Improving Early Infant Feeding Practices with an Evidence Based Education Handout

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Approved May 2018 by the faculty of UMKC in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice

Abstract

Nearly half of all infants are introduced to solid food before the recommended age. The World Health Organization and American Academy of Pediatrics have established guidelines encouraging parents to delay solid food introduction until six months of age. Evidence indicates that introducing solid food prematurely can be problematic for infants because they may not be developmentally prepared and it can lead to an increase in infectious disease, atopic disease, and childhood obesity. The decision to introduce solid foods can be influenced by social support systems and advice from pediatric primary care providers. The purpose of this one group, quasi-experimental pretest-posttest design was to determine if evidence based infant feeding education improved parental intention to delay solid foods until six month of age in a primary care pediatric setting. Data collected using a modified Infant Feeding Intentions Scale (IFI) was used to compare parental intention to introduce solid food before and after the educational handout. Nine patients in a Des Moines, Iowa primary care pediatric clinic participated in the intervention provided by five pediatric providers. The results of this DNP project did not show an improvement in parental intent to delay solid food; however, the actual timing of solid food introduction was 5.5 months which is greater than the national average. Delaying solid food to infants can have a major impact on pediatric healthcare including a low incidence of comorbidities related to infectious diseases, atopic disease, and obesity and a decrease in healthcare costs associated with the comorbidities.

Keywords: early infant feeding practices, solid food introduction, exclusive breastfeeding, delayed solid food introduction, complementary foods, Infant Feeding Intentions scale, and infant feeding intentions

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In 2001, the World Health Organization (WHO) modified the recommendation that all infants be breastfed exclusively for six months instead of the previous recommendation of four months (Duijts, Jaddoe, Hofman, & Moll, 2010). The American Academy of Pediatrics (AAP) also updated, in 2005, their recommendations to align with the WHO's recommendation (Eidelman & Gartner, 2005). Still, fewer than 20% of infants are exclusively breastfed for the first six months of life (Centers for Disease Control and Prevention [CDC], 2014).

Significance

Infants who are exclusively breastfed for six months experience fewer gastrointestinal infections, serious colds, and pneumonia, ear, and throat infections which lessens the frequency of health care visits for the infant and time away from work for parents (Duijts et al, 2010; Eidelman & Schanler, 2012). The risk of hospitalization for respiratory tract infections is reduced by 72% in infants who are not fed solids prior to four months (Eidelman & Schanler, 2012). Infants introduced to solid food prematurely are also at an increased risk for obesity, an epidemic effecting 17% of children in the United States which has the economic consequence of $14.1 billion annually (CDC, 2015; Cawley, 2010; Huh, Rifas-Shiman, Taveras, Oken, & Gillman, 2011).

Local Issue

Breastfeeding, and ultimately delaying solids until six months of age, has been included in the U.S. Healthy People initiatives to highlight the importance of exclusively breastfeeding (Bai, Middlestadt, Peng, & Flys, 2009). Breastfed infants are more likely to have solid food delayed than formula fed infants (Clayton, Li, Perrine, & Scanlon, 2013). Nationally, the rates of breastfeeding exclusively at six months, meaning no solid food or formula introduction, have

increased from 16.4% in 2013 to 22.3% in 2016 (CDC, 2016; CDC, 2013). The state of Iowa historically has higher than national average breastfeeding rates. In 2016, 24.9% of Iowa infants were exclusively breastfed at six months of age compared to 18.8% in 2013 (CDC, 2016; CDC, 2013).

Diversity Considerations

Food and feeding practices vary between culture and ethnicities. This can impact early infant feeding practices greatly and must be considered by primary care pediatric providers. Breastfeeding rates in the United States are highest among Latino Spanish speaking dyads followed by English speaking Latinos and Caucasian breastfeeding dyads (Kuo, Inkelas, Slusser, Maidenberg, & Halfon, 2011). However, Spanish speaking Latino mothers are more likely to introduce solid foods prior to Caucasian mothers, and African American mothers are the most likely to delay solid food introduction relative to mothers from other racial and cultural backgrounds (Kuo et al., 2011).

Cultural practices related to food have a major impact on future feeding preferences and nutritional status. Deeply engrained cultural practices may make changes to food choices and diet difficult. Hispanic infants are usually exposed to cultural food staples such as rice, beans, and soups early; however, they are also exposed to sweetened fruit juices earlier in infancy than non-Hispanic children (Mennella et al., 2006). The combination of the early introduction of solid foods and sweetened juices puts Hispanic children at increased risk for obesity (Kuo et al., 2011; Mennella et al., 2006). Nearly 40% of Hispanic children in the United States are considered overweight or obese compared to 28% of non-Hispanic children (Ogden et al., 2014).

Problem, Purpose

Prior to the AAP and the WHO recommendations, over half of infants in the United States were introduced to solid food too early (Fein, Grummer-Strawn, & Raju, 2008). According to the recommendations, solid food introduction should be delayed until the recommended six months of age to improve infant health outcomes. Childhood obesity rates are rising; therefore, early intervention to prevent the obesity epidemic is imperative (CDC, 2015). The purpose of this Doctor of Nursing Practice (DNP) project was to determine if an evidence based infant feeding education improved parental intention to delay solid foods until six months of age in a primary care pediatric setting. The secondary purpose was to delay introducing solids until 6 months of age.

The major foreseen barrier was the acceptance of the change in practice recommendation. Prior to the implementation of the study, all of the student investigator's preceptors made the recommendation to start feeding infants solid food as early as four months. Delaying the recommendation for an additional two months proved to be difficult because not all providers in the practice wanted to change their recommendations. The project site has three nurse practitioners who participated and facilitated the implementation of the project. A total of four physicians initially participated; however, two of the physicians later withdrew from the study because of practice differences varying from the evidence recommendations. The economic component of the DNP project did not present a barrier. The early infant feeding handout was accepted by the providers who continued to participate and was well received by patients so there is the potential the handout continues to be distributed to patients following the completion of the DNP project.

Review of the Evidence

Quantitative and qualitative evidence supports adhering to the WHO and AAP recommendations to delay solid food until six months of age. The inquiry for the literature search and implemented DNP project follows: In parents of term infants, does the use of an infant feeding educational tool on delaying the introduction of solid food to six months of age in a primary care pediatric clinic, compared to no infant feeding tool, affect parental intentions of the timing of the introduction of solids foods and increase the number of parents who delay introducing solid food to their infants until age six months? The evidence was utilized as the foundation of this evidence based project.

Literature Search Strategies

Literature search for the evidence and the intervention for this DNP project was initiated during the fall of 2014 and has been reevaluated periodically in an effort to stay current on published research. Databases searched include CINAHL, Medline, PubMed, and Cochran. Additional searches were conducted using Google Scholar. Keywords included early infant feeding practices, solid food introduction, exclusive breastfeeding, delayed solid food introduction, complementary foods, Infant Feeding Intentions Scale, and infant feeding intentions (see Appendix A for definition of terms).

Inclusion criteria consisted of publication in a scholarly journal, English language, and matching keywords of the search. The student investigator attempted to have current articles which were published in the past five years; however, older references which provided significant evidence which remains currently relevant were included. The student investigator excluded articles which failed to provide supportive evidence for the PICOTS or contradicted the inquiry; however, contradicting articles were cited during the synthesis of evidence when it was appropriate to provide information on research discrepancies.

The search returned a large volume of studies; however, following a thorough review, not all articles retrieved were included in this synthesis of evidence. A total of five clinical guidelines or systematic reviews, Melynk evidence level one, were used and included guidelines published by the AAP (Melnyk & Overholt, 2015, adapted). Two randomized controlled trials, Melynk evidence level two, were used. A majority of the articles retrieved and utilized were cohort studies. Thirteen, Melynk evidence level four studies were used and there was one level five. Melynk evidence level six, qualitative studies, was comprised of four studies. Melynk evidence level three or evidence level seven was not utilized for this synthesis of evidence (see Appendix B for the Synthesis of Evidence table).

Synthesis of Evidence

A review of the literature revealed six subtopics which revealed the need for parental education on the recommended timing of solid food introduction. Following the AAP and WHO guidelines to delay solid food until six months of age is beneficial to the health of infants and supports breastfeeding efforts. Additionally, it is important to educate parents on the developmental readiness of their infants to start solids and dispel any misinformation they may have regarding early infant feeding practices.

Infectious Diseases

There is strong evidence suggesting two primary health benefits of delaying the introduction of solid food, the decrease in the incidence of respiratory and gastrointestinal illnesses which are the leading causes of morbidity in children (Duijts et al., 2010). Delaying the introduction of solid food until six months of age seems to decrease the risk of gastrointestinal infections when compared to introducing solid food at four months of age (Duijts et al., 2010). It is believed this is due to the immature mucosal lining of the infantile gastrointestinal tract

(Nwaru et al., 2013). The risk of hospitalization for respiratory tract infections is reduced by 72% in infants who are not fed solids prior to four months (Eidelman & Schanler, 2012). Infants who are not developmentally ready for solid food are at increased risk of aspirating food into their lungs which then predisposes them to pneumonia (Duryea & Fleischer, 2015). Additionally, the incidence of otitis media is reduced by 23% in infants who are only fed breast milk, meaning no commercial infant formula (Eidelman & Schanler, 2012).

