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Visual Boards to Improve Compliance with Administration of Glucose Gel

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DNP Project Proposal

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Background and Significance

Neonatal hypoglycemia is a global health problem affecting 5% to 15% of newborns. When left untreated, babies may suffer brain injuries and poor neurodevelopmental outcomes (Harris, Weston, Signal, Chase & Harding, 2013; Hegarty et al., 2016; Makker et al., 2018; Rawat et al., 2016; Ter, Halibullah, Leung, & Jacobs, 2016; Weston et al., 2016). The number of babies at risk for hypoglycemia is rising due to increased incidence of maternal diabetes, obesity, and premature births (Harris et al., 2013; Weston et al., 2016). Neonates at risk for hypoglycemia are those born to diabetic mothers, large for gestational age (LGA; greater than 90th percentile), small for gestational age (SGA; less than tenth percentile), or less than 37 weeks gestation (Harris et al., 2013; Ter et al., 2016).

Past treatment for hypoglycemic neonates consisted of increased feeding, formula supplementation for those breastfeeding, and if blood glucose levels do not rise, admission to NICU for IV dextrose infusions (Weston et al., 2016). Supplemental formula or admission to NICU interferes with bonding and exclusive breastfeeding, which is encouraged the first six months of life due to the health benefits for mom and baby (Bennett, Fagan, Chaharbakhshi, Zamfirova & Flicker, 2016; Weston et al., 2016). Benefits of newborn breastfeeding are well established, including decreased respiratory and gastrointestinal diseases, ear infections, sudden infant death syndrome, skin and food allergies, diabetes, and childhood cancers (Bennett et al., 2016). Long-term maternal benefits of breastfeeding include decreased postpartum depression, diabetes, arthritis, heart disease, and cancer of the breast or ovaries (Bennett et al., 2016). The most influential practice for continuation of breastfeeding at home is support of exclusive breastfeeding during the hospital stay (Bennett et al., 2016). An alternative treatment method

designed to decrease NICU admissions and promote bonding and breastfeeding is buccal administration of glucose gel for hypoglycemic newborns.

In July of 2017, an acute care facility delivering approximately 3000 babies annually, implemented a new evidence-based practice (EBP) protocol related to the treatment of newborn hypoglycemia. The protocol was developed through a collaboration with nursing and neonatology, and after reviewing current literature, it was determined a change in practice was needed. The new treatment protocol consisted of buccal administration of 40% glucose gel to at risk newborns with blood sugars less than 40 mg/dl in the first four hours of life, or less than 45 mg/dl between four and twenty-four hours of life. Prior to project implementation, at risk breastfed babies with low blood sugars received formula supplementation as treatment. If formula supplementation did not increase blood sugar to an acceptable range, admission to the NICU for treatment with IV dextrose occurred.

The glucose gel protocol utilizes buccal administration of 40% glucose gel (200mg/kg or 0.5ml/kg) rather than formula supplementation to improve blood sugar levels. Babies are encouraged to breastfeed immediately after delivery, and their blood sugar is checked within one hour of feeding. If the blood sugar is below 40 mg/dl in the first four hours of life, or below 45 mg/dl between four to twenty-four hours of life, glucose gel is administered. After administration of the gel, babies are encouraged to breastfeed again, with recheck of blood sugar after one hour. This process can occur up to two times, and if blood sugars still do not rise within acceptable ranges, admission to the NICU is warranted.

Nursing staff and physicians were trained to the new protocol, and the practice was introduced July 2017. Results from the project were favorable, showing a decrease in NICU admissions from 12% pre-intervention, to 5% post-intervention. Formula supplementation for

breastfed babies decreased from 90% pre-intervention, to 60% post-intervention; although, exclusive breastfeeding rates remained constant.

