10-27-2022

Implementation of Infant Driven Feeding™ in a Level II NICU

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November 4, 2022

Gardner, Kelly D. MSN, Doctor of Nursing Practice Program, Bellarmine University, 2022.
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In the United States, currently, 1 in 10 babies are born premature. Due to the immaturity of their neurological, gastrointestinal, and cardio-respiratory functions, preterm infants can experience the inability to coordinate sucking, swallowing, and breathing that is essential to oral feed. Cue-based oral feeding methods are designed to give the caregiver the ability to recognize signs of readiness and respond appropriately to the infant cues to adjust the manner in which feeding intervention is performed to match the infant's current state of physiologic tolerance. The Infant Driven Feeding™ program incorporates scales to assess readiness and quality of the oral feeding, along with supportive caregiver techniques. The goal of this project was to implement IDF™ as a feeding practice change in a level II neonatal intensive care unit (NICU) while assessing staff knowledge and the effects on patients born < 37 weeks gestation. Infants in the IDF™ group did not show changes in length of stay. Improvement was seen in the time to full oral feeds in the IDF™ group 28-33.6 weeks gestation with a mean decrease of 2.24 days (p = .59). Nursing knowledge of preterm feeding techniques was also evaluated. Improvement was seen in average test score from 66% to 86% four months post implementation of IDF™. This article offers one level II NICUs methods, outcomes, implications for nursing practice, and administrative recommendations when implementing IDF™.

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Implementation of Infant Driven Feeding™ in a Level II NICU

Oral feeding is an essential skill for extrauterine life and is a significant milestone for preterm infants in a neonatal intensive care unit (NICU). Achieving full oral feedings is often a requirement of many NICUs for discharge home. For preterm infants, compared to healthy full-term infants, oral feeding is at high risk for poor development related to multiple factors during their NICU admission: low birth gestational age, time on respiratory support, infections, and other comorbidities (Lutz, 2012).

Traditionally, NICUs have used a volume-driven model of oral feeding, which prioritizes volume consumed over the infants' experiences during the feeding and weight gain (Lubbe, 2018). This is a task-driven model where caregivers follow a regimented schedule and are known to do whatever it takes to get the bottle empty. Causing physiological stress and negative feeding behaviors which can lead to feeding aversions, volume-driven methods can predispose the infant to long-term learned refusals as neuronal mapping is occurring rapidly when preterm infants are learning to oral feed (Shaker, 2013).

Cue-based oral feeding methods are designed to give the caregiver the ability to recognize signs of readiness for feeding regardless of gestational age and signs of distress while the feeding occurs. Recognizing distress communication from the infant and reacting appropriately has been reported to enhance the development of preterm infants' oral skills (Waitzman, Ludwig, & Nelson, 2014). Use of readiness scales, which examines alertness and hunger cues, provides a guide to caregivers to proceed with oral or gavage feeding methods. If oral feeding is provided, the quality of the feeding is scored to monitor stress and progression of the oral feedings. These are both components of cue-based feeding methods and the use of assessment tools encourages consistency between all caregivers and autonomy of the bedside

caregiver (Waitzman, Ludwig, & Nelson, 2014; Wellington & Perlman, 2015). Another term referring to similar feeding technique is infant driven feeding which is a copyright method of cue-based feedings using validated readiness and quality scales.

Significance

In 2020, 1 in 10 babies were born preterm in the United States (March of Dimes, 2022). Due to the immaturity of their neurological, gastrointestinal, and cardio-respiratory functions, preterm infants can experience the inability to coordinate sucking, swallowing, and breathing that is essential to oral feed (March of Dimes, 2019). Therefore, these infants receive enteral feedings before transitioning to oral feedings. Identifying the time when an infant is ready to shift to oral feedings is complex. The timing of this transition is key to avoid undue stress during feedings, as negative experiences during feeds can cause a negative impact on brain development and feeding behaviors (Fry, Marfurt, & Wengier, 2018). Evidence from a quality improvement study demonstrates that successful feeding of an infant is closely related to the caregiver's capability to understand and respond to the physiological and behavioral cues the infant displays (Chrupcala, Edwards, & Spatz, 2015).

A clinical microsystem evaluation was conducted in the NICU where the project was conducted summer of 2020, discovering inconsistent feeding practices and knowledge deficits in the NICU. Historically, the NICU was a "special care nursery" that advanced quickly to a level II NICU to meet the needs of their population. Although educational requirements were met to increase the level of care, staff recognized inconsistent feeding practices between both nursing and providers and expressed a need for further education on evidenced based feeding practices.

Purpose Statement

The purpose of this project was to implement an evidence-based practice of Infant-Driven Feeding™ in the preterm newborn. The project was driven by the clinical questions: In a Level II NICU, does the implementation of IDF™ protocols decrease time to full oral feeds (TFOF) and decrease length of stay (LOS) in infants born less than 37 weeks compared to current practice (volume/provider driven) in the NICU? Does the implementation of IDF™ education modules increase RN knowledge of preterm feeding practices compared to knowledge prior to completing the modules in a Level II NICU? Compliance with documenting readiness and following the IDF™ protocol will also be monitored through chart audits throughout implementation. The intent for this project is to facilitate a complete transformation of the feeding practices to IDF™.

Guiding Framework

Evidence Based Practice Framework

The Johns Hopkins Evidence Based Practice (JHEBP) Model and Guidelines for Nursing and Healthcare professionals was used to guide the project formation and implementation. Steps of the PET (practice question, evidence, and translation) Process Guide were followed. The JHEBP evidence and quality table was used to evaluate the evidence (Dearholt, et al., 2012).

Next, the Plan, Do, Study, Act (PDSA) model was used to implement the planned practice change (Finkelman, 2018). An implementation plan was developed with a protocol to be incorporated into practice (Plan phase). The plan was implemented (Do phase) while ongoing data collection post implementation (Study phase) occurred. The PDSA was repeated each month as data collection continued and feedback from staff and providers were taken into consideration. Clarifications were made regarding the implemented protocol to further strengthen

the compliance with the practice change/intervention (Act phase). The final steps of the JHEBP Model include reporting results to stakeholders and disseminating findings.

Theoretical Framework

When examining the need for a practice change from volume-based feeding to infant driven feeding to improve outcomes for NICU patients, the Synactive Theory of Infant Development by Dr. Heidelise Als, a dynamic systems model, supported this practice change. The focus of the theory is on understanding the behavior of preterm infants as it clues the providers as to how the brain development of the patient is progressing (Als, 1982). This is a key element of advancing oral feedings among the NICU population. Elements of the theory are evident in the IDF™ method as the readiness assessment examines tone, movement, stable vital signs, and state of arousal. The quality of the feeding is also an important component of infant driven feeding. Quality of the feeding incorporates the Synactive Theory as the ability to self-regulate and maintain a stable balance during the feeding is observed. The focus on individualized feeding plans associated with IDF™ is also supported by this theory, as the NICU population is diverse (Sweeney et al., 2010).

A Theory of Health promotion for Preterm Infants based on Levine's Conservation Model of Nursing by Mefford (2004) also supports this practice change to promote the health of the preterm infant. Mefford applies Levine's model to NICU nursing with the concepts of nurses implementing supportive and therapeutic interventions in accord with the conservation principles of nursing and restoring a state of health. The preterm infant is plunged into an extrauterine atmosphere that is not "fit" for their immature and developing physiologic systems. Nurses caring for these patients must learn the modes of communication, verbal and non-verbal, and the messages embedded in the infants' behavior to modify the environment to minimize stress and

promote health of the infant (Mefford, 2004). The practice change from volume driven to IDF™ promotes the health of the preterm infant by allowing the nurse to follow the infants' communication and behaviors, modifying their actions to meet the patients' individual needs.