Childhood Obesity

A compelling amount of evidence suggests introducing solid food to infants too early can lead to childhood obesity. Children are more likely to be obese at age three if they are prematurely weaned from formula and started on solid foods prior to turning four months of age (Huh et al., 2011). Huh et al. (2011) discovered that children fed solid food prior to four months of age were six times more likely to be obese by three years of age than children who were introduced to solid food after four months. While delaying for months may seem unreasonable or difficult for some parents, waiting until at least five months of age to introduce solid food appears to have a protective factor against childhood obesity (Sun et al., 2016). Infants who were started on solid food between five and six months of age are less likely to be overweight at one year of age, regardless of their breastfeeding status (Sun et al., 2016). The combination of breastfeeding exclusively and delaying solid foods provided even more protection against childhood obesity than each intervention independently (Moss & Yeaton, 2014).

Unhealthy eating habits established before age two are linked to unhealthy eating habits into older childhood and adulthood (Dehghan et al., 2005; Moss & Yeaton, 2014). Obesity and comorbid conditions associated with obesity including hypertension, diabetes, and coronary artery disease are hypothesized to be a result from overfeeding in infancy (Kuo et al., 2011).

Nearly 70% of obese children grow up to be obese in adulthood (Dehghan, Akhtar-Danesh, & Merchant, 2005).

Asthma and Allergies

The timing of solid food introduction and the development of atopy continues to be controversial and misunderstood. Having parents or siblings with atopy, or eczema as an infant, puts infants at high risk for developing allergic disease, including food allergy and asthma (Duryea & Fleischer, 2015; Togias et al., 2017). The AAP and WHO recommendations to delay solid food until six months of age is centered on the biological reasoning that infants have an immature gastrointestinal mucosal immune system (Nwaru et al., 2013). Nwaru et al. (2013) found that introducing wheat, rye, oats, and barley early, or prior to six months of age, may have a protective factor against the atopic triad of allergic rhinitis, asthma, and eczema; however, introduction of other grains such as maize, rice, millet, and buckwheat may increase the risk of atopic eczema. Conversely, Kumar et al. (2010) suggest delaying rice and wheat cereal in addition to other complementary foods until six months which is associated with a lower risk of food allergy. If infants already have eczema, the timing of introduction of solid food does not appear to alter the development of food allergy due to the presence of existing atopy because they already have an increased risk of developing additional atopies (Kumar et al., 2010).

Peanut allergy. Approximately 2% of children have peanut allergy, the leading cause of death related to food allergy anaphylaxis (Togias et al., 2017). Prior to early 2017, guidelines and recommendations about introducing peanuts to infants were relatively consistent and encouraged parents to delay giving highly allergic foods, including peanut products, cow's milk, eggs, and soy, to infants until at least one year of age (Duryea & Fleischer, 2015; Kumar et al., 2010).

The National Institute of Allergy and Infectious Diseases issued new guidelines regarding peanut introduction to children published in January 2017 (Togias et al., 2017). The recommendation has been endorsed by the AAP and includes three guidelines based on risk factors for developing peanut allergy (Togias et al., 2017). The first guideline encourages parents of children at high risk, those having severe eczema or egg allergy, to introduce peanut products as early as four months of age. The second guideline suggests introducing peanut around six months of age to infants who have mild to moderate eczema. Parents of infants without eczema and not considered high risk can introduce peanut freely with other solid food according to the third guideline.

Breastfeeding and Solid Food

The concept of exclusive breastfeeding, rather than supplementing with formula or exclusive formula feeding, is of importance because breastfeeding impacts the timing of introduction of solid foods (Clayton et al., 2013). Exclusively breastfed infants are more likely to have a delayed introduction to solid food unlike their formula feeding counterparts (Clayton et al., 2013). Prevalence of the early introduction of solids food has been found to be over 50% for formula fed infants while only 25% of breastfed infants were introduced solids foods prior to four months of age (Clayton et al., 2013). In addition to being fed solid food later, breastfeeding mothers are more likely to follow other infant feeding guidelines including dietary and nutrition guidelines (Pearce & Langley-Evans, 2013). This may result in the development of healthy eating habits during childhood and a reduced likelihood of childhood obesity (Pearce & Langley-Evans, 2013).

Weaning from breastfeeding before six months of age has been linked to the early introduction of solid food, and the solid food that is introduced prematurely is more likely to

have high fat and sugar content (Moss & Yeaton, 2014). Mothers who breastfeed their infants are less likely to add cereal to infant bottles, a practice which is not recommended (Ashida, Lynn, Williams, & Schafer, 2015). Clayton et al. (2013) also discovered that formula feeding moms were nearly twice as likely to have their health care provider recommend the early introduction of solid foods when compared to breastfeeding moms.

Developmental Readiness

The age at which infants display developmental readiness to eat varies slightly but typically presents around six months of age (Brown & Rowan, 2016). While infant milestones may be well understood by some, many parents are unable to fully identify and understand infant developmental readiness signs to begin solid food (Walsh, Kearney, & Dennis, 2015). Infants should be able to sit up unsupported, have good head and neck control, push up on straight arms from a prone position, and grasp food with their hands or fingers and bring it to their mouth; yet, parents may still misinterpret readiness cues (Brown & Rowan, 2016; Duryea & Fleischer, 2015; Walsh et al., 2015). In a study by Wright, Cameron, Tsiaka, and Parksinson (2011), only 5% of infants were reaching out for food before six months of age and only half were doing so by age six months. A majority of infants in the study were reaching out for food by eight months (Wright et al., 2011). This finding suggests that half of infants are not developmentally ready for solid food at six months of age. Younger infants still have the tongue thrust reflex which does not disappear until four to six months of age, have difficultly holding their heads steady, and are unable to chew and control the movement of food around their mouths (Ashida et al., 2015). Lack of coordination and skills to safely swallow solid food can lead to aspiration which can cause infectious respiratory disease such as aspiration pneumonia (Duryea & Fleischer, 2015).

Introducing solid food prematurely can also have an impact on feeding skills in early and later childhood. Children who were delayed until six months of age to start solid food are less likely to have feeding difficulties which include eating the right food, eating enough food, and being extremely picky with their food choices (Hollis et al., 2016). The addition of complementary food before four to six months of age may decrease the amount of calories and nutrients an infant consumes and have a negative effect on growth and development (Duryea & Fleischer, 2015).

Reasons for Starting Solids

A majority of parents introduce solid foods prematurely because they do not understand the rationale behind the WHO and AAP recommendation (Walsh et al., 2015). Reasons for introducing solid food prematurely include the belief the infant is hungry, that solid food will help the infant sleep longer at night, and that the infant is old enough to have solid food (Clayton et al., 2013). Parents may receive this information from their social support networks consisting of family members and peers, and the parents may be influenced to start solid food prematurely (Walsh et al., 2015). The information can be either supportive or undermining of the AAP recommendation (Ashida et al., 2015).

Parents also introduce solid foods too early because they do so at the suggestion of their doctor or other health care provider (Clayton et al., 2013). Parental and pediatric provider education lacks regarding appropriate early infant feeding practices (Fein et al., 2008). A trusting relationship with a pediatric primary care provider who provides consistent care and adheres to AAP recommendations improves parental understanding and the delaying of introduction of solid food until six months of age (Walsh et al., 2015).

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is commonly used to help predict health-related behaviors such as breastfeeding and infant feeding intentions (Bai et al., 2009). Several studies using the TPB indicate parental infant feeding intentions are strongly correlated with the actual behavior (Bai et al., 2009; Donath & Amir, 2003; Zhang, Shi, Chen, Wang, & Wang, 2009). Donath & Amir (2003) found a strong relationship between maternal prenatal breastfeeding intentions and breastfeeding initiation and duration, a finding which can be presumed for other infant feeding behaviors such as solid food introduction. The earlier intentions about infant feeding are made, the more likely the actual behavior is to happen (Donath & Amir, 2003).

Parents have identifiable attitudes about early infant feeding practices which includes breastfeeding and the timing of solid food introduction. The key TPB concepts of attitude, subjective norms, and perceived behavioral control can be recognized within the DNP project (Bai et al., 2009). The early infant feeding handout was designed to modify parental behavioral beliefs, clarify subjective norms, and empower parents to believe they have control over the timing of introduction to solid food. A visual model of the TPB that is specific to parental intention to not delay solid food until six months of age and parental intention to delay solid food until six months of age in the context of the concepts of the TPB was created by the student investigator (see Appendix C).

Methods

IRB Approval

The intervention site is an affiliate of a larger organization who's IRB served as the primary IRB (see Appendix D). Privacy of participants was protected by using a coding system. An ARNP, CPNP at the intervention site also served as a preceptor for the student investigator but was not considered a conflict of interest. The infant feeding education tool was considered

low risk and had very low potential to cause harm to infants; however, infants are considered a vulnerable population so any potential ethical dilemmas were addressed and resolved promptly.

Costs for the DNP project (see Appendix E) were minimal at $143.14. The cost was from print materials for the infant feeding education handouts, recruitment material, pre-post intervention questionnaires, envelopes, and storage portfolio to keep the project material organized at the clinical site. Funding was provided by the student investigator given the minimal cost.