Although results from the project were favorable, staff compliance with the protocol has not remained consistent. Efforts to improve staff compliance of administering glucose gel were needed, and a review of literature identified daily management boards as a possible solution. Daily management boards provide visual and verbal cues to remind staff of important metrics within the unit. Staff perform a five to ten-minute huddle around these boards daily during each shift to discuss and view metric outcomes. This process has been shown in the literature to improve staff compliance by including those closest to the point of care in performance of key metrics (Bourgault et al., 2018; Horng et al., 2018).

Purpose Statement

The purpose of this quality improvement project is to increase staff compliance of administering glucose gel for the treatment of newborn hypoglycemia through use of a daily management board. Through improved compliance to gel administration, the project further seeks to decrease NICU admissions for hypoglycemia, decrease formula supplementation of breastfed newborns, and improve exclusive breastfeeding rates at discharge.

Methodology

A review of the literature was conducted through Bellarmine University electronic library. EBSCO host was searched using Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Medline databases. Searches utilizing the terms “compliance” or “lean” and key words “management board”, “visual board”, “gemba board”, and “huddles” yielded 9,277 articles. The search was then limited to academic articles, written in English language during the years of 2017-2019 with access to full text, dropping the number to 20

articles. Articles excluded were those older than 2 years, not in English, or not related to the topic of improving compliance. Article reference listings generated one more article from 2012 that had direct implications to the project. After evaluating abstracts and eliminating duplicates, nine articles were chosen addressing the PICO question. Daily management boards are used frequently in the automotive industry but have only recently been introduced into the health care setting. For this reason, there are a limited number of research articles in healthcare journals.

Literature Review

Transitioning from long standing practices, to newer evidence-based models is often difficult for health care staff, even if those older models of care cause harm (Bourgault, Upvall, & Graham, 2018; Branda et al., 2018; Tseng, 2017; Zarbo, 2012). Changing these outdated practices requires a culture change in how people think and behave at work every day (Zarbo, 2012). Changing culture is achieved through adopting a leadership philosophy that empowers staff to pursue high quality without blame and identify process improvements to provide better care (Zarbo, 2012). Daily huddles are a newer tool used in health care to change outdated practices and promote team-based initiatives, improving quality of care while containing costs (Bourgault, et al, 2018; Branda et al., 2018; Kaur et al., 2017; McBeth, Durbin-Johnson, & Siegel, 2017; Tseng, 2017; Zarbo, 2012). One method of daily huddle is a lean methodology technique using visual or daily management boards. The idea of the daily management board huddle was borrowed from automotive industries like Toyota to promote performance improvement, transparency, and teamwork (Bourgault et al., 2018; Gao & Gurd, 2019). Daily management boards function under the assumption that by taking process problems to the Gemba, or the point of care, issues are solved by those closest to the work (Bourgault et al., 2018; Horng, Brunsman, Smooth, Starosta & Smith, 2018). Daily management board huddles

and lean methodologies allow for real time, safe, nonpunitive input of ideas to improve unit performance (Bourgault et al., 2018; Foster, 2017; Gao & Gurd, 2019; McBeth et al., 2017; Tseng, 2017; Zarbo, 2012). It is recommended that teams should hold a brief huddle daily for 5 to 10 minutes to track and fix unit problems (Branda et al., 2018; McBeth et al., 2017; Tseng, 2017). Bringing the entire team together daily minimizes hierarchies at the point of care, and improves staff satisfaction and communication (Branda et al., 2018; McBeth et al., 2017).

McBeth et al. (2017) implemented daily huddles at a Children's hospital. Afterward, changes in patient flow were examined. Daily huddle topics included the need for shorter times from admission orders to bed assignment. After the implementation of the daily huddle, results demonstrated a significant decrease in pediatric bed transfer from emergency department to floor (McBeth et al., 2017). This study demonstrates a core concept of the daily management huddle; when workers are involved in the change, they experience ownership and accountability, improving the results (Zarbo, 2012).