Review of Evidence

Literature Search Strategy

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) served as a guide for the search and review process (Page et al, 2021). Articles published in English language since 2011, full-text, and peer-reviewed were considered. See Appendix A.

In December 2021, databases Academic Search Complete, CINAHL Plus, E-Journals, and Medline were searched through EBSCOhost and Worldcat.org. Search strategy included *cue-based feeding* or *infant-driven feeding* as subject terms and keywords included any form of *neonatal intensive care unit, preterm, infant, and oral.*

Articles were selected if the authors reported results on assessment of nurse knowledge or evaluated of length of stay or TFOF in infants less than 37 weeks gestation at birth. An article was eliminated if it was a duplicate or did not report results on either of the three objective topics. Articles using different feeding method assessment tools other than readiness and quality scales were excluded.

Critical Appraisal and Evaluation of the Evidence

Grounded on relevance to the clinical question, permission was obtained to use the Johns Hopkins Research Evidence Appraisal Tool and Non-research Evidence Appraisal Tool to evaluate the strength of the evidence reviewed and organized by The Johns Hopkins University Evidence Summary Tool (Dang et al, 2022). Most articles reviewed ranked at evidence level III-IV based on the Johns Hopkins Hierarchy of Evidence Guide, however, three systematic review

of QI (quality improvement) initiatives were included. All articles were of high or good strength according to the Research and Non-research Evidence Appraisal Tools by Johns Hopkins (see Appendix B). Many of the studies were conducted in the United States or Canada, however, one study (Girgin & Gozen, 2020) was completed in Turkey and all studies were completed in NICUs. Author background varied and included a combination of advanced practice nurses, occupational therapist, registered nurses (RN), and nursing faculty.

Articles were grouped by theme of results and study type to compare results. Common themes discovered in the QI implementations and systematic reviews of QI initiatives were time to attainment of full oral feeding and LOS. Staff knowledge and staff satisfaction were frequent themes discerned in a combination of article types.

Staff Knowledge

A descriptive, cross-sectional study completed in Turkey amongst nurses working full-time in a NICU for over one year was the only article found in this review that specifically appraised staff knowledge. The study was completed via questionnaire that consisted of questions regarding the process of transitioning preterm infants to oral feeds and how to assess the infant during that transition. The study concluded that nurses need more knowledge and training on evidence-based interventions related to oral feedings of preterm infants and use of reliable assessment tools (Girgin & Gozen, 2020).

Wellington and Perlman (2015) completed a QI project implementing IDF™ protocols into a NICU in New York. At the completion of their project, four months post implementation, nurses were given a questionnaire to determine staff knowledge and satisfaction with the IDF™ method. Of the providers (n=37) who completed the questionnaire, 92% indicated that the flowsheet guiding the IDF™ method helped in understanding an infant's feeding ability or

problem (Wellington & Perlman, 2015). The IDF™ method of feeding infants' gives the nurse an assessment tool and guide to determine if the infant is ready for oral feeding at that moment. It also provides a tool to educate families as to what the nurse is examining regarding feeding readiness and stress signals their baby may give during the feeding.

Time to Full Oral Feeding Attainment

The time from initiation of oral feedings to time to full oral feeding attainment, (no feedings given via enteral feeding tube) was examined in the systematic reviews and QI initiative articles. Wellington and Perlman (2015) found that there was a significant difference in time to full oral feeding attainment in all three subgroups addressed in the study. The attainment of full oral feeds using the IDF™ method was between 3-17 days quicker than the provider-driven (PDF) method (standard practice/control). In Fry, Marfurt, and Wengier's (2018) systematic review of QI initiatives related to infant driven feedings, they discovered five studies reported attainment of full oral feedings at an earlier gestational age (GA) than PDF methods when using the infant driven method.

Length of Stay

A corresponding factor to reducing the time taken to reach full oral feedings, the LOS can be lessened by using infant driven feeding methods. Swant and Fairchild (2013) observed in their review of the literature that much of the research reported a potential decrease in LOS without negative outcomes noted.

After doing a comprehensive narrative review, Lubbe (2018) developed a clinicians' guide to infant driven feeding in preterm infants. The review yielded results that infant driven feedings methods have decreased the length of stay in the NICU (Lubbe, 2018). In a different

systematic review, six studies measured LOS and five studies revealed a reduction in LOS after implementation of infant driven feedings (Fry et al., 2018).

When comparing to the traditional provider driven feeding (PDF) method, a QI initiative implemented an infant driven feeding protocol for preterm infants <34 weeks GA. Infants 28-31 weeks GA fed by cues were discharged nine days earlier than infants fed by PDF methods. Infants >32 weeks GA also displayed a shorter LOS by three days when fed by infant driven methods compared to PDF methods (Wellington & Perlman, 2015). Another QI project implementing IDF™ method as a standard practice in their NICU across all populations also exhibited a potential mean decrease the LOS by 6.63 days for their patients (Chrupcala et al., 2015). At a level II NICU in Houston, TX, an IDF™ QI project was completed and reported that there was a tendency for earlier discharge (26.5 days vs. 28.2 days) and fewer speech therapist consults (8.3% vs 18.8%) in the post-intervention group compared to the pre-implementation group, but the results did not reach statistically significant difference (Gelfer, McCarthy, & Spruill, 2015).

Examining outcomes for the preterm infant population regarding oral feeding methods was the focus of a systematic review containing three QI projects. This review offered conflicting evidence. There was practical support for using readiness scales and emerging evidence suggesting that consistent oral feeding assessments may reduce LOS, however, there was not enough statistical significance to support a particular cue-based feeding method (Settle & Francis, 2019). A systematic review that reviewed eight studies and one systematic review was inconclusive as statistical significance was not available to support the relationship of cue-based feeding and decreased LOS (Swant & Fairchild, 2013).

In a more recent QI implementation project, Thomas, Goodman, Jacob, and Grabher (2021) implemented a unit wide practice change from volume-driven feeding to cue-based feeding among preterm infants achieved by four-hour long online education, resource book, and individual cue cards. A champion model roll out was used to assist with documentation, peer education, and provider order writing. The champion team was comprised of physicians, occupational therapist, nurses, and a dietician. The core team frequently assessed the progress of the practice implementation through documentation audits and discussions with staff and parents (Thomas, Goodman, Jacob, & Grabher, 2021).

In the QI project performed by Thomas et al. (2021) data were collected over a two-year span post implementation. During that time, Thomas et al. (2021) found that in infants 23 0/7 weeks to 27 6/7 weeks gestation age (GA), time to achieve full oral feedings decreased by 7 days and LOS decreased by 4.4 days. For infants 28 0/7-31 6/7 weeks GA, time to achieve full oral feedings decreased by 6.6 days and length of stay decreased by 2.7 days, thus concluding that cue-based feeding decreased time to full oral feeds and decreased length of stay resulting in a cost savings for the organization (Thomas et al.,2021).

Staff Satisfaction

Systematic reviews by Lubbe (2018) and Swant & Fairchild (2013) reflected that when implementing cue-based feeding methods there was a correlation with improved parental satisfaction and staff satisfaction. The improved staff satisfaction could be from the more individualized and co-regulated relationship between the nurse and infant that is emphasized in cue-based feeding, rather than task-oriented feeding.