Setting and Participants

The project was conducted at a Midwestern primary care pediatric clinic. The clinic is a primary care pediatric clinic which employs 13 total providers, three of whom are nurse practitioners who participated in the DNP project. An additional four physicians initially participated in the project as well; however, only two continued participation for the duration of the project. Participants consisted of parents of newborn infants visiting the clinic for the standard two week well child check using convenience sampling. Inclusion criteria consisted of newborns up to two weeks of age who turned six months of age by March 1, 2018. Excluded from the project were infants greater than two weeks of age and those who had specific conditions such as gastroesophageal reflux, developmental delays, or food allergies, and infants of parents less than 18 years of age. The intervention site accepts patients from a wide variety of ethnicities; therefore, patients with a language barrier were excluded from the project due to the time constraints required to properly translate the surveys and educational handout into multiple language. The total number of participants was nine infants with parent.

EBP Intervention

Betzold, Laughlin, and Shi (2007) found distributing educational handouts to breastfeeding moms along with reinforcement from health care professionals improved breastfeeding goals and duration. This EBP project intervention followed a similar study design; therefore, the results were expected to be comparable. The EBP intervention began during summer 2017 (see Appendix F for project timeline flow) and consisted of a bi-fold, full color infant feeding education handout (see Appendix G). Information included in the handout was developmental readiness to introduce solid food, the benefits of breastfeeding and delaying solid food, and appropriate food choices. The student investigator provided the information to a local graphic design artist who designed a visually appealing handout. A majority of the content came from AAP recommendations. Additional content was derived from evidence based studies related to the project intervention.

In July 2017, following IRB approval, the student investigator conducted an educational session with the three participating nurse practitioners (ARNP) and staff at the intervention site. The student investigator presented the intervention, discussed the role of the ARNP, and provided the ARNPs copies of the handout, the recruitment letter, and IFI scales. The intervention began immediately following the educational session (See Appendix H). Recruitment began in summer 2017. Using convenience sampling, parents of newborns seen by the ARNPs at the two week well child exam who met the inclusion and exclusion criteria were identified by the student investigator and selected as potential participants. Recruitment continued until February 1, 2018 for the primary outcome of parental intention to delay solid food. A chart review was conducted on infants who turned four or six months of age by March 1, 2018 to determine if and when the introduction of solid food occurred. This secondary outcome was compared to national statistics.

Parents received verbal and written information about the intervention. A recruitment letter explaining the purpose of the survey, the student investigator's name and contact information, and how the information provided would be used was included with the educational handout (Appendix I). The recruitment letter directed participants to contact the student investigator with any questions.

Parent implied consent was indicated with the completion of the initial IFI scale at the two week well child exam. The participating ARNPs or staff nurses distributed and collected the forms from the parents with the student investigator's guidance. The IFI tool directed parents to contact the student investigator with any questions. Following the completion of the initial IFI scale, ARNPs or staff nurses distributed the infant feeding education handout along with other newborn information distributed by the intervention site. Parents were able to review the infant feeding education handout on the timing of solid food introduction between the two week well child exam and the two month well child exam. The student investigator accessed infants' medical records to determine the date and time of the two month well child exam to improve completion of the posttest IFI. At the two month well child exam, parents completed a second IFI scale which was distributed by the ARNPs or staff nurses. The data collected from the pretest IFI and the posttest IFI was used to measure the primary outcome of the project which was parental intention to delay solid food. It was expected that parental intention to delay solid food until six month of age would improve following the intervention.

The student investigator reviewed infant charts from the four and six month well child exam to determine if parents introduced solid food and the age of infant when solid food was introduced. This chart review was the measurement of the secondary outcome. The data collected from the four and six month well child exam visits was compared to national statistics.

It was expected that the percentage of parents delaying solids until six months of age following an infant feeding education program would be greater than the national percentage. Depending on the source, the percentage of infants not being introduced to solids before six months is as low as 7.1% to 18.8% (CDC, 2014; Clayton et al., 2013). Additionally, the mean age of introduction of solid food was expected to be greater in the project than the national average. The mean average of solid food introduction has been reported at 17.7 weeks, or slightly over four months of age (Clayton et al., 2013).

Change Process and EBP Model

Kotter and Cohen's Model of Change was used in this DNP project. A meeting was held with the participating ARNPs at the project site to create a sense of urgency to change their recommendation for introducing solid food. Education on the benefits of delaying solid food and adhering the AAP recommendation was believed to aid in the acceptance of the change.

The evidence based practice (EBP) model utilized for this DNP project was The Advancing Research and Clinical Practice Through Close Collaboration Model (ARCC). The student investigator served as the EBP mentor. This theory closely aligns with the infant feeding educational handout. Sustainability of the infant feeding education handout after the completion of this project is feasible given the ease of distribution; however, the sustainability is dependent upon the willingness to change practice recommendation by the participating nurse practitioners and physicians.

Study Design

The project was a one group, quasi-experimental pretest-posttest design. IFI data was used to compare parental intention to introduce solid food before and after an early infant

feeding educational handout. Data regarding the actual timing of the introduction of solid foods was collected from a chart review of the four and six month well child exams.

Validity

The internal validity of the infant feeding education handout was inferred after the IFI was completed following the distribution of the handout. The infant feeding education handout, the independent variable, was expected to cause a positive variation in parental intention to delay solid food, the dependent variable. A high IFI score, or stronger intention to delay solid food, was anticipated following the intervention which would have inferred internal validity. The percentage of parents in this study who actually delayed solid food until six months of age was expected to be higher than national statistics which would have inferred internal validity. The length of the study did not affect the outcomes as solid food introduction follows the chronological age of infants; however, more time would have allowed for more participants. A lack of diversity and concern of representativeness threatened external validity. Over 85% of the population of the county in which the intervention site is Caucasian (United States Census Bureau, 2015). The results of this study should only be generalized to communities with similar demographics. It would be invalid to generalize the findings to non-predominantly Caucasian communities.

Measured Outcomes

The objective of the infant feeding education handout was to increase the knowledge parents have regarding infant feeding practices, specifically the timing of introduction of solid foods. The primary project outcome measured was the parental intent to delay solid food until six months prior to receiving the intervention and parental intent to delay solid food until six

months following the intervention. The secondary outcome measured was the actual timing of solid food introduction.

Measurement Instrument

The measurement instrument used was the IFI scale. The IFI was developed to assess parental intention to breastfeed infants for the first six months of life (Nommsen-Rivers & Dewey, 2009). The data collected was a self-report from parents participating in the study. Participants self-recorded their answers on the distributed hard copy forms of the IFI scale. Nommsen-Rivers and Dewey (2009) found it took most participants only one to two minutes to complete the scale; therefore, it was expected to take participants five minutes maximum to complete each administered IFI scale. There was a total of two IFI scales administered, before and after the infant feeding education handout, and the total time involved in completing the IFI scales was likely less than 10 minutes. The IFI is a Likert-scale format which measures levels of agreement with the provided infant feeding statements (Nommsen-Rivers & Dewey, 2009). The original wording of the IFI was tailored for intentions for breastfeeding; therefore, the wording was slightly modified by the student investigator to measure the intentions for solid food introduction (see Appendix J for the five question IFI for solid food introduction). Permission to use and alter the IFI was requested and granted from Nommsen-Rivers in May 2017 (see Appendix K).

Nommsen-Rivers and Dewey (2009) used one-way Analysis of Variance (ANOVA) and a Cox proportional hazards regression model to assess for IFI validity. It was found that IFI scores were strong predictors of actual breastfeeding behavior (Nommsen-Rivers & Dewey, 2009). The reliability and validity of the IFI was likely affected due to the revision of wording to

include intentions for solid food introduction to infants rather than intended breastfeeding behavior.

Quality of Data

The size of the study was dependent upon participant recruitment. A priori power analysis was completed to determine a minimum sample size of 64 participants to achieve a medium effect size, a power of 0.8, and 0.05 alpha. The pre and post test data collected was compared to determine the effectiveness of the intervention. Additionally, the secondary outcome of parents' actually delaying solid food until six months of age was compared to national statistics of the actual timing of solid food introduction.

Analysis Plan

Using the results of the IFI scales, a paired sample t-test was expected to be used to assess the difference between participant intention to introduce solid foods before the interventional handout and the intention on when to introduce solid foods after reading and analyzing the handout (see Appendix L for SPSS template). Given the sample size of nine participants, descriptive statistics were used and SPSS was not required for statistical analysis. An increase in post IFI scores, or parental intention to delay solid foods until six months of age, was expected to be seen following the infant feeding education handout. Parents were asked at the six month visit about the actual timing of solid food introduction. This descriptive data was used to compare to national statistics to determine the impact of the infant feeding education handout. No additional times of measure were included to calculate the secondary outcome, so a further analysis was not required.

Results

Setting and Participants

The intervention began in August 2017 with data collection ending in early February 2018 to allow for adequate time for participating infants to turn four or six months by April 1, 2018. A total of 44 participants completed the IFI pretest but only 20 percent of them also completed the IFI posttest. Nine participants completed both IFI scales, resulting in a sample size of nine. Of the nine participants, all but one participant completed demographic information. The age of participants ranged from 23 years old to 34 years old with a mean of 26.75 years. Half of the participants identified themselves as Caucasian while the other half identified themselves as Hispanic. The infant was the first child for half of the participants. Three participants had one other child and one participant had two other children. The average number of children for participants was 1.625 children with a mode of this infant being the first child for participants. All data collection took place at the intervention site during normal business hours.