Kaur et al. (2017) implemented daily management board huddles as part of a quality initiative to improve processes, generate ideas, and identify problems and solutions. Results generated from the implementation of daily huddles included over fifty new ideas from staff, and implementation of ten new projects designed to improve outcomes. The visual display of the daily management board, along with the daily huddle, helped generate ideas and demonstrate project progress, which enhanced team engagement and confidence.

Throughout the literature, a common theme emerged demonstrating the need to identify a core team who participates in training to ensure success of the daily huddle (Bourgault, et al, 2018; Branda et al., 2018; McBeth et al., 2017; Tseng, 2017; Zarbo, 2012). Team training can be achieved through intense weeklong sessions, or intermittent weekly or monthly support.

Training should include team leaders, along with bedside staff, who can engage ideas for process improvement at the point of care (Zarbo, 2012). This core team is key to driving and facilitating process improvement at the bedside (Zarbo, 2012). Another prerequisite for successful implementation of daily huddle boards is strong leadership and stakeholder involvement (Gao & Gurd, 2019). Leadership must show engagement in the process and acceptance of ideas from bedside staff. Without the support of hospital leadership at all levels, daily huddle boards will not be enculturated in the organization.

An additional benefit of daily huddles noted within the literature is the improvement of relationships and communication between team members (Bourgault, et al, 2018; Branda et al., 2018; McBeth et al., 2017; Kaur et al., 2017; Tseng, 2017; Zarbo, 2012). This is important to healthcare providers because they often work in silos, which can lead to poor patient outcomes (McBeth et al., 2017). Communication among the interdisciplinary team is crucial to improving quality in patient care. The implementation of daily huddle boards helps bridge this communication gap between providers, administrators, and point of care staff (Bourgault et al., 2018; Branda et al., 2018; Gao & Gurd, 2019; Kaur et al., 2017; McBeth et al., 2017; Tseng, 2017; Zarbo, 2012).

The findings in the literature offer evidence that use of daily management boards may improve staff compliance with administration of glucose gel. Among the articles reviewed, enough data exist to warrant a quality improvement project utilizing daily management boards to improve compliance of glucose gel as treatment for newborn hypoglycemia.

Theoretical Framework

In order to improve compliance in the use of 40% glucose gel as first line treatment for neonatal hypoglycemia, Lewin's Theory of Planned Change was utilized to implement the daily

management board. Lewin uses a force field analogy to demonstrate what drives change. According to Lewin, there are driving and restraining forces which maintain status quo. For change to occur, the driving forces must exceed the restraining forces (Nursing Theory, 2018).

Lewin's theory includes three stages: unfreezing, change or moving, and refreezing (Zaccagnini & White, 2017). The first stage is unfreezing, where needs are determined and support gained (Nursing Theory, 2018). During this phase, a multidisciplinary committee met to determine implementation of the daily management board. The committee included the Director of Nursing, Nurse Manager, Nurse Unit Coordinator, four Mother Baby (MB) unit Nurses, and two MB unit Nursing Assistants. Once the process was discussed, protocols were made for auditing 40% glucose gel as treatment of newborn hypoglycemia. Data were on staff compliance, NICU admissions for hypoglycemia, formula supplementation for hypoglycemia, and exclusive breastfeeding rates at discharge. Comparison of these data determined project success.

Lewin's second stage is change or moving, where action occurs and driving forces must be stronger than restraining forces to enable transition (Nursing Theory, 2018). During this stage, MB unit education was provided during each daily management board huddle for the first three weeks. This allowed all staff members to hear the information several times. The project lead weekly performed retrospective chart audits to determine outcomes.

Lewin's third stage is refreezing, where change is enculturated replacing old habits (Nursing Theory, 2018). During this stage, compliance continued to be monitored until the target goal of 100% of babies meeting criteria and receiving glucose gel for hypoglycemia was reached and sustained. Comparison of pre and post data demonstrated project success.