Implementation of cue-based feedings is a complex and involved process with many layers of education for staff and a significant change in practice. Although change is difficult, the

reviews from staff after implementing IDF™ protocols have been satisfactory. One QI project reported that 97% of staff were positive about the IDF™ approach and 92% favored continuing with the new method (Wellington & Perlman, 2015). The favorability of continuing with the IDF™ protocols could be related to the standardized evaluation and guided intervention tools to support staff in making decisions related to oral feedings for their patients, giving the nurse more autonomy.

Staff are increasingly concerned about workload when evidence-based practice changes are introduced to the unit culture. Lubbe (2018) highlights in her clinical guide for cue-based feeding that there is no additional workload added to nursing staff with cue-based feeding methods. Wellington and Perlman (2015) specifically asked in their questionnaire to staff if the IDF™ method was an overall burden on their time. The nursing staff (91%) indicated that use of IDF™ method was not burdensome to their workflow, thus leaving them satisfied (92%) with the method overall (Wellington & Perlman, 2015).

Summary

A primary goal of a NICU nurse is to provide care that supports positive development and better life long outcomes for their patients. Cue-based feeding is a positive way to support the preterm infant in their neurological and oral feeding development. Although there is a need for longitudinal studies on outcomes of preterm infants' oral fed with cue-based feeding techniques, the benefits seen in shorten LOS and time to full oral feeds is reason in itself to change practices. Families need to be together to thrive and earlier discharge can aide in this growth.

In particular, units have had success with implementing the IDF™ program. With a cue-based philosophy in mind, the structured, interactive education, easy to interrupt readiness and

quality scoring, and the tips for appropriate caregiver techniques to use for common concerns provide for consistency amongst nursing practice. Consistency also benefits the patient as they are learning to feed. This program has also been implemented in different size NICUs with different acuity level of patients; for that reason it could be applied to many different types of NICUs to better serve preterm infants' around the world.

Synthesis of Internal Evidence

Cost and Benefits

The cost of the IDF™ method implementation included the educational program, posters for each patient room, and educational handouts for parents of NICU patients upon admission (Table 1). Funding was obtained from the organization's special education fund with approval from the senior nursing executive team. Project Team members worked on the project during normal shift hours and did not accrue any additional salary cost. The cost of the Dr. Brown's Medical™ bottles was added to the patient supply cost on the unit. This extra cost will be offset by eliminating use of other products, such as infrequently used items, reduction in disposable items to reusable products, and decreased LOS in the unit (estimated at $3,600.00/day). While the hospital may lose "patient days," this is a benefit for both the patient and family that is not measurable in a dollar sum.

Table 1

IDF™ Implementation Budget

	Cost
Classroom Education	$5,625.00
Posters (13)	$30.00
Handouts (300)	$45.00
Total	$5,700.00

Based on the evidence, increased staff satisfaction was also expected to be a benefit resulting from this practice change (Whetten, 2016). The cost of nurse turnover can range from $37,700 to $58,400 according to the 2016 National Healthcare Retention and RN staffing report. Staff satisfaction in their role as a bedside nurse and the feeling of autonomy in the care that they deliver is an important factor in a nurse choosing to stay in their role at on organization (Nursing Solutions, Inc., 2016). While the project might not lead to a direct cost impact to the unit's budget, these other mentioned avenues are areas that a return on investment could be seen.

Feasibility of Change

The need for feeding related education to combat inconsistent feeding was voiced by both nursing and providers during a microsystem analysis summer of 2020. The executive nursing leadership team agreed to allow the NICU to purchase the IDF™ education modules supported by the special education fund at the organization. Staff were given time during regularly scheduled shifts to complete the educations modules in the hospital computer lab. Documentation of readiness and quality scores could be completed in the electronic medical record (EMR), as the feature currently existed in the EMR used by the organization.

The timeline for this project was five months from start to end of data collection. This included time for education modules to be completed and four months of implementation of IDF™. While this project may not have a noticeably significant impact to organizational finances, the project aligns with the mission, vision and values of the organization to meet community needs and provide excellent care to patients. The project proposal was approved by the organizations' nursing research oversight committee and implemented March of 2022.

Recommended Practice Change

The purpose of this project was to implement the EBP of cue-based feeding in the NICU, specifically the IDF™ program and education modules. The staffs' comprehension of the importance of the practice change is essential to enhance the benefits of cue-based feedings for each patient. The IDF™ program offers extensive educational modules focusing on neurological development of preterm infants providing the foundation of why it is important to follow the infants' cues as they learn to oral feed. The modules also offer an interactive presentation on what resembles appropriate readiness and safe, supportive techniques to assist the infant in learning to oral feed without inducing a negative experience for the infant. The IDF™ was also chosen for its easy to use readiness and quality scoring tools that were readily available in the current EMR used by the organization to promote consistency in assessing each infant.

Implementation Methods

Sample Population

Nurses, patient care assistants, speech/occupational therapists, and medical providers that provide care in the NICU received the IDF™ education. Nursing staff completed knowledge pre/post questionnaires. Neonates born less than 37 weeks gestation and admitted to the NICU were the target patient population assessed for LOS and TFOF after implementation of the IDF™ method.

Project Setting

The host organization was a Magnet designated, Joint Commission certified hospital in a large metro city in Kentucky with 519 beds offering a wide range of healthcare services such as emergency services, a cancer center, lung care clinic, and women's health services. Within the organization is a Level II NICU where project implementation took place. The 12 bed NICU

offers services close to the infant's mother for infants born 28 weeks gestation or greater. The newly renovated, private room unit has an average daily census of 10 patients. The staff in the unit include clinical assistants, RNs, lactation consultants, neonatologist, neonatal nurse practitioners, occupational, respiratory, and speech therapy.

Stakeholders

The major stakeholders for this project include preterm infants, parents, healthcare organizations, NICU staff and providers, and the community at large. The possible benefits for the infant include decreased stress, positive feeding experiences and neuronal mapping, and shorter time to achieving full oral feedings as IDF™ encourages neurosupportive care (Kenner, Altimier, & Boykova, 2019)

Parents can benefit from IDF™ methods as well through enhanced bonding as they learn their babies' signs of stress and increased involvement in oral feedings (Whetten, 2016). As a result of positive feeding experiences, long-term outcomes for preterm infants are improved, resulting in less need for specialty therapy services (learning, speech, occupational), creating a positive whole family environment.

Benefits for the organization could be decreased length of stay (Whetten, 2016). Decreased length of stay can have a budget savings impact of approximately $3,500 per day per patient and a decreased risk of hospital acquired infections related to being in the hospital environment. Implementing IDF™ methods has correspondingly shown improved parental satisfaction and staff satisfaction (Lubbe, 2018; Swant & Fairchild, 2013).

For the NICU staff and providers, benefits include an increase in neurodevelopmental knowledge, providing up-to-date evidence-based care to patients, as well as increased autonomy

and satisfaction with job role for nursing staff (Girgin & Gozen, 2020; Wellington & Perlman, 2015).

A meta-analysis completed in 2021 on the prevalence of feeding problems in children under 4 years of age that were born premature, found an overall prevalence of problematic feeding was 42% (Pados, 2021). Changing these outcomes for preterm infants could lead to changes to insurance premiums and a reduction in use of resources (speech therapy, specialty learning resources, etc.) in the community. This practice change can aid in increasing the success of the preterm-infant population creating the probability they can become productive citizens as adults.

Ethical Considerations

The project was approved by an Institutional Review Board (IRB) and was granted exemption from ongoing IRB oversight throughout the project. The organizations Nursing Research Oversight Committee granted approval for the project to proceed after IRB approval was attained. No project procedures were begun prior to IRB and organizational approval.