Actual Intervention Course

When the intervention began in August 2017, there were three nurse practitioners and four physicians who agreed to participate in the DNP project. In October 2017, two of the physicians decided to not participate going forward; therefore, any of their patients who initially participated by completing the IFI pretest did not complete the IFI posttest. Three nurse practitioners, two physicians, and the nursing staff still actively participated till the end of the data collection period in February 2018.

Outcome Data

An increase in IFI scores would have indicated an increase in parental intent to delay solid food introduction. Parental intent to delay solid food did not increase as expected following the distribution of the infant feeding education handout. There was no increase in total

IFI scores nor did any of the five posed questions see an increase in scores. The first question, *I am planning on introducing solid food to my baby as soon as possible*, had an average pretest score of 2 and an average posttest score of 1.78. The second question, *I am trying to breastfeed or at least try*, had an average pretest score of 3.56 and an average posttest score of 2.56. Question number 3, *When my baby is less than 2 months of age, I will only be feeding my baby breastmilk or formula*, was the only question that had no change in score between the pretest and posttest IFI scales averaging 3.56 for both scales. Question 4, *When my baby is 4 months of age, I will only be feeding my baby breastmilk or formula*, had an average pretest score of 2.89 and an average posttest score of 2.56. Question 5, *When my baby is 6 months of age, I will only be feeding my baby breastmilk or formula*, had an average pretest score of 2.22 and an average posttest score of 1.89. Overall, the average total IFI score fell 1.44 points from 13.77 to 12.33 (see Appendix M for Statistical Analysis Tables).

Discussion

Successes

The data did not reflect an overall increase in IFI scores; however, three of the nine participants, or 33 percent, did show improvement in their IFI scores. Although IFI scores did not show improvement in parental intent to delay solid food until six months of age, a chart review revealed a majority of the parents did delay solid food introduction with an average age of solid food introduction of 5.5 months. This is an improvement over the national average of approximately four months of age for solid food introduction (Clayton et al., 2013). The self-reported actual timing of solid food introduction was contrary to the findings of the self-reported decrease in parental intention to delay solid food until the recommended age of six months.

The infant feeding education handout was well received by the participating nurse practitioners, physicians, and the nursing staff. At the beginning of the study, the nursing staff was very cognizant of implementing the DNP project which is evident by the number of IFI pretests completed. There has also been interest from other new or expecting parents to receive the infant feeding education handout after hearing about the DNP project either socially or at the student investigator's other clinical sites.

Study Strengths

The effort needed to distribute and collect the IFI scales and distribute the infant feeding education handout required was minimal. It was included in the packet of information distributed to all parents of two week old infants at the first well child exam and required no additional effort on the part of the nursing staff, which is not only a strength but a weakness as well because it was often overlooked. Additionally, infant feeding practices is a recommended topic of discussion for anticipatory guidance and did not require any additional time spent with patients nor additional office visits.

Results Compared to Evidence in the Literature

The results were not expected based on the evidence in the literature. The literature suggested, based on the Theory of Planned Behavior, that parental intention about breastfeeding was closely related to the actual execution of the behavior, and it was assumed that parental intention regarding solid food introduction would produce similar results. Parental intention to delay solid food decreased in this study, yet parental behavior indicated otherwise. It was expected to see a younger age of solid food introduction given the decrease in IFI scores; however, participants in the study had an older age of solid food introduction than the national average.

Limitations

Internal Validity Effects

Internal validity was threatened for several reasons. While the student investigator reviewed participating provider schedules weekly and communicated scheduled two week and two month appointments with the project preceptor, potential opportunities to recruit new participants and collect the follow-up IFI posttest were missed. The participating nurse practitioners, physicians, and nursing staff have many tasks to perform at the two week and two month well child exam; the DNP project was a temporary task and would often times get overlooked.

External Validity Effects

The project site is located in an Iowa county that has a population that is predominantly Caucasian. Eight participants completed demographic information. Half identified themselves as Caucasian and the other half identified themselves as Hispanic. The information collected should not be generalized to communities with greater diversity as other races and ethnicities, such as Asian and African American, were not represented in this study sample.

Sustainability of Effects and Plans to Maintain Effects

A decrease in observed practice gains or change was witnessed during the execution of this DNP project. When the project began, the providers and nursing staff were highly motivated to participate in the project and distribute IFI scales and the infant feeding education handout to patients meeting inclusion criteria as evidenced by the relatively high number of participants, 44, who completed the IFI pretest. Overtime, the motivation and effort to actively recruit new participants gave way to other routine and required tasks set forth by the clinic. Because participation was voluntary, the sustainability of the project over time may wane unless it is

incorporated into regular standards of care for the project site or any other primary care pediatric site. For example, Vaccine Information Statements are required to be given to parents of newborns; therefore, it becomes second nature to distribute and discuss vaccination information. Unless all providers and nursing staff are required or even highly encouraged to distribute the infant feeding education handout, sustainability may not be feasible despite the level of evidence based information presented in the handout.

Efforts to Minimize the Study Limitations

A meeting with the participating ARNPs was held in the summer of 2017 prior to the implementation of the DNP project; however, no nursing staff members or physicians attended. The goal of the meeting was to involve the providers in the project and to encourage them to reiterate the information presented in the infant feeding education handout when they spoke about anticipatory guidance to parents during the two week well child exam. The meeting was successful in getting the ARNPs onboard to participate, but may have been more successful had the nursing staff and participating physicians been present.

Each week, the student investigator reviewed the providers' schedules for scheduled two week well child exams of patients likely to meet inclusion criteria. The student investigator also monitored the two month well child exam schedule for the patients who completed the pretest IFI scale. When the student investigator was present at the site, intervention materials were directly handed to the nursing staff of the provider with whom appointments were scheduled. The student investigator also communicated scheduled two week and two month well child exams weekly with the project preceptor so the project preceptor was able to distribute project material to the appropriate personnel when the student investigator was not present at the project site. Despite the frequent monitoring of schedules and communication, many opportunities to

collect IFI pretests and posttests were overlooked which impacted participant recruitment and final sample size.

Interpretation

Expected and Actual Outcomes

The objective of the infant feeding education handout was to increase the knowledge parents had regarding infant feeding practices. The primary project outcome was the measurement of parental intent to delay solid food until six months prior to receiving the infant feeding education handout and comparing that to parental intent to delay solid food until six months following the intervention. It was expected that the parental IFI score would increase following the intervention; however, the actual outcome was not reflective of the evidence used to support the intervention. The overall mean IFI posttest score was 12.33, a decrease by 1.44 from the overall mean IFI pretest score of 13.77. One possible reason for the unexpected outcome is the lack of control over what the nurse practitioners and physicians verbally instructed their patients to do regarding introducing solid food. While they were educated to verbally reinforce the education in the infant feeding education handout to delay solid food until six months of age, they may have verbally instructed the participants otherwise. The providers were not questioned on what they actually said to the participants. It was only assumed they would reinforce the infant feeding education handout; however, this action may not have occurred as anticipated. There were three participants who did have an increase in total IFI scores which was the expected outcome. Of the five questions posed on the IFI scale, four had a decrease in mean score from pretest to posttest and one question had the same mean score for both the pretest and posttest (see Appendix N).

The secondary outcome measured was the actual timing of solid food introduction. The mean age of solid food introduction is just over four months of age or 17.7 weeks (Clayton et al., 2013). Following a chart review, the mean age of solid food introduction for the study sample was calculated at 5.5 months or approximately 22 weeks. This was an unexpected finding as it was assumed the age of solid food introduction would have occurred at a younger age given the decrease in calculated IFI scores.

Intervention Effectiveness

The intervention did not go according to the project plan. Only 20 percent of the initial participants actually completed the posttest IFI scale. It was expected that the participating nurse practitioners and physicians reinforced the education in the infant feeding education handout and verbally recommended delaying the introduction of solid food until six months of age. The results of the study are not reflective of the evidence used to develop this intervention, so it was assumed that not all of the participating providers fully supported the infant feeding education handout. They may not have reinforced the education presented in the infant feeding handout and may not have verbally recommended delaying solid food introduction until six months of age. Additionally, some of participants saw different providers for the two week and two month well child exams which increased the risk of receiving conflicting information as the verbal recommendation of when to introduce solid foods is provider dependent and not standardized throughout the practice. The intervention would likely be more effective in an environment in which all providers are in agreement of when to introduce solid food and provide the same recommendation across the practice.

Intervention Revision

An improvement in outcomes may be seen in a smaller practice where all providers practice similarly and all make the recommendation to delay the introduction of solid food until six months of age. Another suggestion to improve the attainment of outcomes would be to purposefully schedule participants with the same provider for both the two week and two month well child exams to ensure consistency and reinforcement of information. The project intervention site was large and had many providers who did not have standardized solid food introduction recommendations.

Expected and Actual Impact to Healthcare System

Given the small sample size, it is difficult to assess the actual impact this DNP project had on the healthcare system, costs, and policy. There was no cost impact to the clinic as this project was funded by the student investigator. It required no substantial increase in time for providers and nursing staff to spend with the patients, so there were no additional costs related to any increases in hourly wage or overtime work. Based on a priori power analysis, 64 participants were required for the data to be statistically significant; therefore, a sample size of nine participants is not enough to accurately reflect the impact this project had or has the potential to have in the future on a healthcare system. If more participants were recruited and data was collected over a greater period of time, a conclusion could eventually be drawn given the potential this project may have on comorbidities of introducing solid food prematurely, especially childhood obesity, a condition that costs an estimated $14.3 billion annually in the United States (Hammond & Levine, 2010).