Setting and Participants

A convenience sample of at risk breastfed babies, born at the project hospital during the data collection timeframe, with blood sugars less than 40 mg/dl in the first four hours of life, or less than 45 mg/dl between four and twenty-four hours of life was used for the project (see Appendix A for complete algorithm).

Inclusion/exclusion criteria

Inclusion criteria are breastfed babies at risk for hypoglycemia, which are those who are small for gestational age (SGA), large for gestational age (LGA), infants born to diabetic mothers (IDM), or those less than 37 weeks gestation. Exclusion criteria are those babies who do not meet the inclusion criteria.

Setting

A 519-bed acute care facility located in a suburban area of the south-central United States. Obstetrics is one of many service lines offered within the organization, currently serving Louisville and its surrounding counties. The service line consists of a Labor and Delivery (L&D), housing fourteen labor beds, five triage rooms, three operating rooms, and four recovery rooms. There is a Mother Baby Unit (MBU) with 40 postpartum beds, and a Neonatal Intensive Care Unit (NICU) with eight beds. The service line delivers over 3000 babies per year, including high-risk deliveries, and premature babies 28 weeks gestation or above.

Intervention

A core team consisting of the Director of Nursing, MB Nurse Manager, MB Nurse Coordinator, four MB nurses, and two MB Nursing Assistants attended a full week Process Excellence class to learn implementation of daily management boards. The training included implementing quality improvement processes and change management skills. As part of this

class, the daily management board was created utilizing a 4x8 foot white board as the base structure. The board was divided into five organizationally supported pillars including Safety, Quality, Patient Experience, People, and Finance. Under each pillar, unit selected metrics were chosen to be monitored for compliance and improvement. Staff compliance to the glucose gel protocol was listed under the Quality pillar, as glucose gel use protects newborns from the harmful effects of hypoglycemia.

The daily management board was placed in the nursing station where staff could visually see glucose gel usage and compliance, along with other unit quality measures. A daily management board huddle lasting ten minutes occurs twice daily, at 10:00 a.m., and at 1:00 a.m., to capture both day and night shifts. During this ten-minute huddle, the team discusses each metric on the board, and provides ideas to improve scores. Glucose gel compliance was updated on a weekly basis to determine how many babies meeting criteria received glucose gel, with a goal of 100%. When the goal is met, a green dot is placed on the tracking sheet on the board; when the goal is not met, a red dot is placed on the board. This provides a quick visual for team members, and a daily reminder of unit performance.

Measures

A retrospective chart review of thirty newborns pre-intervention, and thirty newborns post-intervention, was used to evaluate staff compliance with administration of glucose gel. Information collected included whether or not 40% glucose gel was administered to breastfed babies at risk of hypoglycemia with blood sugars less than 40 mg/dl in the first four hours of life, or less than 45 mg/dl between four and twenty-four hours of life. This was collected as categorical data and coded as either a “yes” or “no”. The electronic health record EPIC provided data in list form of all newborns with blood sugars below 45 mg/dl. From this list, a manual

review of each chart determined if the baby met criteria for inclusion, and if so, if staff administered glucose gel.

Further data collected was if baby was admitted to NICU for hypoglycemia, if baby received formula supplementation for hypoglycemia, and if baby was exclusively breastfeeding at discharge from the hospital. NICU admission, formula supplementation, and exclusive breastfeeding data were collected as categorical data and coded as "yes" or "no". Data were entered into the statistical software SPSS and analyzed using the chi-square test for independence to determine if there was a significant association between pre-intervention and post-intervention groups.

Results

Sample Description

The study sample included a total of 60 breastfed newborns born at the project hospital, at risk for hypoglycemia, and admitted to the newborn nursery. Descriptive summaries (Table 1) include frequencies and percentages for categorical data. A chi-square test for independence with Yates' Continuity Correction indicated there were no significant differences between pre-intervention and post-intervention groups for any risk factors (Table 1).

