

CHILDHOOD OBESITY PREVENTION: INFANT NUTRITION AND FEEDING
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ABSTRACT

Childhood obesity is a global concern, as of 2020 it affected 39 million children under the age of five. Obesity increases the risk of developing many health problems, including type-2 diabetes, hypertension, heart disease, asthma, sleep apnea, and others. Overweight and obese children are more likely to become obese adolescents and adults. Once obesity occurs, it is likely to persist as achieving and maintaining a healthy weight is more challenging. Many of the diseases related to obesity are now developing in childhood and adolescence.

Preventing obesity from occurring has the most promising effect on tackling the issue. Researchers have found that food preferences and eating patterns are developed in the first two years of life, therefore, to prevent obesity from occurring, the focus should be placed on nutrition during infancy. This practice improvement project aspired to increase parental knowledge regarding healthy nutrition and feeding during infancy. An educational session was conducted during a childbirth preparation classpost-educationtion survey showed that participants did report an increase in their knowledge regarding healthy nutrition and feeding during infancy.

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DEDICATION

I would like to dedicate this dissertation to Lori Askew. You had a special way of making all who knew you feel important. You made me feel like I belonged in the DNP program at NDSU, and for that I am forever grateful.

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LIST OF ABBREVIATIONS

AAP.....	American Academy of Pediatrics.
BMI.....	Body Mass Index.
CDC	Centers for Disease Control and Prevention.
DOI	Diffusion of Innovation.
DNP.....	Doctor of Nursing Practice.
EBP	Evidence-Based Practice.
PIP.....	Practice Improvement Project.
QR.....	Quick Response.
UNICEF	United Nations Children's Fund
USDA.....	United States Department of Agriculture.
WCV	Well Child Visit.
WHO.....	World Health Organization.
WIC.....	Women, Infants, and Children.

CHAPTER 1: INTRODUCTION

Background and Significance

Approximately 2.8 million people globally die each year because of being overweight or obese (World Health Organization [WHO], 2021a). In 2020, 39 million children under the age of five, worldwide, were overweight or obese. (WHO, 2021b). Obesity increases the risk of developing many health problems, including type-2 diabetes, hypertension, heart disease, asthma, sleep apnea, and others (Benson, 2020; Center for Disease Control and Prevention [CDC], 2017; Smith et al., 2020). People with obesity often struggle with decreased self-esteem, depression, and anxiety. Children with obesity are at increased risk of being bullied by peers and are more likely to become obese adults.

The WHO (2021a) states childhood obesity has become one of the most significant public health challenges of this century. Childhood obesity has become an epidemic in the United States, 17.8% of children and adolescents aged 2-19 years were obese in 2013-2016 (Healthy People 2030, n.d.). Many health issues seen in adulthood related to obesity are becoming more prevalent in childhood and adolescence (Benson, 2020; Nicolucci & Maffeis, 2022; Smith et al., 2020). Obese children are four times more likely to develop type-2 diabetes and 22.5%-52% more likely to develop nonalcoholic fatty liver disease compared to children with a healthy weight (Smith et al., 2020). Sixty percent of obese children have pediatric obstructive sleep apnea and 25% have high blood pressure (Smith et al., 2020). Weight-related stigma can occur in multiple settings for children with obesity including at home, in a clinic, and school. Once obesity occurs, it is very difficult to treat, therefore, the focus should be placed on preventing obesity from occurring (Benson, 2020). Prevention strategies can start as early as the

prenatal period and should focus on the first two years of life, as this is when habits related to nutrition and intake are developed.

This practice improvement project (PIP) focuses on the epidemic of childhood obesity and ways to prevent it. A review of literature defined obesity (specifically childhood obesity), examined childhood obesity prevention strategies and identified what barriers exist for parents, caregivers, and healthcare providers regarding the prevention of childhood obesity. After reviewing the literature, an education session was created to teach parents about healthy nutrition and feeding during infancy and presented at a childbirth preparation class.

Problem Statement

At the most basic level, weight gain occurs when one consumes more energy than is used. Eating an unhealthy diet, both food choices and serving size, and living a sedentary lifestyle are directly related to poor health overall (Smith et al., 2020; Tak & Lee, 2021). Children who are overweight or obese are more likely to become obese adolescents and adults. Evidence of treatment of childhood obesity has not been effective due to the inability to maintain a healthy weight long term (Benson, 2020; Tak & Lee, 2021). Thus, emphasis should be placed on preventing the occurrence of obesity. Food preferences and eating habits are developed during the first two years of life, which can influence the development of childhood obesity (Benson, 2020). Educating parents and caregivers on healthy nutrition and feeding practices during infancy may prevent obesity from occurring.