Conclusions

Practical Usefulness of Intervention

Infant feeding education is a standard topic of anticipatory guidance as outlined by the AAP (2008); therefore, the intervention did not increase the amount of time the practitioner spends with the patient because feeding should be discussed at every well child visit during the first year of life. The infant feeding education handout provides basic early infant feeding information. The information provided in the handout reinforces education that was verbally addressed by the practitioner. Utilizing both written and verbal instructions improves parental knowledge and satisfaction (Johnson & Sandford, 2005). The intervention provides practical usefulness in a pediatric primary care setting because it did not increase the amount of time spent with the patient and it reinforced verbal instruction.

Further Study or Implementation of Intervention

The synthesis of evidence concludes that appropriate timing of introducing solid food has beneficial health outcomes for infants including decreased risk of obesity, gastrointestinal infections, respiratory infections, and atopic disease (Duijts et al., 2010; Huh et al., 2011; Nwaru et al., 2013). Future studies may be performed on the sample of this study to determine if the incidence of obesity, infectious disease, and atopic disease are reduced as well. Translating the infant feeding education handout and IFI scales into other languages would also help increase participant recruitment and sample size.

Dissemination

This DNP project and ultimately the results of the study have the potential to benefit providers caring for infants and their families (see Appendix O for Logic Model). The DNP project was submitted for poster presentations at two conferences: the national conference for the National Association of Pediatric Nurse Practitioners and the regional conference for the Midwest Nursing Research Society (MNRS). The poster was accepted and presented as a

student poster on Saturday April 14, 2018 in Cleveland, Ohio at the MNRS conference. The project results will also be presented to the project preceptor. Even in the absence of the infant feeding education handout, providers can utilize the evidence based information in educating families on the importance of delaying solid food introduction to favorably impact infant health outcomes.

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Appendix A

Definition of Terms

Delayed solid food introduction: waiting until six months to introduce solid food.

Early introduction of solid food: starting solid food prior to six months of age.

Infant feeding education handout: Printed material distributed to parents with infant feeding information.

Intention: a parent's plan as to when to introduce solid food to infants.

Solid food: any food or drink given to infants other than breastmilk or infant formula.

Appendix B

Research Evidence Table

First author, year, title, Journal	**Research Design[1] & Evidence Level[2]**	**Sample & Sampling**	**Measures & Reliability (if reported)**	**Results & Analysis Used**	**Limitations**	**Sub-Topics**
First author: Duijts, Liesbeth Year: 2010 Title: Prolonged and exclusive breastfeeding reduces the risk of infectious diseases in infancy Journal: Pediatrics	RD: Quantitative, prospective non-experimental Melynk Level 4: cohort study	4164 infants, convenience	Questionnaires, parental reports on duration/exclusiveness of breastfeeding and infectious diseases. No reliability reported.	Breastfeeding for 6 months provides protection for the development of respiratory and GI tract infections during first 6 months Analyzed using multiple logistic regression analysis in SPSS.	No limitations included.	Infectious Disease
First author: Kuo, Alice Year: 2011 Title: Introduction of solid food to young infants	RD: Quantitative, non-experimental, Melynk Level 5: descriptive, multivariate	2068 parents of children between 4-35 months of age, convenience	Structured telephone interviews using the National Survey of Early Childhood Health (NSECH). No reliability reported.	Several social, demographic, and behavioral factors associated with the early introduction of solid food. Ex. White mothers with high school education or	Based on parental reports and recall	Obesity

Journal: Maternal and Child Health Journal				less had highest rate of introducing solid foods before 4 months of age. Analyzed using Pearson X2, logistic regressions, and Wald tests.		
First author: Bai, Y.K. Year: 2009 Title: Psychosocial factors underlying the mother's decision to continue exclusive breastfeeding for 6 months: an elicitation study Journal: Journal of Human Nutrition and Dietetics	RD: Qualitative Melynk Level 6: Single qualitative study	25 mothers 6-18 months postpartum who were exclusive breastfeeding (EBF) or had EBF experience	Self-administered questionnaire with six open ended questions. No reliability reported.	Popular results for salient consequences, social referents, and circumstances were presented. "Helping bond with the baby" most mentioned advantage to EBF. Most frequent disadvantage was "having to be present for all feedings." "The present study clearly demonstrates	Minimal sample size, open ended questions. Sample was from primarily white women in Midwest	Parental Intention

				that women place a very high value on the emotional and health benefits of continued EBF for 6 months" (p. 138).		
First author: Hetzner, N. Year: 2009 Title: Associations among feeding behaviors during infancy and illness at two years Journal: Maternal and Child Health Journal	RD: Quantitative, non-experimental. Melynk Level 4: longitudinal study	Approximately 7,900 children age 23.4 months or younger at time of data collection, convenience	Data collected from the Early Child Longitudinal Study-Birth Cohort (ECLS-B) was used to analyze three feeding practices during infancy (breast milk, formula, and solid food). No reliability reported.	Nearly 70% of infants were breastfed during first 6 months. Infants who were exclusively breastfed for 6 months had lowest percentage of both respiratory and ear infections. Analyzed using logistic regression.	No limitations included.	Infectious Disease
First author: Sun, C. Year: 2016	RD: cross sectional, population based study	3153 infants with feeding information, weight and length	Extracted information from the self-administered questionnaire. Used Student t test and x2 test to compare	Introduction of solid food at 5-6 months compared with earlier or later introduction is associated with decreased odds of	Cross sectional study, infant BMI at 1 year of age ay limit generalizability to	Childhood obesity

Title: The impact of timing of introduction of solids on infant body mass index Journal: The Journal of Pediatrics	Melynk Level 4: Quantitative	from the HealthNuts study. Convenience sample	characteristics. Logistic regression models examined the association between feeding and infant about normal BMI.	above normal BMI at 1 year.	a longer term outcome.	
First Author: Nwaru, B. Year: 2012 Title: Timing of infant feeding in relation to childhood asthma and allergic diseases Journal: Journal of Asthma and Clinical Immunology	RD: prospective cohort study Melynk Level 4	3781 infants	Cox proportional hazard and logistic regressions were used to analyze the association between duration of breastfeeding and timing of introduction of solid food on the development of atopy	Early introduction of certain foods (wheat, rye, oats, barley, egg, and fish) may decrease risk of atopy.	No limitations included	Infectious Disease, Asthma & Allergies
First author: Duryea, T.	RD: EBP Guideline	Target population: Parents of infants		Best early infant feeding practices including	No limitations included.	Infectious Disease, Childhood

Year: 2016 Title: Patient education: Starting solid foods during infancy Journal: retrieved from Up-To-Date	Melynk Level 1: clinical guidelines	Intended users: RNs, ARNPs, P.A.s, physicians		developmental milestones, solid food precautions, types of supplemental food		Obesity, Development al Readiness
First author: Clayton, H. Year: 2013 Title: Prevalence and reasons for introducing infants early to solid foods: variations by milk type Journal: Pediatrics	RD: Quantitative, non-experimental. Melynk Level 4: Longitudinal study	Sample included 1334 mothers who participated in the Infant Feeding Practices Study II. Convenience sampling was used.	Pre and postnatal questionnaires at 1, 2, 3, and 4 months were distributed and completed by participants.	More than 1/3 of mothers in study reported introducing solids before 4 months of age. Most common reason for introducing solids early was "My baby was old enough to begin eating solid food). Mothers who formula fed were more likely than mothers of breastfed infants to introduce solid foods early, although the reason is	IFPS II sample is not nationally representative (participants predominantly white, have moderate income, and English literate). Because mothers of low-economic status are more likely to introduce solids early, it is reasonable to think sample may underestimate prevalence of	Breastfeeding and Solid Food, Reasons Parents Introduce Solid Food.

				unknown/not well understood.	early solid food introduction.	
First author: Pearce, J. Year: 2013 Title: The types of food introduced during complementary feeding and the risk of childhood obesity: a systematic review. Journal: International Journal of Obesity	RD: Systematic Review Melynk Level 2	A total of 10 articles fulfilled selected characteristics.	Data was extracted and assessed using an adapted Newcastle-Ottawa scale. Categorized into three groups: macronutrient intake, food type/group, adherence to dietary guidelines.	High intakes of energy and protein in infancy can be associated with increase in BMI and fatness. Breastfed infants had lower intakes of energy and protein during infancy and had parents that were more likely to follow infant feeding guidelines.	Limited evidence on the extent of which protein intake between 4-12 months is important.	Breastfeeding and Solid Food
First author: Eidelman, A. Year: 2005, revised 2012 Title: Breastfeeding and	RD: Non-experimental, EBP guidelines Melynk Level 1: clinical guideline	216 references are cited in the policy statement.		AAP recommends that infants should be exclusively breastfed for 6 months.	No limitations were included.	Infectious Disease

the use of human milk Journal: Pediatrics						
First author: Wright, C. Year: 2011 Title: Is baby-led weaning feasible? When do babies first reach out for and eat finger foods? Journal: Maternal and Child Nutrition	RD: Population based cohort study Melynk Level 4: cohort study	609 infants after exclusion criteria Convenience sample	Questionnaires given at intervals during the first year of life.	Half of infants in cohort were reaching out for food and beginning to eat finger food by the age of 6 months with the majority of infants doing so at 8 months.	Similar studies have used different form of questions regarding self-feeding and finger food so can't be sure answers are directly comparable.	Developmental Readiness
First author: Brown, A. Year: 2013 Title: A exploration of experiences of mothers following	RD: Qualitative study Melynk Level 6: Single qualitative study	36 mothers of 12-18 months old infants Convenience sample	Semi-structured interviews of mothers who used baby led weaning approach	Mothers followed infant cues such as readiness, hunger, exposure and responses to various food textures, and taste preferences. Provides insight to experiences,	Sample size is smaller and is mothers who started and continued to use baby led weaning so isn't	Developmental Readiness

a baby-led weaning style: developmental readiness for complementary foods				attitudes, and decisions about baby led weaning.	representative of entire population.	
First author: Ashida, S. Year: 2015 Title: Competing infant feeding information in mothers' networks: advice that supports versus undermines clinical recommendations Journal: Public Health Nutrition	RD: Cross-sectional survey	81 low income mothers of infants 0-12 months of age Convenience sample	One time interviews.	Mothers received both supporting and undermining advice. Breastfeeding advice supported clinical recommendations of breastfeeding and not adding cereal to infant bottles.	Study findings may not be generalized to other others who have different social and economic backgrounds.	Breastfeeding and Solid Food, Reasons Parents Introduce Solid Food