Results of the questionnaires did not contain any identification of the participants and were sent privately to the project lead's secure email. Data obtained on LOS and TFOF for patients both pre and post implementation did not include identifiable personal health information. This data was stored on a password protected Excel file on the project lead's password protected computer in a private office. There was no anticipated risk associated with this project. All staff were to complete the education as part of a unit wide policy change in the hospital.

Project Barriers

Unit wide policy changes take time to implement in a large organization. Practice changes also take time to become the "normal" practice for nurses. Below are some anticipated potential barriers to the implementation of this project and probable solutions to the barriers during implementation.

- Inconsistent sample size with knowledge questionnaires. Solution: Encourage participation through frequent rounding on unit, email reminders, and include questionnaire reminders in shift huddle topics.
- Provider involvement will be necessary for success of the program. Various providers rotate through service at the host NICU. Solution: Include providers in reviewing the practice policy; provide opportunity for receiving the full IDF™ education or the condensed provider specific version from Dr. Brown's Medical™ and create tip sheets to post in provider offices for easy reference.
- Inconsistent charting of Readiness scores for eligible patients. Solution: monthly chart audits by charge nurses will target identifying staff not following protocol. Remediation done by charge nurse and project lead.
- Lack of consistency from nurse to nurse. Solution: This was addressed through universal online module training for all staff. Monthly staff meetings also had dedicated time for questions and review the protocol for consistent practice promotion.

Project Timeline

The project implementation and evaluation was projected to take six months (Table 2). The timeline was realistic as the project was completed as intended.

Table 2

2022 Timeline of IDF™ Project Implementation

Month	Task
March	Pre knowledge questionnaire completed, IDF™ education modules completed, and immediate post knowledge questionnaire completed by all nursing staff.
April	Implementation of IDF™ protocol
May	Charge nurse audits begin, remediation, staff rounding
June	Charge nurse audits, remediation, staff rounding
July	Charge nurse audits, remediation, staff rounding
August	Post implementation knowledge questionnaire completed, data collection
September	Summarize findings

***** Ongoing education will continue with new staff members and information will be refreshed in the NICU yearly competency requirements.

Project Team

The NICU nurse manager served as project lead. Responsibilities included overseeing program logistics, updating practice policy, budget oversight, disseminating information, and analyzing data related to program implementation. The NICU educator served as the program education manager. Responsibilities included gaining expertise on the IDF™ method, serving as a clinical expert to NICU staff, coordinating program education and encouraging compliance.

Other key members of the program team were representatives from each area (provider, staff RN, speech/occupational therapist, and a lactation RN) who provided insight into how the practice change would affect their role and suggestions for successful implementation. These members of the project team helped promote excitement around the practice change through launch week decorations and positive reinforcement surrounding the change. They posted the new policy algorithms in nurse charting stations and hung IDF™ reference cards in each patient room for staff to easily reference. One member of the team also created a one-page handout for parents that explained IDF™, readiness and quality scoring, and importance of positive feeding

experiences. This handout was place in the welcome folder each patient received upon admission.

The Director of Women's Services provided the program team support with budget approval, purchasing of the IDF™ program, and acted as a liaison between the team and the hospital executive team. A member of the Dr. Brown's Medical IDF™ program was also a key member of the team in coordination of program education, as well as providing pre and post knowledge questionnaires.

Project Implementation

Purchase of the education models was completed after approval to begin the project was obtained. Education of the NICU staff and providers was delivered via interactive online learning modules obtained from Dr. Brown's Medical™ during a three-week period. The modules were completed at the hospital or at home; all staff were paid for time taken to complete education, as it was required for unit wide policy implementation at the hospital. The modules took approximately five hours to complete. The IDF™ project team hosted three 1-hour question and answer sessions via Zoom© post completion of the online modules. It was required by staff to attend one of the three sessions. The project manager provided education and demonstration on specific EMR documentation related to the program during these sessions. Notes from each session were combined and emailed to staff to reference.

Pre/post knowledge questionnaires were required from RNs only. The link for the questionnaire in Survey Monkey® developed by Dr. Brown's Medical™ to examine knowledge related to feeding preterm infants was delivered via email to the project lead. The pre-questionnaire link was sent one week prior to availability of the education modules to the RNs work email and was completed prior to accessing the learning modules. The initial post

knowledge questionnaire was completed within one week of completing the online education. The final post knowledge questionnaire was completed four months post implementation.

Evaluation Plan

The education provided to staff was evaluated through a 21 question pre and post questionnaire to be completed online prior to the course, immediately after completion, and four months after IDF™ was implemented. The questionnaire took approximately 10 minutes to complete and entailed 12 knowledge-based questions to assess knowledge of the IDF™ method and what developmental factors should be assessed when determining whether to oral feed a patient. Open-ended questions on the questionnaire allowed for expression of the strengths and weaknesses of the current feeding method used. Demographics collected were level of education, years of nursing experience, and years' experience in the NICU.

Four months post-implementation, NICU staff were requested to complete the same online questionnaire to assess their retention of preterm feeding knowledge and understanding of IDF™ methods. Survey results were examined as an aggregate.

Key indicators of data that were examined prior to and after implementation were LOS and TFOF based on gestational age at birth. Examination of LOS and TFOF began upon implementation and continued for four months. Retrospective data was obtained on patients admitted prior to the start of IDF™ education as the pre-implementation sample.

Anticipated Outcomes

The primary outcomes from this project are an expected decrease in LOS and TFOF. Length of stay was measured by date of birth to date of discharge. Time to full oral feeds was calculated from date of first oral feeding (bottle or breast) to date of last enteral feeding.

Additional expected outcomes are an increase in knowledge from initial to first post questionnaire. Aggregate data was pulled from all three questionnaire to show the average test score at each interval. Compliance was also monitored by charge nurse and displayed as a percentage of overall compliance with the IDF™ program. The compliance goal was 90%.

Data Collection Procedure

Questionnaire results were delivered to the project manager by secure email after the closure of the collection period by the Dr. Brown's Medical™ team member. Aggregated data was examined for differences in knowledge pre and post education/implementation.

Data on LOS and TFOF was pulled by the project lead from EMR reports and chart review. Retrospective data was examined on NICU patient's born up to six months prior to implementation and post implementation data was collected for patients admitted after implementation start date. Patients that were not discharged home from the NICU were eliminated. Patients were grouped by birth gestational age into cohorts. Comparison of the cohorts aggregate LOS and TFOF was examined for changes using a two-tailed *t*-test.

A team member (RN) compiled compliance data from the paper audit forms received from unit charge nurses monthly assigned audits. The question on the audit form read, "Follows IDF™ protocol for Readiness scoring and PO feeding; Yes/NO." Calculations of monthly compliance were completed by project lead. All data sheets were password protected, stored on a password protected computer in a locked private office.

Project Outcomes

Description of the Sample

Patients born from October 2021 through March 11, 2022 and were less than 37 weeks and discharge home from the NICU were considered the pre-implementation group ($N = 47$).

Patients born April 18, 2022 through August 15, 2022 and met the same criteria were included in the post implementation data group (N = 46). Primary health problems seen in the patients were prematurity, low birth weight, respiratory distress, or evaluation for infection. Because this project was to implement a unit-wide practice change, infants with intrauterine drug exposure were not excluded. Patients who were transferred to another facility for higher level of care were excluded. Patients were then divided into cohorts based on birth gestational age. Patients born 28.0-33.6 weeks gestation were included in Cohort 1 (pre n = 17; post n = 12), 34.0-34.6 weeks gestation Cohort 2 (pre n = 13; post n = 16), and 35.0-36.6 weeks gestation Cohort 3 (pre n = 17; post n = 18). Descriptive analysis was down on sex breakdown of the groups. See Table 3 for sample descriptives. Cohort 1 and Cohort 2 had significantly more males than females in Cohort. Cohort 3 was almost equal number of males to females. When examining make-up of the pre-implementation group verses the post implementation group, there were 19% more males in the pre-implementation group than females. In the post implementation group, there was almost a 35% difference in males to females.