Purpose

The purpose of the PIP was to implement childhood obesity prevention strategies and to identify what barriers exist for parents and caregivers regarding childhood obesity. A review of the literature was completed and used to create an education session regarding nutrition and

feeding during infancy. Finally, a parent-focused educational session was implemented to prevent childhood obesity.

Objectives

1. Develop and implement an educational session for expecting parents regarding infant nutritional feeding guidance for newborns to age 12 months.
2. Compare and contrast perceived barriers between the existing literature and the project participants regarding childhood obesity prevention.
3. Increase parental knowledge regarding childhood obesity prevention in at least 10 households.

CHAPTER 2: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Theoretical frameworks are used to guide practice improvement projects, and a review of literature provides evidence to support the project. This chapter will include a review of Roger's Diffusion of Innovations theory along with a summary of supporting literature. The review of literature will be divided into the following topics: a) etiology of childhood obesity, b) patterns of weight gain in infancy, c) nutritional feeding and guidance during infancy, d) barriers to childhood obesity prevention, and e) current treatment options for obesity.

Theoretical Framework

Roger's Diffusion of Innovation Theory

Roger's Diffusion of Innovation (DOI) theory is one of the oldest social science theories and it is used to describe how over time a new idea spreads throughout a social system and is adopted into practice (LaMorte, 2019). The key to the DOI is an idea must be seen as new for diffusion to occur. Childbirth preparation classes typically focus on the last weeks of pregnancy, what to expect during the labor and delivery process, and the immediate postpartum period for mother and infant (Mueller et al., 2020). Childbirth education can empower individuals or couples in transition to parenthood, however, the general effects of childbirth or parenthood education are largely unknown due to a lack of standardization and quality of material covered (Akca et al., 2017). Teaching parents about healthy nutrition and feeding during infancy at childbirth preparation class is innovative as childbirth classes usually do not include infant feeding past the first few weeks of life. Educating on healthy nutrition and feeding during infancy in childbirth preparation classes will expose the expecting parent(s) to the topic earlier, in hopes to prevent childhood obesity. The following section will describe how the DOI theory can be applied to this PIP.

Dr. Everett Roger defines innovations as “an idea, practice or project that is perceived as new by an individual or other unit of adoption,” and diffusion as “the process in which an innovation is communicated through certain channels over time among the members of a social system,” (Chism, 2019). A child’s growth and development are usually discussed between parents or caregivers and healthcare providers at children’s well-child visits (WCV). For this paper, parent is defined as adoptive or biological parents, and caregiver is anyone else who cares for the child. The CDC recommends WCV occur at ages two weeks, two months, four months, six months, nine months, 12 months, 15 months, 18 months, two years, two and a half years, three years, and then annually until age 20. This PIP introduces parents to healthy nutrition and feeding prior to the birth of their child. The information learned during the PIP can then be reinforced at WCV as the child grows.

People learn and adopt new information differently and the DOI theory describes the five different types of adopters (Chism, 2019; LaMorte, 2019). The first type of adopters in the DOI theory are the innovators. These are the people who want to be the first to try something new and often initiate new ideas. Creating and implementing this PIP would fall under the category of innovators. Next are the early adopters, or the leaders. The early adopters are aware of a need to change and armed with the new information of how to change, will help lead the change. The project site sponsor and the dissertation committee for this PIP are considered the early adopters. The co-investigator, another adopter, proposed the PIP and helped to lead the change. The third type of adopters in the DOI theory are the early majority, they adopt new ideas before the average person. Early majority adopters need evidence of the innovation’s effectiveness before they will adopt it. Parents or caregivers that are early majority adopters recognize the epidemic of childhood obesity and apply what they learned during the childbirth preparation class to