First author: Walsh, A. Year: 2015 Title: Factors influencing first-time mothers' introduction of complementary foods: a qualitative exploration Journal: BMC Public Health	RD: Qualitative study Melynk Level 6: Single qualitative study	21 first time mothers in a metropolitan area Convenience sample	Interviews and focus groups using a semi-structured interview guide based on the Theory of Planned Behavior	First time mothers found that it was difficult waiting until 6 months of age to start solids despite guidelines. A good understanding of rationale behind recommendations was not demonstrated.	Can't be generalized to all settings.	Developmental Readiness, Reasons Parents Introduce Solid Food
First author: Frederiksen, B. Year: 2015 Title: Timing of solid food introduction is associated with urinary F2-isoprostane concentrations in childhood	RD: Longitudinal prospective cohort study Melynk Level 4: cohort study	336 healthy children less than 1,266 clinic visits in the Diabetes Autoimmunity Study in the Young	Urinary F2-isoprostanes were assessed in the sample population. An analysis was done on the association between F2-isoporstane concentration and infant diet exposures.	Increased F2-isoprostane levels indicate oxidative stress, which can damage lipids, proteins, and nucleic acids. Oxidative stress has been implicated in pathogenesis of many pediatric diseases including asthma, CF, JRA. Later solid	No limitations were included.	Asthma & Allergies

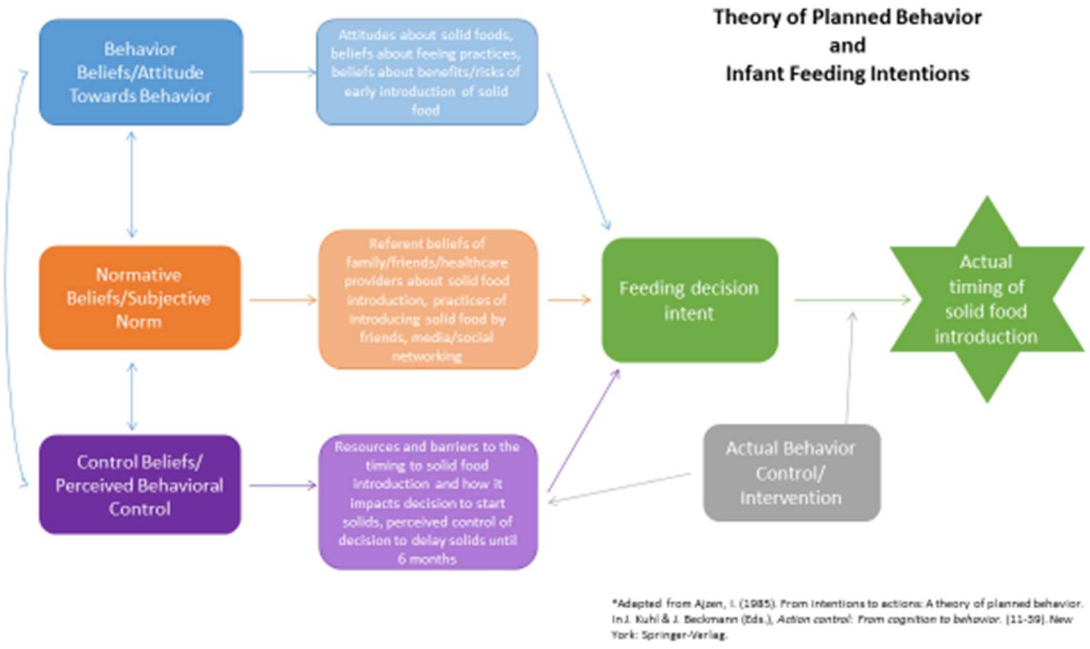
Journal: Pediatric Research				food introduction was associated with lower F2-isoprostane levels.		
First author: Hollis, J. Year: 2016 Title: Age at introduction of solid foods and feeding difficulties in childhood: finding from the Southampton Women's Survey Journal: British Journal of Nutrition	RD: Prospective cohort study Melynk Level 4: cohort study	3,158 live births from the 12, 583 women in the SWS.	Interviews and self-administered questionnaires. Questionnaires used a four-point Likert scale about six potential child feeding difficulty questions.	Children who were introduced to solid food at six months of age or greater were less likely to have feeding difficulties at age 3 than children who were introduced to solid food between 4-6 months of age. Feeding difficulties included not eating sufficient amounts of food, refusal to eat the right food, being choosy with food, over-eating, and being difficult to get into a feeding routine.	No limitations were included.	Developmental Readiness
First author: Moss, B. Year: 2014	RD: Longitudinal cohort study Melynk Level 4: cohort study	Sample of children from the Early Childhood Longitudinal Study-Birth Cohort. 6,950	Data was collected from the 9 month, 2 & 4 years waves of the Early Childhood Longitudinal Study. Height and weight	Obesity odds decreased with solid food introduction was delayed until 4 months. It was further decreased if	Breastfeeding was reported as a dichotomy (as either breastfed or not breastfed) which	Obesity, Breastfeeding and Solid Food

Title: Early childhood healthy and obese weight status: Potentially protective benefits of breastfeeding and delaying solid foods. Journal: Maternal and Child Health Journal		total children remained in sample for duration of study.	were taken at the 2 and 4 month waves. Contingency tables and multinomial logistic regression were used to analyze different weight statuses as it related to breastfeeding and three timing categories for solid food introduction.	combined with breastfeeding. Delaying solids and breastfeeding yielded consistently and substantially lower likelihood of obesity and greater probability of healthy weight status.	underestimated the benefits of breastfeeding in this study.	
First author: Brown, A. Year: 2016 Title: Maternal and infant factors associated with reasons for solid food introduction Journal: Maternal and Child Nutrition	RD: Qualitative study Melynk Level 6: Single qualitative study	756 mothers with infants age 6-12 months Convenience sampling	Open ended questionnaire describing main reason for introducing solid food. Purpose was to examine reasons why mothers introduce solid food and to explore the association between these reasons and maternal and infant factors.	Mothers who breastfed reported giving solids because they thought their infant was hungry and needed more than breastmilk. Signs of feeding readiness were also misinterpreted by mothers. Mothers who fed infants solid food prematurely did so for the same reasons.	Participants were self-selected, mothers were older and more educated. Study used retrospective design, asking women to recall feeding practices.	Developmental Readiness

First author: Jonsdottir, O. Year: 2012 Title: Timing of the introduction of complementary foods in infancy: A randomized controlled trial Journal: Pediatrics	RD: Parallel group, masked, randomized controlled trial Melynk Level 2: randomized controlled trial	119 healthy term infants Convenience sampling	119 infants were assigned to either the complementary food group or exclusively breastfed group. Multiple regression analysis was done to evaluate predictors of iron status at 6 months.	Giving complementary food at 4 months does not affect growth rate at 4-6 months of age but can have a positive effect on iron status at 6 months.	Iron status was not possible to measure at baseline.	
First author: Huh, S. Year: 2011 Title: Timing of solid food introduction and risk of obesity in preschool-age children. Journal: Pediatrics	RD: Prospective prebirth cohort study Melynk Level 4: cohort study	847 children in Project Viva. Convenience sampling.	Separate logistic regression models were used to analyze timing of solid food introduction and weight status. Mothers were asked to fill out a questionnaire about introducing solid food to their infants. Each child's height and weight was measures at 3 years of age.	Introduction of solid food prior to 4 months was associated with increased odds of obesity at age 3 years. Mothers who breastfed were more likely to delay solid food versus their formula feeding counterparts.	Generalization to more socioeconomically disadvantaged populations may be limited.	Childhood Obesity

Appendix C

Theory to Application Diagram



Appendix D

IRB Approval Letter and IRB Authorization Letter

Approval granted July 17, 2017.