Nursing Compliance

The first aim of the project was to increase rates of nursing compliance with administration of glucose gel to at risk hypoglycemic newborns. A chi-square test for independence with Yates' Continuity Correction indicated a significant improvement in compliance to the protocol between pre-intervention and post-intervention groups (χ^2 (1, n = 60) = 5.69, p = .02, *phi* = .35). Compliance to the protocol improved from 18 newborns (60%) pre-implementation to 27 newborns (90%) post-implementation of the daily management board.

NICU admissions

The second aim of the project was decreasing newborn NICU admissions for hypoglycemia following increased compliance. A chi-square test for independence with Yates' Continuity Correction indicated no significant difference in NICU admissions between the pre-intervention and post-intervention groups (χ^2 (1, n = 60) = .10, p = .75, phi = .08). NICU admissions slightly increased after implementation of the daily management board from 5 newborns (17%) pre-intervention to 7 newborns (23%) post-intervention.

Formula supplementation

A third aim of the project was to decrease formula supplementation for hypoglycemia to breastfed infants. Thirty newborn charts were reviewed before and after the implementation of the daily management board. There was a not significant change in babies given formula supplementation between the pre-intervention and post-intervention groups, based on a chi-square test for independence with Yates' Continuity Correction (χ^2 (1, n = 60) = .10, p = .75 phi = .08). Formula supplementation increased from 23 newborns (77%) pre-implementation to 25 newborns (83%) post-implementation of the daily management board.

Exclusive breastfeeding

A fourth aim of the project was to increase the rate of exclusive breastfeeding at hospital discharge. A Chi-square test for independence with Yates' Continuity Correction indicated no significant change in exclusive breastfeeding at discharge between the pre-intervention and post-intervention groups (χ^2 (1, n = 60) = .68, p = .41, phi = -.14). Exclusive breastfeeding increased with implementation of the daily management board from 8 newborns (27%) pre-intervention to 12 newborns (40%) post-intervention.

Discussion

The primary goal of the project was to improve nursing compliance with administration of glucose gel to at risk breastfed newborns through the use of a daily management board. Results were both statistically and clinically significant, showing an improvement in nursing compliance of the glucose gel protocol from pre-intervention to post-intervention groups (60% to 90%, respectively). Improvement of compliance was shown through the use of the daily management board technique, suggesting that visual reminders of quality indicators improve outcomes. This result is consistent with the literature which indicates daily management boards increase ownership and accountability and improve compliance.

There was neither a statistically or clinically significant decrease in NICU admissions for hypoglycemia between pre-intervention and post-intervention groups (17% to 23%, respectively). In fact, there was a slight increase in NICU admission percentage after the project completion. A possible explanation of this increase in NICU admissions is several attending physicians prefer to treat hypoglycemia with intravenous dextrose; however, a larger sample size is needed to determine true significance.

Formula supplementation was neither clinically or statistically significant between pre-intervention and post-intervention groups (77% to 83%, respectively). Formula supplementation numbers remain high, regardless of administration of glucose gel. Parental choice may play a key role in this decrease, as noted in the literature; mothers often choose to switch to formula after being informed their baby has low blood sugar.

Although not statistically significant, exclusive breastfeeding at discharge increased within this subset of newborn population from pre-intervention to post-intervention groups (27% to 40%, respectively). A larger sample size may have shown statistical significance in this

category. Increasing exclusive breastfeeding rates at discharge is a hospital goal and will continue to be monitored for improvement.

Future plans are to continue use of the daily management board until nursing compliance to the glucose gel protocol reaches 100%. The glucose gel protocol metric will continue to be highlighted at the daily huddle, and educational reminders will be given of the benefits of glucose gel for treatment of newborn hypoglycemia.