provide healthy nutrition and feeding to their infant to prevent their child from becoming obese. Early majority parents may influence other parents to apply what they learned as well. Late majority adopters are skeptical of change and like information on how others have tried the innovation and have shown success before adopting. Parents or caregivers that are late majority adopters need more than just the facts about healthy nutrition and feeding during infancy. Late majority adopters will need examples and stories of how other parents or caregivers have been successful in implementing what they learned. The final type of adopter are the laggards. The laggards are very skeptical of change and bound by tradition. Laggards may need statistics and pressure from other type of adopters to be willing to change. Laggards are the parents or caregivers that resist the recommendations to providing healthy nutrition and feeding during infancy. There are many reasons why parents or caregivers may be laggards, most of the reasons can be considered a barrier to preventing childhood obesity. Two examples of laggards are parents or caregivers that come from a culture where having an overweight or "chubby" infant is seen as a positive perception or may come from a background that not finishing a bottle or eating everything on a plate is considered wasteful. Understanding the different characteristics of how people adopt new ideas was taken into consideration when creating the educational session for nutrition and feeding practices during infancy to prevent childhood obesity. Information in the educational session included innovations to prevent childhood obesity by teaching parents and caregivers' ideas on healthy nutrition and feeding practices, prior to the birth of the child. Guidance on how to instill healthy eating habits was provided.

Literature Review

A review of literature was completed for the topic of childhood obesity prevention. Databases used to search the literature include Cochrane Library, Cumulative Index to Nursing

and Allied Health Literature (CINAHL), and PubMed. Keywords searched included childhood obesity and prevention, childhood obesity and prevention and nurse practitioners, and childhood obesity and nutrition. Filters applied to the search were full text articles, publication years from 2015-2022, English language, as well as age groups consisting of infant, infant 1-23 months, and birth -23 months. For this PIP, infant will be used to describe a child from 0-12 months of age. A total of 1,290 articles were yielded from this search. Inclusion criteria articles addressed obesity prevention in the first year of life. Articles focusing on specific minorities or income classes were also excluded as they may not be applicable to all the participants in the childbirth preparation classes for this study.

Etiology of Childhood Obesity

Consuming more calories than what is expended leads to weight gain and excess body fat (Smith et al., 2020). Over the past several decades, the diet in America has progressively increased in the consumption of sugar sweetened beverages, low nutrient dense, and high saturated fat foods (Mameli et al., 2016; Savage et al., 2018; Smith et al., 2020). Convenient food choices, which may be higher in sodium, fat, and sugars, have become the norm, over healthy food choices, due to busy lifestyles and both parents working outside the home (Giampaoli et al., 2019)

The use of electronics has led to decreased levels of physical activity and an increase in sedentary behaviors. The portability of electronic devices such as phones, tablets, and computers has led to an increase of overall screen time. The youth in the United States average more than seven hours of screen time daily (Smith et al., 2020). The American Academy of Pediatrics recommends no screen time for infants under 18 months, with the exception of video-chatting.

Children aged two to five should be limited to one hour of high-quality programming per day, watched with their parent(s).

Poor diet and lack of activity in America's youth has led to an increase in childhood obesity. While there are many stages of development related to childhood obesity, this PIP will be focusing on infancy. Preventing obesity from occurring is the goal, educating parents or caregivers on how to help their child(ren) develop healthy eating habits could potentially help curb obesity from occurring.

Patterns of Weight Gain in Infancy

Growth charts account for age, sex, and relative body fat are used to evaluate the growth of people ages 0-20 years. (CDC, 2017). Body mass index (BMI) is calculated by taking a person's weight in kilograms and dividing by their height in meters squared. The weight status of a child aged two or older is assessed by using growth charts containing BMI percentiles that compare children of the same age and sex. According to the CDC, there are many unanswered questions regarding the use of BMI in infancy, so growth charts containing BMIs are not recommended until age two. For infants and toddlers ages 0-2, the CDC recommends using the WHO growth charts. The WHO growth charts measure weight for length and consider a normal range for weight-for-length between the second and 98th percentiles. Once a toddler reaches age two, the CDC recommends using the CDC growth charts with BMI percentiles. A child aged two to twenty that falls between fifth and 85th percentile has a healthy BMI. Overweight children have a BMI between the 85th and 95th percentile, and obese children's BMI is greater than 95th percentile (Benson, 2020; CDC, 2017; Mameli et al., 2016).

Healthcare providers need to understand childhood growth patterns and how to accurately interpret a child's data on the growth charts for assessment of undernutrition, overnutrition, and

to evaluate for abnormalities in the growth curve. Providers should not assume an infant will grow out of being obese (Hessler, 2015). For instance, if a child followed the curve and suddenly had a drop below the fifth percentile or a rise above the 85th percentile, the healthcare provider should inquire about the child's nutrition and activity level. The provider may be suspicious for metabolic diseases. Recognizing trends or sudden changes in the growth pattern is an important aspect of preventing childhood obesity, so interventions, such as changing diet and increasing physical activity, can be initiated.

