>
<td>No: 6</td>
</tr>
</tbody>
</table>

Likert-scale Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Response (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. How familiar are you with IDF? [1 (not at all) to 5 (very)]</td>
<td>4.3</td>
</tr>
<tr>
<td>Q6. I feel comfortable with the time/volume-based feeding model? [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.73076923</td>
</tr>
<tr>
<td>Q7. I feel comfortable feeding a preterm infant. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.73333333</td>
</tr>
<tr>
<td>Q8. I have experience with the IDF model. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.29032258</td>
</tr>
<tr>
<td>Q9. I feel I have the knowledge to determine &quot;what the infant is telling me&quot; during feeds. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.56666667</td>
</tr>
<tr>
<td>Q10. I feel that IDF is safe for infants. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.6</td>
</tr>
<tr>
<td>Q11. I feel comfortable and ready to teach staff and parents about IDF. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.2</td>
</tr>
<tr>
<td>Q12. I feel that IDF would be difficult to implement on my unit. [1 (strong disagree) to 5 (strong agree)]</td>
<td>2.51724138</td>
</tr>
<tr>
<td>Q13. IDF increases parental involvement. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.1</td>
</tr>
<tr>
<td>Q14. IDF decreases length of stay. [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.85714286</td>
</tr>
<tr>
<td>Q15. IDF leads to faster attainment of full oral feeding. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.06896552</td>
</tr>
<tr>
<td>Q16. IDF increases medical costs. [1 (strong disagree) to 5 (strong agree)]</td>
<td>2.44827586</td>
</tr>
<tr>
<td>Q17. IDF promotes infant oral feeding experiences. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.5</td>
</tr>
<tr>
<td>Q18. IDF supports neurologic development. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.43333333</td>
</tr>
<tr>
<td>Q19. IDF supports physiologic development. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.46666667</td>
</tr>
<tr>
<td>Q20. IDF supports behavioral development. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.5</td>
</tr>
<tr>
<td>Q21. Gestational age is the primary determinant in readiness to do oral feedings. [1 (strong disagree) to 5 (strong agree)]</td>
<td>2.83333333</td>
</tr>
</tbody>
</table>

Note: This pie chart shows (Q26.) the distribution of participants’ years of experience as a RN in the NICU.
### Appendix L

**Post-Intervention Survey Results (n=6)**

<table>
<thead>
<tr>
<th>Likert-scale Questions</th>
<th>Response (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. How familiar are you with IDF? [1 (not at all) to 5 (very)]</td>
<td>4.5</td>
</tr>
<tr>
<td>Q6. I feel comfortable with the time/volume-based feeding model? [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.83333333</td>
</tr>
<tr>
<td>Q7. I feel comfortable feeding a preterm infant. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.66666667</td>
</tr>
<tr>
<td>Q8. I have experience with the IDF model. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.33333333</td>
</tr>
<tr>
<td>Q9. I feel I have the knowledge to determine &quot;what the infant is telling me&quot; during feeds. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.66666667</td>
</tr>
<tr>
<td>Q10. I feel that IDF is safe for infants. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.33333333</td>
</tr>
<tr>
<td>Q11. I feel comfortable and ready to teach staff and parents about IDF. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.33333333</td>
</tr>
<tr>
<td>Q12. I feel that IDF would be difficult to implement on my unit. [1 (strong disagree) to 5 (strong agree)]</td>
<td>2.66666667</td>
</tr>
<tr>
<td>Q13. IDF increases parental involvement. [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.66666667</td>
</tr>
<tr>
<td>Q14. IDF decreases length of stay. [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.16666667</td>
</tr>
<tr>
<td>Q15. IDF leads to faster attainment of full oral feeding. [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.66666667</td>
</tr>
<tr>
<td>Q16. IDF increases medical costs. [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.16666667</td>
</tr>
<tr>
<td>Q17. IDF promotes infant oral feeding experiences. [1 (strong disagree) to 5 (strong agree)]</td>
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<td>4.16666667</td>
</tr>
<tr>
<td>Q19. IDF supports physiologic development. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.16666667</td>
</tr>
<tr>
<td>Q20. IDF supports behavioral development. [1 (strong disagree) to 5 (strong agree)]</td>
<td>4.16666667</td>
</tr>
<tr>
<td>Q21. Gestational age is the primary determinant in readiness to do oral feedings. [1 (strong disagree) to 5 (strong agree)]</td>
<td>3.33333333</td>
</tr>
</tbody>
</table>
Appendix M

Statement of Determination (SOD)

Doctor of Nursing Practice
Statement of Non-Research Determination (SOD) Form
The SOD should be completed in NURS 7005 and NURS 791EP or NURS 749/A/E

General Information

Last Name: Nguyen
First Name: Ann
CWID Number: 20575025
Semester/Year: Summer 2021
Course Name & Number: 791P Assessing the Needs of Populations with Evidence-based Interventions
Chairperson Name: Dena Cuvel~
Second Reader Name: 
Advisor Name: Nancy Selix

Project Description

1. **Title of Project:** Implementation of an infant-driven feeding model: Assessing knowledge and barriers of NICU nurses at Kaiser San Francisco

2. **Brief Description of Project** *(Clearly state the purpose of the project and the problem statement in 250 words or less):*

   Effective transition from nasogastric feeding to full oral feeding is one of the first challenges premature infants overcome in order to satisfy criteria to be discharged home safely from the neonatal intensive care unit (NICU). The ability to feed orally requires maturation of physiologic, neurologic, and behavioral systems to coordinate an effective suck, swallow, breath technique without becoming physically exhausted or burning excessive calories during a feeding. Traditionally, the feeding model for premature infants in the NICU has been task-oriented, volume-based, and physician-driven approach primarily dictated by the patient’s age or weight. This approach has been received criticism for its lack of regard to the neonate’s developmental readiness. In contrast, the infant-driven feeding approach, otherwise termed infant-led or cue-based feeding, has received growing attention as a potential feeding model to replace the traditional physician-driven approach. Infant-driven feeding is an approach that is comprised of continuous assessment of infant cues indicating readiness to feed.
Implementation of the infant-driven feeding model and its associated outcomes from many quality improvement projects in NICUs throughout the United States and beyond and yielded largely positive results.