Table 3

Sample Descriptives by Cohort

Cohort/Phase	Frequency	Percent
Cohort 1 (*N*=29)[a]		
Male	19	65.5
Female	10	34.5
Cohort 2 (*N*=29)[b]		
Male	21	72.4
Female	8	27.6
Cohort 3 (*N*=35)[c]		
Male	19	54.3
Female	16	45.7
Pre-Implementation (*N*=47)		
Male	28	59.6
Female	19	40.4
Post-Implementation (*N*=46)		
Male	31	67.4
Female	15	32.6

[a]28.0-33.6 weeks GA

[b]34-34.6 weeks GA

[c]35-36.6 weeks GA

Length of Stay

Differences in LOS were evaluated for each cohort using paired two-tailed *t*-test (Table 4). In cohort 1, 28.0-33.6 weeks birth gestation, the pre-implementation groups mean LOS was 33.76 days and the post implementation groups mean LOS was 34.83 days. Cohort 2, 34.0-34.6 weeks gestation at birth, saw the most change in mean LOS. Cohort 2 pre-implementation groups mean LOS was 11.15 days while the post implementation groups LOS increased by 4.85 days. Cohort 3, 35.0-36.6 weeks gestation at birth, had almost equal number of patients in each group and saw a mean difference of -2.13 days in LOS between the groups. Cohort 3 pre-implementation groups mean LOS was 8.65 days while the post implementation groups LOS was 10.78 days.

Table 4

Evaluation of Length of Stay

					Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
Phase	*N*	Mean	Std. Deviation	Std. Error Mean	*F*	Sig.	*t*	*df*	Significance Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Cohort 1[a*]													
Pre-Implementation	17	33.76	20.456	4.961	6.42	0.02	-0.203	19.85	0.841	-1.069	5.266	-12.059	9.922
Post-Implementation	12	34.83	6.118	1.766									
Cohort 2[b+]													
Pre-Implementation	13	11.15	6.878	1.908	0.266	0.61	-2.023	27	0.053	-4.846	2.396	-9.762	0.07
Post-Implementation	16	16	6.022	1.506									
Cohort 3[c+]													
Pre-Implementation	17	8.65	4.541	1.101	2.565	0.119	-1.101	33	0.279	-2.131	1.936	-6.069	1.807
Post-Implementation	18	10.78	6.647	1.567									

[a] 28.0-33.6 weeks GA
[b] 34-34.6 weeks GA
[c] 35-36.6 weeks GA
* Equal Variances not assumed
+ Equal Variances assumed

Time to Full Oral Feeds

Differences in TFOF were examined for each cohort using paired two-tailed t-test (Table 5). In Cohort 1, the pre-implementation groups mean TFOF was 18.82 days and the post implementation groups mean TFOF was 16.58 days. This age group displayed the most change in TFOF. Cohort 2 pre-implementation groups mean TFOF was 6.31 days while the post implementation groups TFOF increased by 2.36 days. Cohort 3 exhibited a mean difference of about half a day in TFOF attainment between the groups. Cohort 3 pre-implementation groups mean TFOF was 4 days while the post implementation groups TFOF was 4.67 days.

Table 5

Evaluation of Time to Full Oral Feeds

					Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
Phase	*N*	Mean	Std. Deviation	Std. Error Mean	*F*	Sig.	*t*	*df*	Significance Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Cohort 1[a]													
Pre-Implementation	17	18.82	11.727	2.844	0.242	0.627	0.541	27	0.593	2.24	4.14	-6.254	10.735
Post-Implementation	12	16.58	9.793	2.827									
Cohort 2[b]													
Pre-Implementation	13	6.31	6.115	1.696	0.496	0.487	-0.875	27	0.389	-2.067	2.362	-6.914	2.779
Post-Implementation	16	8.38	6.49	1.622									
Cohort 3[c]													
Pre-Implementation	17	4	3.873	0.939	1.43	0.24	-0.443	33	0.66	-0.667	1.503	-3.725	2.392
Post-Implementation	18	4.67	4.923	1.16									

[a] 28.0-33.6 weeks GA
[b] 34-34.6 weeks GA
[c] 35-36.6 weeks GA
*Equal Variances assumed in all cohorts

Knowledge

The knowledge questionnaire sent prior to receiving the online education consisted of 12 multiple choice questions regarding preterm infant brain development, oral feeding, and understanding of IDF™. Also included were two opinion questions on satisfaction with the current feeding methods used on the unit and feelings of respect amongst the healthcare team. The questionnaire also gathered demographic information on highest level of education for each nurse.

Table 6

Scores by Highest Level of Education

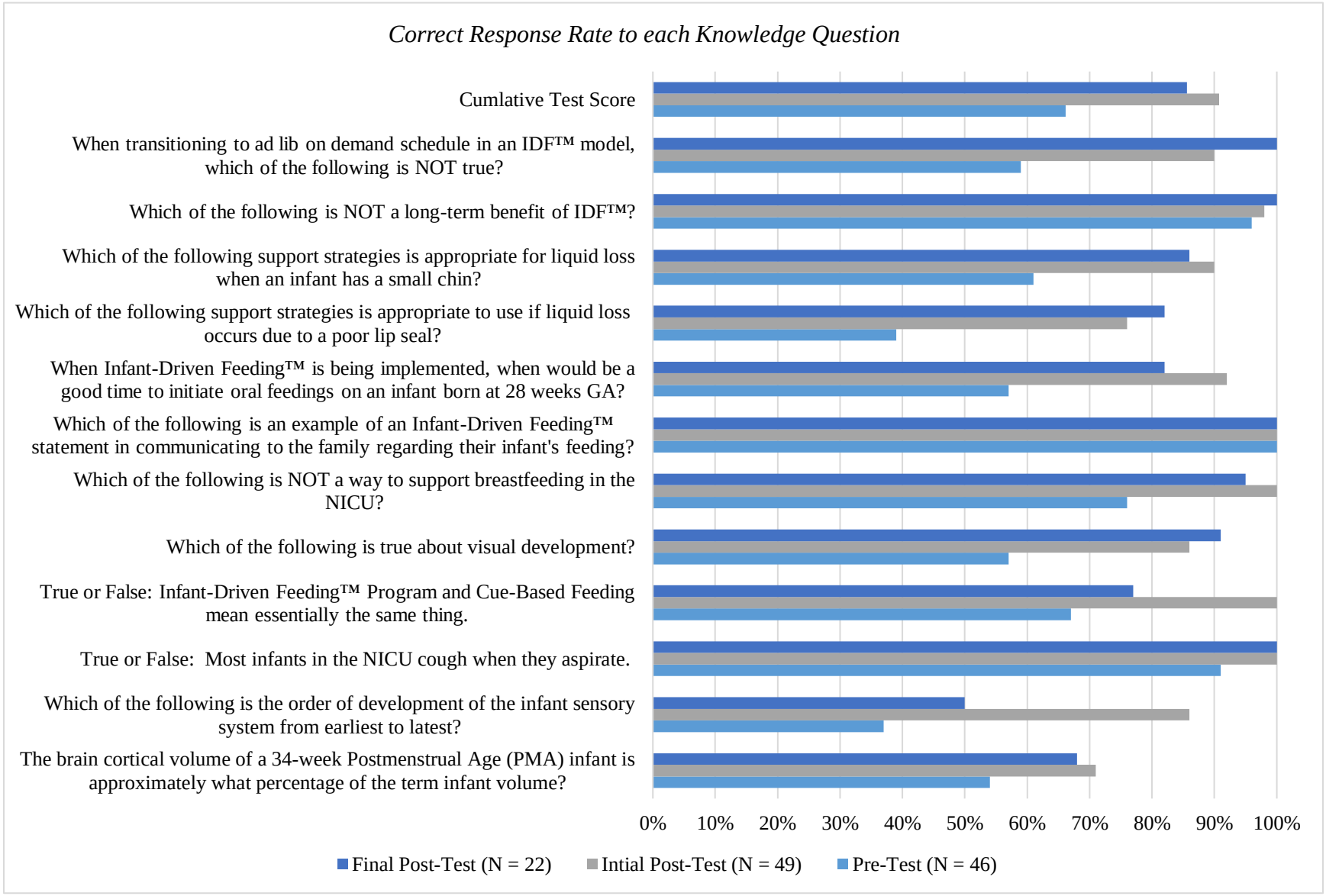
	Frequency	Percent	Mean Test Score
Pre-Implementation (*N*=46)			
Diploma	1[c]	2.2	67
ASN/AD	11	23.9	69.09
BSN	29	63	65
MSN	5	10.9	66.8
Total			66.22
Post-Implementation (*N*=22)			
ASN/AD	6	27.3	83.5
BSN	14	63.6	86.93
MSN	2	9.1	87.5
Total			86.05