Appendix E

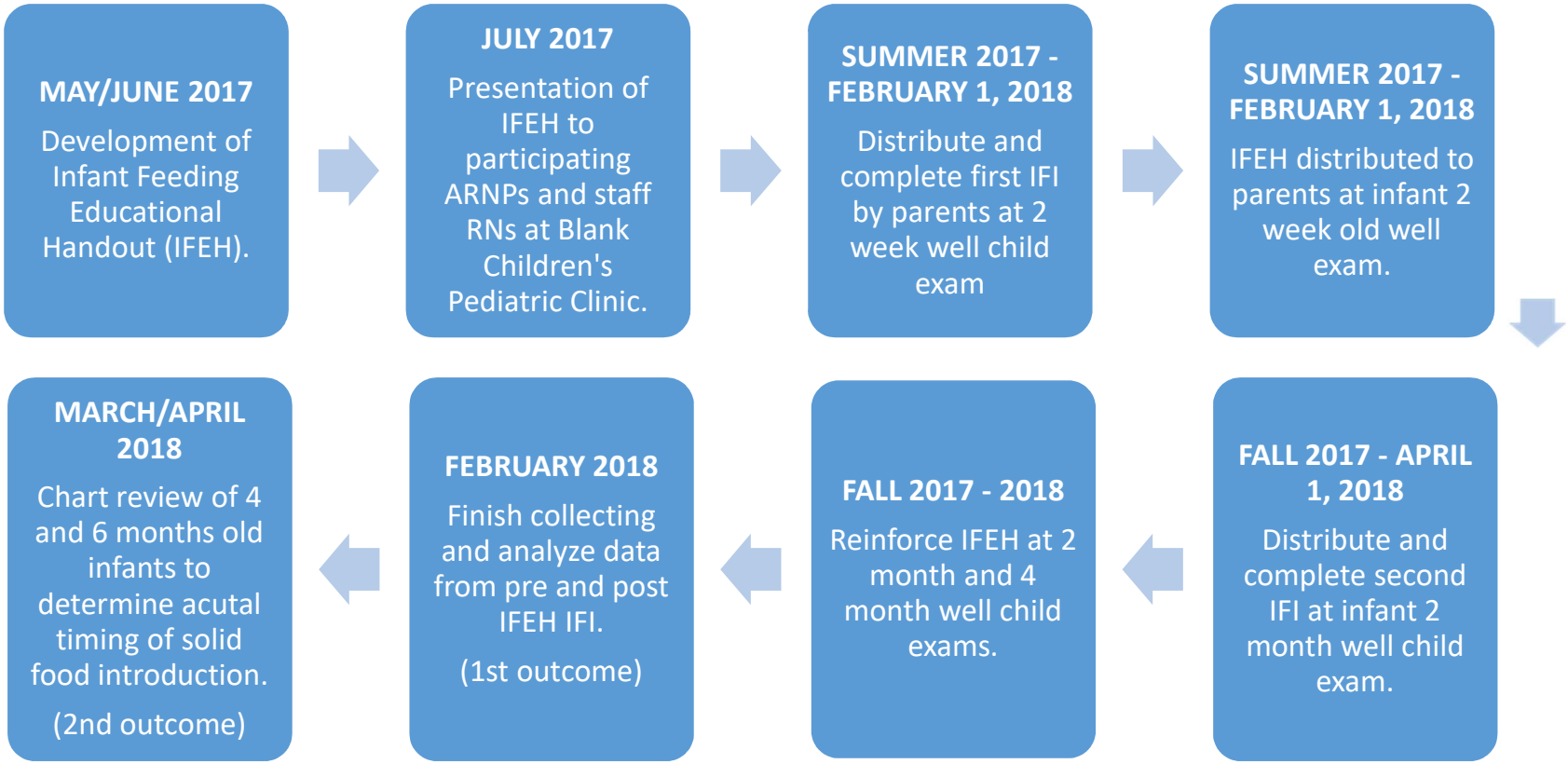
Cost Table for Project

- Graphic Designer for Infant Feeding Education Handout
  - Graphic designer produced handout at no cost to DNP student
- Print materials, 100 of each:
  - Infant Feeding Educational Handout, full color, double sided
  - Recruitment material, full color, single sided
  - Infant Feeding Intention Scale, pretest and posttest, black and white, single sided

	$113.48
• Envelopes	**$8.49**
• Portfolios	**$21.17**
TOTAL	**$143.14**

Appendix F

Project Timeline Flow Graphic



Appendix G

Infant Feeding Education Handout

INTRODUCING SOLIDS TO YOUR INFANT: KNOW THE STORY

WHO

According to American Academy of Pediatrics (AAP) and the World Health Organization (WHO), infants should be introduced to solid food at 6 months of age.

WHAT

OVER HALF OF INFANTS ARE FED SOLID FOOD TOO EARLY.

Safe foods for baby

- Rice cereal, barley, or oatmeal
- Fruit and vegetable baby food. You can purchase from store or make your own, just avoid adding salt or sugar.
- Easily dissolvable/mashable food: Cheerios, Gerber Puffs, yogurt, cottage cheese, toast, bananas, green beans, crackers.

Unsafe food for baby

- Hot dogs, nuts, seeds, whole grapes, popcorn, hard candy, honey (until 12 months of age).

WHEN

START INTRODUCING SOLID FOOD AT 6 MONTHS OF AGE. INFANTS SHOW DEVELOPMENTAL READINESS TO START SOLIDS AT 6 MONTHS OF AGE.

Things your baby should be doing before he or she is fed solid food (feeding cues):

- No tongue thrust reflex (usually disappears around 6 months of age)
- Push-up on straight arms
- Grasps food with hands or fingers and brings to mouth
- Sit unsupported
- Good head and neck control

Also start introducing the sippy cup with water around 6 months of age to help make the transition from the bottle easier. The goal is to be off bottle at 1 year of age.

ADDITIONAL RESOURCES

www.healthychildren.org/English/ages-stages/baby/feeding-nutrition/Pages/Switching-To-Solid-Foods.aspx

www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/HALF-Implementation-Guide/Age-Specific-Content/pages/infant-food-and-feeding.aspx

DO

- Start with small spoon or teaspoon of solid food, once per day.
- Increase the amount and frequency as baby desires and is tolerated.
- Introduce one new food at a time. Allow for 2-3 days between starting new food.
- Talk to your baby during feeding time ("Mmm, yummy food")

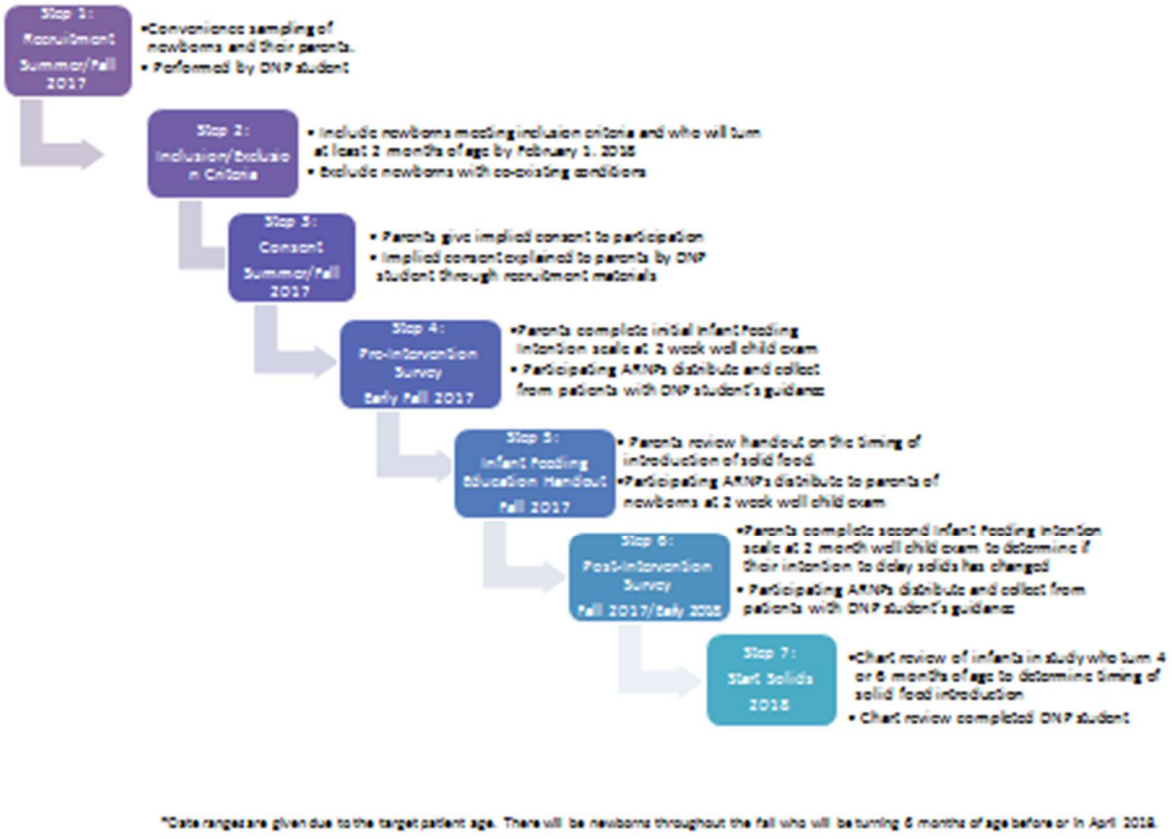
DO NOT

- Make your baby eat if he or she is crying or turning away from food. Try again later.
- Put cereal in your baby's bottle.
- Give food that requires chewing or that they may choke on.

As your baby starts to eat more solid food, he or she may drink less breast milk or formula.

Appendix H

Intervention Flow Diagram



*Date ranges are given due to the target patient age. There will be newborns throughout the fall who will be turning 6 months of age before or in April 2018.