The purpose of my project is to implement an educational intervention to teach about an infant cue-based feeding model. As the literature has revealed, there are lots of positive outcomes both immediate and long-term associated with this feeding model including attainment of full oral feeding which then determines length of stay, physical development, readmissions, caregiver relationships and bonding, and much more.

3. AIM Statement: What are you trying to accomplish?
   - Provides clear, well-defined, and concise statement regarding the purpose of the project and describes the specific aim in the IHI format: What? How much? For whom? Where? When? The Aim Statement needs to follow the SMART guidelines: specific, measurable, achievable, realistic, and timely.
   - To improve (your process) from (baseline)% to (target)% by (timeframe), among (your specific population)

By October 2021, develop, implement, and evaluate an infant cue-based feeding program for staff nurses at Kaiser SF NICU.

4. Brief Description of Intervention (150 words):
The educational intervention will be in the form of a pre-recorded presentation given during a mandatory staff skills day training wherein peer-reviewed literature will be presented on the detrimental effects of the old physician-led volume-based feeding model, the merits of infant-driven feeding model, and the outcomes of institutions already with infant-driven feeding models in place. Assessments both before and after the intervention will measure uptake in knowledge and level of comfort with the infant-driven feeding will help to guide implementation of the infant-driven feeding model as the new practice change on the NICU unit.

4a. How will this intervention be implemented?
   - Where will you implement the project? Kaiser San Francisco
   - Attach a letter from the agency with approval of your project. (see previously submitted letter of support)
   - Who is the focus of the intervention? NICU nurses at Kaiser San Francisco
   - How will you inform stakeholders/participants about the project and the intervention? Mandatory departmental meetings

5. Outcome measurements: How will you know that a change is an improvement?
   - Measurement over time is essential to QI. Measures can be outcome, process, or balancing measures. Baseline or benchmark data are needed to show improvement.
   - Align your measure with your problem statement and aim.
   - Try to define your measure as a numerator/denominator.
   - What is the reliability and validity of the measure? Provide any tools that you will use as appendices.
   - Describe how you will protect participant confidentiality.

A baseline knowledge assessment will be conducted. Immediately following the educational intervention, participants will complete another knowledge assessment. In order to assess for retention of educational materials, participants will
again complete the assessment 1 month following the educational intervention. Pre- and post-assessment responses will be measured. Respondents will be anonymized to protect participant confidentiality.
## DNP Statement of Determination

### Evidence-Based Change of Practice Project Checklist*

*The SOD should be completed in NURS 7005 and NURS 791/E or NURS 749/A/E

**Project Title:** Implementation of an infant-driven feeding model: Assessing knowledge and barriers of NICU nurses at Kaiser San Francisco

<table>
<thead>
<tr>
<th>Mark an &quot;X&quot; under &quot;Yes&quot; or &quot;No&quot; for each of the following statements:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>The aim of the project is to improve the process or delivery of care with established/accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The specific aim is to improve performance on a specific service or program and is a part of usual care. All participants will receive standard of care.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The project is not designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does not follow a protocol that overrides clinical decision-making.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does not develop paradigms or untested methods or new untested standards.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does not seek to test an intervention that is beyond current science and experience.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The project has no funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., a personal research project that is dependent upon the voluntary participation of colleagues, students and/or patients.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: &quot;This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board.&quot;*</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Answer Key:**

- If the answer to all of these items is "Yes", the project can be considered an evidence-based activity that does not meet the definition of research. IRB review is not required. Keep a copy of this checklist in your files.
- If the answer to any of these questions is "No", you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

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University of San Francisco, School of Nursing and Health Professions

REV 071619, 091619, 073120; ed. mk, fwd. 10-8-20; DNP Faculty Approval. 11.19.20

DNP Statement of Determination Form | Page 4
To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: [http://answers.hhs.gov/chrp/categories/1569](http://answers.hhs.gov/chrp/categories/1569)

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**DNP Statement of Determination**

**Evidence-Based Change of Practice Project Checklist Outcome**

The SOD should be completed in NURS 7005 and NURS 791E/P or NURS 749/A/E

- This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). **Student may proceed with implementation.**

- This project involves research with human subjects and **must be submitted for IRB approval before project activity can commence.**

**Comments:**

---

<table>
<thead>
<tr>
<th>Student Last Name:</th>
<th>Nguyen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student First Name:</td>
<td>Ann</td>
</tr>
</tbody>
</table>

| Chairperson Name: | Jo Loomis |
| Chairperson Signature: | Jo Loomis |
| Date: | 4/29/2023 |

| Second Reader Name: | |
| Second Reader Signature: | |
| Date: | |

| DNP SOD Review Committee Member Name: | |
| DNP SOD Review Committee Member Signature: | |
| Date: | |
Appendix N

Letter of Support from Agency

**Required:** This is a letter of support for Ann Nguyen to implement her DNP Comprehensive Project name Implementation an Infant-led Feeding Model at Kaiser.

**Voluntary:** We give her permission to use the name of our agency in their DNP Comprehensive Project Paper and in future presentations and publications.

Signature: ___Dena Cuviello___ DNP, PNP