Overall, the average score increased from the pre-test to the initial post-test. There was not a difference in average test scores amongst different education levels (Table 6). A final questionnaire was completed four months post implementation, roughly five months from the time education modules were released, to examine retention of knowledge. The average for the final questionnaire was 86%.

One question was answered correctly by all participants on each assessment. Others saw improvement with each assessment. Questions regarding brain and sensory development had the

lower scores, even when tested immediately after the education course was completed. See Figure 1 for a breakdown of average scores for each individual question with each assessment period. There was also not a difference in average scores and education level in the final questionnaire results.

Figure 1


Correct Response Rate to each Knowledge Question
Cumlative Test Score
When transitioning to ad lib on demand schedule in an IDF™ model, which of the following is NOT true?
Which of the following is NOT a long-term benefit of IDF™?
Which of the following support strategies is appropriate for liquid loss when an infant has a small chin?
Which of the following support strategies is appropriate to use if liquid loss occurs due to a poor lip seal?
When Infant-Driven Feeding™ is being implemented, when would be a good time to initiate oral feedings on an infant born at 28 weeks GA?
Which of the following is an example of an Infant-Driven Feeding™ statement in communicating to the family regarding their infant's feeding?
Which of the following is NOT a way to support breastfeeding in the NICU?
Which of the following is true about visual development?
True or False: Infant-Driven Feeding™ Program and Cue-Based Feeding mean essentially the same thing.
True or False: Most infants in the NICU cough when they aspirate.
Which of the following is the order of development of the infant sensory system from earliest to latest?
The brain cortical volume of a 34-week Postmenstrual Age (PMA) infant is approximately what percentage of the term infant volume?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Final Post-Test (N = 22)
Intial Post-Test (N = 49)
Pre-Test (N = 46)

When assessing satisfaction with feeding method being used at the time of the questionnaire (Table 7), 15.2% disagreed and only 21.7% agreed they were satisfied with the provider driven feeding methods used prior to implementation of IDF™. Looking at satisfaction at the final questionnaire, 50% agreed and 31.8% strongly agreed they were satisfied with using the IDF™ for their patients.

Table 7

Satisfaction with Feeding Method

	Frequency	Percent
Pre-Implementation (*N*=46)		
Disagree	7	15.2
Neutral	29	63
Agree	10	21.7
Post-Implementation (*N*=22)		
Neutral	4	18.2
Agree	11	50
Strongly Agree	7	31.8

The feeling of respect as a member of the healthcare team in regard to feeding plans for their patients was also assessed (Table 8). Prior to implementation 15.2% of staff felt neutral or strongly disagreed. Post implementation all staff that completed the final questionnaire agreed or strongly agreed that they felt respected as a member of the healthcare team.

Table 8

Feel Respected as Member of the Healthcare Team

	Frequency	Percent
Pre-Implementation (*N*=46)		
Strongly Disagree	6	13
Neutral	1	2.2
Agree	32	69.6
Strongly Agree	7	15.2
Post-Implementation (*N*=22)		
Agree	13	59.1
Strongly Agree	9	40.9

Compliance

Compliance was measured by computing number of correctly done audits (staff member followed the IDF™ protocol) compared to the total number of audits completed during that month (Table 9). The goal compliance rate for this project was 90%.

Table 9

RN Compliance with IDF™ Protocol

	N	# Compliant	% Compliant
1st Month	31	27	87%
2nd Month	72	64	89%
3rd Month	63	55	87%
4th Month	37	34	92%
Total	203	180	89%

Discussion

Cohort differences were not found as evidenced by a lack of statistical significance in results. Descriptive analysis of the data indicated that the cohorts were similar in sample size, but had some demographic differences, as age and sex were not equal. Cohort 1 included the widest age range of the different cohort, which could have skewed the results as an infant born at 28 weeks gestation will likely have a longer LOS and TFOF than a 33.6-week infant. Gender is not addressed in other studies found during the review of literature, however the differences in each cohort, poses the question, does gender play a role in preterm infants LOS and TTOF?

In this project, LOS increased from one to five days in each cohort. The articles presented in the literature review indicated a decrease in LOS could be observed. Possible reasons for the increase in LOS observed during this project are small sample size, large age range with Cohort 1, and compliance with the IDF™ protocol. Length of stay is also affected by other factors such

as apnea, bradycardia, and desaturation events (ABDs), insufficient thermoregulation, and weight gain that keep the infant from going home although they are feeding well. These cofounding factors are a limitation of this project, as they were not taken into consideration during data analysis. The LOS increase could also be related to nurses and providers not forcing the infant to take certain volumes orally, thus allowing the infant to control the speed at which they orally take larger volumes.

Respiratory distress is a common health problem requiring admission to the NICU. It is not recommended for infants to oral feed when on respiratory support greater than 2L nasal cannula, thus delaying start oral feeds and possibility of limiting attempts when support is removed. Another factor that could affect the TFOF was the time of daily provider rounds. The order for the patient to feed ad lib, thus not requiring a certain amount to be taken orally, had to be placed by the provider, otherwise if the infant did not take the ordered volume, the remainder was fed via enteral tube. Many of the final enteral tube feeding occurred during the night, as providers round daily in the morning, thus changing the feeding order typically once a day.

The goal of 90% compliance with following the IDF™ protocol was not met until the four-month post implementation. Improvement was seen throughout the project, however the overall compliance rate is 89%. This could be related to unanswered questions, variation in response from charge nurses, variation in provider preferences or orders, or unwillingness to change practice. Questions were answered in staff monthly meetings and a provider meeting was held twice during the collection period. The most common area for improvement is initiation and continuation with readiness scoring once a patient reaches 32 weeks correct gestational age for each feeding regardless respiratory support or if oral attempts were made. Opportunities for initiation of oral feeds were missed due to not having proper documentation of readiness in the

past 24 hours, following the recommended protocol. Although the compliance rate did not maintain the goal of 90%, an average compliance rate of 89% and the final month of data collection rate of over 90%, would suggest that majority of staff has adopted the practice change.