Appendix I

Recruitment Letter

Dear New Parent(s),

Congratulations on the birth of your new child!

My name is Courtney Huston, RN and I am a Doctorate of Nursing Practice student from the . I am writing to tell you about my research study on early infant feeding practices. Because you just had a newborn and will be introducing solid food to your infant within the next year, you may be a part of this study. This study has been approved by Institutional Review Board (IRB).

In this study, you will complete a pre-test survey at today's two week well child visit. You will be sent home with an educational brochure about introducing solid foods to your infant. At your infant's two month well child visit, you will complete a post-test survey. It takes less than five minutes to complete each survey, both of which will be completed at your infant's regularly scheduled well child exam.

Remember, this is completely voluntary. If you'd like more information on the study or have questions about the study, please email me at . Thank you for your time.

Sincerely,

Courtney Huston

Appendix J

Infant Feeding Intentions (IFI) Scale

Permission granted to use.

Appendix K

Permission to use Infant Feeding Intentions Scale

RE: Permission to use Infant Feeding Intentions Scale

Nommsen-Rivers, Laurie (nommsele) <nommsele@ucmail.uc.edu>

Tue 5/23/2017 1:38 PM

Yes, best wishes with your research. Note that for ques on 2, we found content validity issues for La na respondents
(English and Spanish speaking). It was be er when modified to, “When my baby is born, I am going to breas eed or at least try.”

From:
Sent: Tuesday, May 23, 2017 2:27 PM
To: Nommsen-Rivers, Laurie (nommsele)
<nommsele@ucmail.uc.edu> Subject: Permission to use
Infant Feeding Inten ons Scale

Good afternoon Dr. Nommsen-Rivers.

My name is Courtney Huston and I am a BSN-DNP student at

For my doctoral project, I am evaluating the effectiveness of an evidence based infant feeding education handout on parental intention to delay solid food introduction to six months of age. I found your Infant Feeding Intentions ﴾IFI﴿ scale and would like to modify the wording slightly to make it applicable to the topic of solid food introduction instead of breastfeeding.

I am contacting you to ask for permission to use the modified IFI scale for my project. I have attached a copy of the modified version for you to review.

Please contact me with any questions or concerns. I appreciate your time and consideration in this request.

Sincerely,

Courtney Huston

Appendix L

Proposed Data Collection Template for Variables

	Name
1	IFIPretest
2	IFIPosttest
3	PreQuestion1
4	PreQuestion2
5	PreQuestion3
6	PreQuestion4
7	PreQuestion5
8	PostQuesti...
9	PostQuesti...
10	PostQuesti...
11	PostQuesti...
12	PostQuesti...
13	Age
14	Race
15	Numberofch...
16	

Appendix M

Statistical Analysis Tables

Table 1: Overall IFI score (n = 9)

Pretest mean	13.77
Posttest mean	12.33
Difference, p-value	-1.44

Table 2: Average IFI Score comparison by question

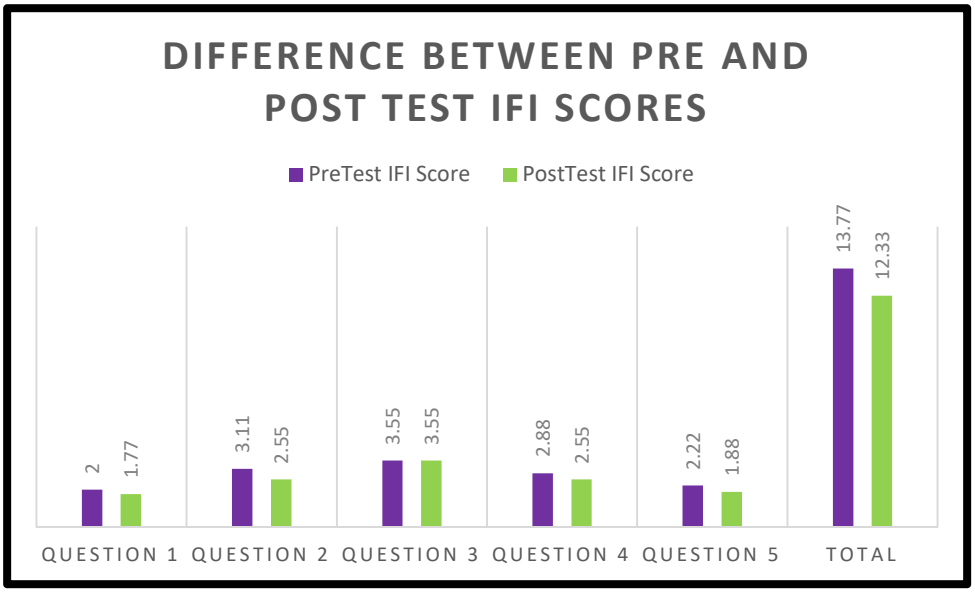
Question	Average Pretest Score	Average Posttest Score	Difference
1. I am planning on introducing solid food to my baby as soon as possible.	2	1.77	-0.23
2. When my baby is born, I am going to try to breastfeed or at least try.	3.11	2.55	-0.56
3. When my baby is less than 2 months of age, I will only be feeding my baby breastmilk or formula.	3.55	3.55	0
4. When my baby is 4 months of age, I will only be feeding my baby breastmilk or formula.	2.88	2.55	-0.33
5. When my baby is 6 months of age, I will only be feeding my baby breastmilk or formula.	2.22	1.88	-0.34

Table 3: Solid Food Introduction (n = 9)

	Yes No. (%)	No No. (%)
Solid food introduced at 4 month visit	2 (22%)	7 (78%)
Solid food introduced at 6 month visit	9 (100%)	0 (0%)

Appendix N

Study Results



Appendix O

Logic Model

Logic Model for DNP Project					
Student: Courtney Huston					
Inquiry, PICOTS: *In parents of term infants (P), does the use of an infant feeding educational tool on delaying the introduction of solid food to six months of age (I) in a primary care pediatric clinic (S), compared to no infant feeding tool (C) affect parental intentions of the timing of the introduction of solids foods and increase the number of parents who actually delay introducing solid food to their infants (O) until age six months (T)?*					
Inputs	***Intervention(s)*** *Activities*	***Outputs*** *Participation*	***Outcomes -- Impact*** *Short*	*Medium*	*Long*
Evidence, sub-topics *1. Infectious Disease* *2.Childhood Obesity* *3.Allergies & Asthma* *4.Breastfeeding* *5.Developmental Readiness* *6. Reasons Parents Introduce Solid Food* ***Major Facilitators or Contributors*** *1. ARNP support at site* *2. AAP recommendations* ***Major Barriers or Challenges*** *1. Changing practice for DNP project* *2.Lack of physician support* *3. Time constraints* *4. Number of patients*	***EBP intervention which is supported by the evidence in the Input column (brief phrase)*** *Infant feeding education handout* ***Major steps of the intervention (brief phrases)*** *1. Development of early infant feeding handout* *2. Presentation of handout to participating ARNPs* *3. Distribution to patients* *4. Verbal recommendation to delay solids along with handout* *5. Follow up of recommendations at subsequent visits until 6 months of age*	***The participants (subjects)*** *ARNPs at site will help distribute handout and provide verbal education to parents of infants less than 6 months of age* ***Site*** *Blank Children's Pediatric Clinic* ***Time Frame*** *Starting in August 2017 through February 1, 2018 (primary outcome) and/or April 1, 2018 (secondary outcome)* ***Consent or assent Needed*** *No* ***Other person(s) collecting data (yes,no)*** *No* ***Others directly involved in consent or data collection (yes/no)*** *No*	***(Completed during DNP Project)*** ***Outcome(s) to be measured*** *Primary: Intention of timing of solid food introduction* *Secondary, if applies: Actual delaying of solid food until 6 months* ***Measurement tool(s)*** *1. Infant Feeding Intention Scale* *2. Chart Review* ***Statistical analysis to be used*** ***1. Expected: paired t test Actual: Descriptive statistics*** ***2.Descriptive Data***	***(after student DNP)*** ***Decreased incidence of respiratory infections and secondary respiratory infections such as otitis media.*** ***Decreased incidence of aspiration pneumonia.*** ***Decreased incidence of gastrointestinal infections.***	***(after student DNP)*** ***Decreased incidence of obesity at age 3.*** ***Decreased incidence of childhood obesity at > 3 years of age.*** ***Decreased incidence of childhood obesity that carries over into adulthood.***

Appendix P

UMKC SoNHS Proposal Approval Letter

UMKC School of Nursing and Health Studies

June 21, 2017

Members of UMKC Institutional Review Board
University of Missouri-Kansas City
Kansas City, MO 64108

Primary Project Site IRB

UMKC IRB or Primary Project Site IRB,

This letter serves to provide documentation regarding Courtney Huston's Doctor of Nursing Practice (DNP) Project proposal. Ms. Huston obtained approval for her project proposal, *Improving Early Infant Feeding Practices with Evidence Based Infant Feeding Education Handout*, from the School of Nursing DNP faculty committee on June 21, 2017.

If I can provide any further information, please feel free to contact me.

Sincerely,

Susan J. Kimble

Susan J. Kimble, DNP, RN, ANP-BC, FAANP
Clinical Associate Professor
DNP Programs Director
UMKC School of Nursing and Health Studies
816-235-5962
kimbles@umkc.edu