Conclusion

The goal of administration of 40% glucose gel is treatment of newborn hypoglycemia without the need for NICU admission or formula supplementation. NICU admissions are costly and interfere with maternal/infant bonding and establishment of breastfeeding. Supplementing with formula discourages breastfeeding, relaying the message to mother her breastmilk is not adequate for her baby. Compliance in administering 40% glucose gel eliminates these barriers paving the way for a safer hospital stay for both mother and baby. Daily Management Boards have shown to increase staff compliance in quality measures and can be a useful tool in improving patient outcomes. Limitations of this project are the small sample size; further research should include a large randomized sample group to ensure more generalizable results.

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Appendix A

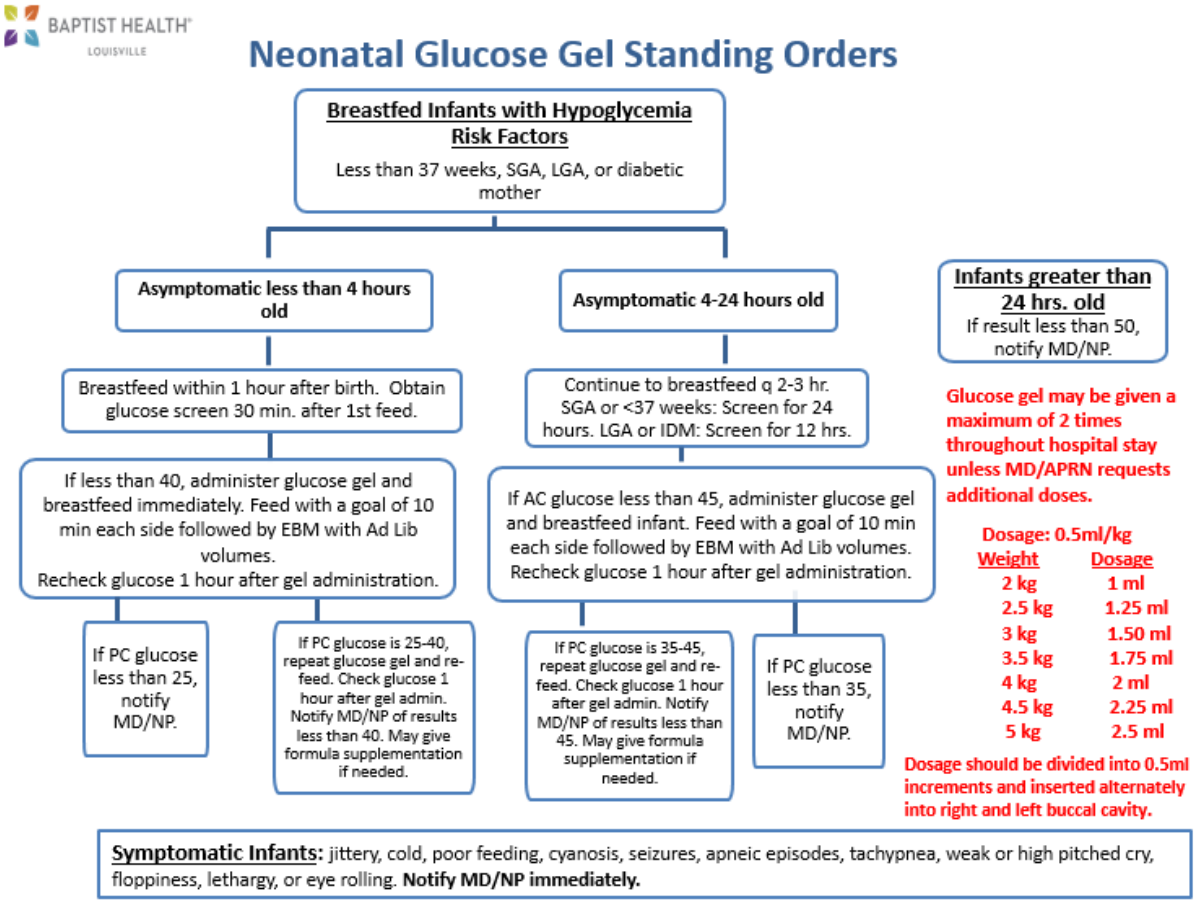
BAPTIST HEALTH
LOUISVILLE
Neonatal Glucose Gel Standing Orders
Breastfed Infants with Hypoglycemia Risk Factors
Less than 37 weeks, SGA, LGA, or diabetic mother
Asymptomatic less than 4 hours old
Asymptomatic 4-24 hours old
Infants greater than 24 hrs. old
If result less than 50, notify MD/NP.
Breastfeed within 1 hour after birth. Obtain glucose screen 30 min. after 1st feed.
Continue to breastfeed q 2-3 hr. SGA or <37 weeks: Screen for 24 hours. LGA or IDM: Screen for 12 hrs.
If less than 40, administer glucose gel and breastfeed immediately. Feed with a goal of 10 min each side followed by EBM with Ad Lib volumes.
Recheck glucose 1 hour after gel administration.
If AC glucose less than 45, administer glucose gel and breastfeed infant. Feed with a goal of 10 min each side followed by EBM with Ad Lib volumes.
Recheck glucose 1 hour after gel administration.
If PC glucose less than 25, notify MD/NP.
If PC glucose is 25-40, repeat glucose gel and re-feed. Check glucose 1 hour after gel admin. Notify MD/NP of results less than 40. May give formula supplementation if needed.
If PC glucose is 35-45, repeat glucose gel and re-feed. Check glucose 1 hour after gel admin. Notify MD/NP of results less than 45. May give formula supplementation if needed.
If PC glucose less than 35, notify MD/NP.
Glucose gel may be given a maximum of 2 times throughout hospital stay unless MD/APRN requests additional doses.
Dosage: 0.5ml/kg
Weight Dosage
2 kg 1 ml
2.5 kg 1.25 ml
3 kg 1.50 ml
3.5 kg 1.75 ml
4 kg 2 ml
4.5 kg 2.25 ml
5 kg 2.5 ml
Dosage should be divided into 0.5ml increments and inserted alternately into right and left buccal cavity.
Symptomatic Infants: jittery, cold, poor feeding, cyanosis, seizures, apneic episodes, tachypnea, weak or high pitched cry, floppiness, lethargy, or eye rolling. Notify MD/NP immediately.