The knowledge amongst nurses increased, as expected, from the pre-questionnaire to the initial post-questionnaire. Since this was completed almost immediately after completing the online modules, the material was fresh in mind. Correspondence between level of education and mean test score was unremarkable for both pre and final questionnaire results. This could be related to preterm infant development being minimally discussed in most nursing programs. Questions that directly asked about brain or sensory development increased in correct response rate from the initial post-questionnaire but saw a decline during the post-implementation questionnaire. Examining the response rate to each question will allow for future education to be developed for review regularly.

Satisfaction with the feeding method being used on the unit at the time of the questionnaire showed positivity with implementation of the IDF™ protocol. Although the response rate was significantly less during the post-implementation questionnaire, there were no responses for disagree or strongly disagree. Feeling respected as a member of the healthcare team regarding their patients plan of care is very important to a nurse. Prior to implementation 15.2% of the staff did not feel respected. Post-implementation, every nurse that took the questionnaire either agreed or strongly agreed that they felt they were respected as a member of the healthcare team. This could be related to the policy change surrounding the IDF™ method that encourages autonomy and advocating for their patients. The policy also encouraged consistent practices amongst nurses and providers.

Conclusion

Limitations of the Project

Limitations discovered during the implementation of this project include time frame of the project, sample size, new staff, and medical provider changes. The time frame of this project was five months; one for education and four for implementation/data collection. This time frame was sufficient for the scope of this student led project, however a longer period for data collection could have offered larger, demographically similar sample sizes. A larger sample size may have allowed for statistically significant results, as the age variety in the cohorts could have been more similar. Other cofounding factors that limited the project results are health problems that inhibit the infant from discharging home that are not related to oral feeding success, such as thermoregulation, ABDs, and weight gain.

The medical providers servicing this NICU rotate to other NICUs that do not follow the same protocol. Challenges were meet when providers entered orders that did not follow the IDF™ protocols potentially causing confusion for nursing staff. Medical providers were also given the options to complete the entire education course or to watch a 45-minute condensed version of the program made for providers by Dr. Brown's Medical™. It is possible not all providers servicing this NICU watched the video.

New staff joined the NICU nursing team after project implementation, four of which were new graduate nurses. The IDF™ education modules were not required to be completed by the new graduates until they reached two months into orientation. This process was followed to allow the new nurse to grasp "normal" newborn care before addressing preterm infant development, but also could have impacted TFOF results.

Recommendations

For those that wish to implement IDF™, consider requiring all providers to complete full education alongside nursing staff. This may allow for better understanding and program compliance. Partnering with the provider team to create consistent orders could decrease confusion and variance in practices.

Strong consideration for longer period of data collection is suggested to allow for more age-appropriate cohorts to be examined. When examining nursing knowledge, years of NICU experience could be examined as it may play a different role in results than level of education.

Strong buy-in from the project team is essential. Project team excitement, promotion, and assistance with the launch of this project was critical to the EBP change implementation and adoption.

Plans for Continuation

To address knowledge gaps, IDF™ core concepts will be addressed at yearly competency requirements for nursing staff. Compliance audits and remediation by charge nurses will continue. After discussion with multiple providers, modifications to the requirements to start oral feeds for infants born ≥ 34 weeks will be made to allow oral feeding to begin immediately. The modification made will be to eliminate the requirement of five good readiness scores to begin oral feeds. Questions will continue to be addressed at staff meetings monthly. Quick reference cards and algorithms will remain at the bedside and charting stations for easy reference for staff and education of parents. Parent handouts will continue to be reproduced for each patient's welcome folder.

Summary

In the population served at a level II NICU, there was not a statistically significant reduction in LOS or TFOF with the implementation of the IDF™ protocol. There was an

increase in staff knowledge pre and post completion of IDF™ education. There were improvements post implementation in satisfaction with the feeding method and respect as a member of the healthcare team. Compliance is improving suggesting adoption of the practice change by the majority of staff; however, compliance could have been a hindering factor in seeing more positive results as other studies have seen. Differences in samples size, time frame for data collection, and level of care provided in the NICU might also reflect why there is inconsistency among these results and previously reviewed studies. During the project, successful translation of the EBP of IDF™ into practice was completed at a level II NICU, which has strong long-term potential to continue to improve infant health outcomes, staff knowledge and staff satisfaction.

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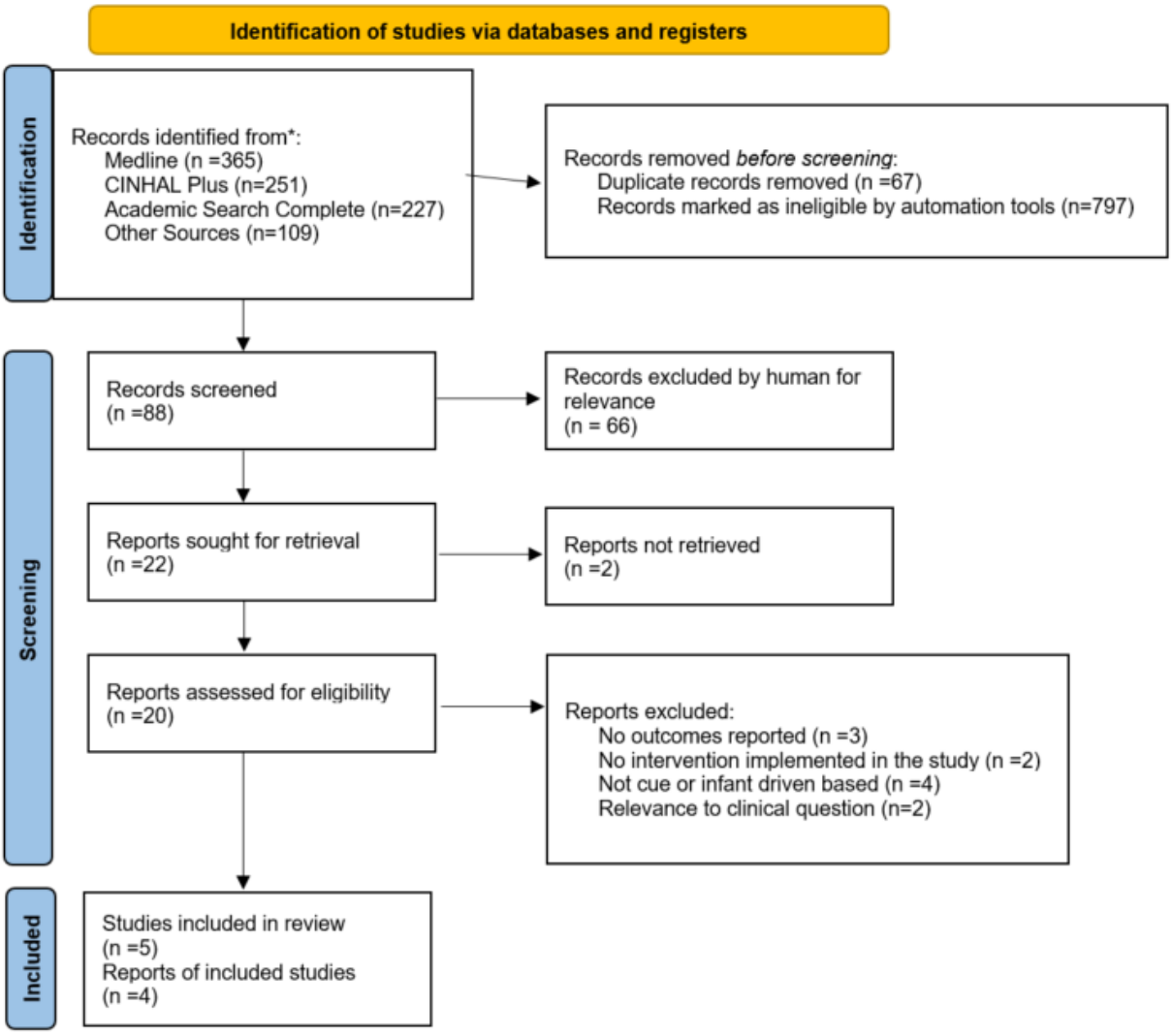
Appendix A


Identification of studies via databases and registers
Identification
Records identified from*:
Medline (n =365)
CINHAL Plus (n=251)
Academic Search Complete (n=227)
Other Sources (n=109)
Records removed *before screening*:
Duplicate records removed (n =67)
Records marked as ineligible by automation tools (n=797)
Screening
Records screened
(n =88)
Records excluded by human for relevance
(n = 66)
Reports sought for retrieval
(n =22)
Reports not retrieved
(n =2)
Reports assessed for eligibility
(n =20)
Reports excluded:
No outcomes reported (n =3)
No intervention implemented in the study (n =2)
Not cue or infant driven based (n =4)
Relevance to clinical question (n=2)
Included
Studies included in review
(n =5)
Reports of included studies
(n =4)

Appendix B

Literature Review Findings Evaluation

Author, Date & Title	Evidence Type	Population, Size, Setting	Intervention	Findings	Measures Used	Limitations	Evidence Level, Quality
Thomas, Goodman, Jacob & Grabher (2021) Implementation of cue-based feeding to improve preterm infant feeding outcomes and promote parents' involvement	Quality improvement project	Infants born 23 0/7 to 31 6/7 weeks gestation, n=249, Level III NICU in US Northeast	Practice change from volume-driven to cue-based feeding among preterm infants.	Mean decrease for infants 23 0/7-27 6/7 weeks of 10.1 days in LOS. Mean decrease in LOS of 3.6 days for infants 28 to31 6/7 weeks gestation.	Time to full oral feeds, LOS, descriptive statistics	1 yr. retrospective data obtain prior to implementation. Single NICU in one hospital.	Level V, A
Fry, Marfurt, & Wengier (2018) Systematic review of quality improvement initiatives related to cue-based feedings in preterm infants	Systematic review	QI initiatives published from 2000-2017, 7 articles met criteria conducted in NICUs in Canada and the US.	Literature review	In five out of six studies, hospital LOS was decreased. The use of a multidisciplinary team or task force, ongoing staff education and parental involvement in infant care and feeding were paramount for success.	LOS, infant weight gain, attainment of full oral feeds	Possibly did not identifies all published QI initiatives for cue based feeding in preterm infants.	Level III, A/B
Wellington & Perlman (2015) Infant-driven feeding in premature infants: a quality improvement project	Quality improvement project	n=309 babies <34 weeks, 153 (PDF) and 101 (IDF). NICU at New York Presbyterian Hospital. Questionnaire completed by n=35 healthcare professionals	Implementation of IDF method	Provider understanding of an infant's feeding ability or problem by using a flowsheet was favorable (92%), 97% were positive about the IDF approach and 92% favored continuing the IDF plan rather than reverting to the PDF method. LOS decreased by 3-9 days dependent on birth gestational age.	Time to full oral feeds, LOS, and assessment of provider acceptance of the protocol.	Observational trail rather than randomized, uncontrolled differences in practice, different sample sizes between groups.	Level V; A

Author, Date & Title	Evidence Type	Population, Size, Setting	Intervention	Findings	Measures Used	Limitations	Evidence Level, Quality
Swant & Fairchild (2013) Placing the bottle or breast in their premature hands: a review of cue-based feeding research	Systematic review	1 systematic review, 8 articles (RCT, cohort studies, case studies, expert opinions)	literature review	Sufficient evidence to support a certain protocol was not supported; however, numerous protocols displayed improvement in caregiver and staff satisfaction. Not enough data to be considered statistically significant.	Impact of cue-based feeding on GA at attainment of full oral feedings, parent satisfaction, and LOS.	Not enough data to support implementation of a specific algorithm for cue based feedings.	Level III; A
Lubbe (2018) Clinicians guide for cue-based transition to oral feeing in preterm infants: an easy to use clinical guide	Narrative review: Clinical guide	Comprehensive review of human studies and reviews published between 2000-2016.	literature review	LOS decreased, earlier transition to oral feedings, no additional workload for providers, determining readiness and assessment of the feeding are key.	LOS, time to full oral feeds	No clinical practice guideline on cue based feedings could be found.	Level IV; B
Chrupcala, et al. (2015) A Continuous quality improvement project to implement infant-driven feeding as a standard of practice in the newborn/infant intensive care unit.	Quality Improvement initiative	N=150, level IV NICU, Children's Hospital of Philadelphia.	Implementation of IDF methods	First CQI project to address IDF in a population other than ELBW or preterm infants. Infants who were able to be fed according to cues achieved full oral feedings faster and were discharged from the hospital sooner. Due to the decrease in LOS a decrease in the duration of parenteral nutrition, central line utilization, and risk for infection occurred.	IDF champions documented on a weekly basis the date the patient started oral feeds, the feeding cues documented, the date the patient reached full oral feeds, the LOS following initiation of oral feeds, and the patients total LOS.	Only a portion of the unit was selected for the project. Approximately 1/4 the participants were discharged on a combination of oral and tube feedings. Baseline and sample size differ but both comprise of diverse and medically complex population.	Level V; A

Author, Date & Title	Evidence Type	Population, Size, Setting	Intervention	Findings	Measures Used	Limitations	Evidence Level, Quality
Girgin & Gozen (2020) Turkish neonatal nurses' knowledge and practices regarding the transition to oral feeing in preterm infants: a descriptive cross-sectional study	Descriptive cross-sectional study	n=275 NICU RNs in 9 Turkish hospitals.	Questionnaire with 2 sections: 40 T/F to evaluate knowledge of the process to transition to oral feeds. 10 questions regarding assessment criteria of infants.	More than half responded incorrectly related to knowledge about cue-based feeding and intervention to promote oral-motor development. The mean knowledge score was 64.7/100. 69.1% stated they consider the physicians decision when determining when to initiate oral feedings.	Demographic form, oral feeding knowledge and practices questionnaire.	Limited sample to 9 Turkish hospitals	Level III; A
Gelfer, McCarthy, & Spruill (2015) Infant driven feeding for preterm infants: learning through experience	Quality improvement project	Large referral tertiary care hospital Houston TX, level II NICU. N= 124, 64 pre-intervention, 60 post-intervention.	IDF educational training to all nurses, implementation of IDF method	Decrease in time to full oral feeds, no compromise in weight gain, and slight decrease in LOS.	Time to full oral feeds, LOS	Strict compliance was not measured, use of historical controls, confounding factors.	Level V; A
Settle & Francis (2019) Does the infant-driven feeding method positively impact preterm infant feeding outcomes?	Systematic review	3 QI projects	Literature review	Findings were conflicting: 1 found the IDF favorable in achievement of full oral feedings, 2 found the IDF method favorable for reducing LOS, and 1 did not find differences in initiation, achievement of oral feedings, or LOS.	Time to independent oral feedings, LOS in the NICU for preterm infants.	No randomized control, quasi-experimental, or retrospective studies.	Level III; A