Table 1
Demographic Characteristics and Chi Square Test Results
(*N*=60)

Characteristic	Total	Group 1 Pre-Intervention	Group 2 Post-Intervention	χ^2(*p* value)
Compliance with Protocol				
Yes	75% (45)	60% (18)	90% (27)	5.69 (.02)*
No	25% (15)	40% (12)	10% (3)	
Hypoglycemia Risk Factor				
Small for gestational age (SGA)	41% (25)	43.3% (13)	40% (12)	.00 (1.00)
Large for gestational age (LGA)	26.7% (16)	20% (6)	33.3% (10)	.77 (.39)
Less than 37 weeks gestation	26.7% (16)	33.3% (10)	20% (6)	.77 (.38)
Infant of diabetic mother (IDM)	5% (3)	3.3% (1)	6.7% (2)	.00 (1.00)
NICU Admit for Hypoglycemia				
Yes	20% (12)	16.7% (5)	23.3% (7)	.10 (.75)
No	80% (48)	83.3% (25)	16.7% (5)	
Discharge Feeding Preference				
Breast Feeding	33% (20)	26.7% (8)	40% (12)	.68 (.41)
Bottle Feeding	66.7% (40)	73.3% (22)	60% (18)	
Formula Supplementation				
Yes	80% (48)	76.7% (23)	83.3% (25)	.10 (.75)
No	20% (12)	23.3% (7)	16.7% (5)	

Note. Percentage (frequency) and Chi-Square (*p* value) are given.
*p value < .05