Nutritional Feeding During Infancy

Responsive Feeding

Being able to recognize an infant's hunger and fullness cues is crucial to regulating an infant's healthy eating pattern (Savage et al., 2018). When parents or caregivers respond appropriately to infant cues regarding nutrition and feeding, the infant will learn to eat when hungry and stop eating when full. If parents do not understand their infant's hunger cues, they may use feeding as a way of soothing the infant when upset for reasons other than hunger, such as being tired, discomfort, or wanting to be held. Paying attention to an infant's hunger and fullness cues and responding accordingly is known as responsive feeding (Benson, 2020; Savage et al., 2018). Using food to soothe infants causes overeating and can lead to childhood obesity.

Hunger cues in early infancy, from birth to around three months, include opening and closing the mouth, bringing hands to the face, flexing arms and legs, and making sucking noises or sucking on lips, hands, fingers, toys, or clothing (Benson, 2020; United States Department of Agriculture [USDA], 2019). Four months of age hunger cues include smiling at the caregiver or cooing during feeding to indicate wanting more, as well as moving their head towards a spoon or trying to move food toward their mouth with their hands. As the infant continues to grow, hunger

cues will include the infant reaching for the food, pointing to food, getting excited when food is presented, and using words or sounds to indicate a desire for specific foods. Notice that crying was not listed as a hunger cue. Crying is a late sign of hunger and crying does not always mean the infant is hungry.

When an infant displays sign of fullness, whether breastfeeding, drinking from a bottle or eating solid foods, feeding should stop (Benson, 2020; Savage et al., 2018; USDA, 2019). From birth to three months fullness cues include the infant's sucking slows or decreases, their arms, legs, and fingers extend or relax, the infant turns head away, pushes or arches away from the nipple, or the infant may fall asleep. Around four months of age, fullness cues include releasing the nipple, sealing lips together, or paying attention to surroundings more. Around eight months, when infants are feeling full, they will slow down the rate of eating, may clench their mouth shut, push food away, or shake head to say, "no more." (Benson, 2020; USDA, 2019). Parents or caregivers that encourage or force infants to finish a bottle or eat everything on their plate, are teaching infants to ignore their internal fullness cues, and diminishes the infants the ability to self-regulate the amount ingested (Savage et al., 2018).

Savage et al. (2018), conducted a study that provided first time mothers a responsive parenting intervention for infants aged three weeks to one year. The mother-newborn dyads were randomized into one of two groups. The responsive parenting (RP) group was provided nutrition guidance five times during the child's first year, the control group was provided child safety interventions during the same frame. The study found that the RP intervention influenced feeding practices for first time mothers. The RP mothers provided more consistent feeding routines, were less likely to overfeed their infant by using food to soothe or to force their infant to finish the bottle.

Breast Feeding vs Formula Feeding

Breastmilk is lower in total energy and protein and higher in fat than most formulas (Mameli et al., 2016). The fat in breastmilk contains long chains of polyunsaturated fatty acids associated with lower glucose levels in breast-fed infant's skeletal muscle. Energy dense formula leads to a higher total energy intake or higher caloric intake. Formula fed infants consume up to 20-30% more volume of milk per feed, and usually eat fewer, larger meals, and tend to need fewer nighttime feedings compared to breastfed infants. For every additional 100kcal/day ingested by a four-month-old infant, there is 46% increased odds of being overweight at age three (Mameli et al., 2016).

The American Academy of Pediatrics (AAP), American College of Obstetricians and Gynecologist, American Academy of Family Physicians, the WHO, the United Nations Children's Fund (UNICEF) and many other health organizations recommend exclusive breastfeeding for the first six months of life, unless directed otherwise by a health care provider. Exclusive breastfeeding means that an infant consumes only human milk, with no supplementation of any other food or beverage, such as water, juice, non-human milk, or foods (USDA, 2019). Breastfeeding should continue for the first year of life, and then for as long as it is mutually desired by mother and infant, unless directed otherwise by a healthcare provider.

Breastfeeding provides positive effects upon the developmental, immunological, nutritional, psychological, social, and economic status of mothers and their children (USDA, 2019). Breastmilk is easy to digest, absorbed, and contains the composition changes to meet the infant's changing nutritional needs. Infants can self-regulate the amount of milk ingested when feeding from the breast compared to a bottle (Mameli et al., 2016). Breastmilk contains immunoglobulins that fight against viruses and bacteria. Some of the health problems that

breastmilk protects against include acute and chronic infections, atopic dermatitis, eczema, incidence of asthma, diabetes, leukemia, sudden infant death syndrome and most importantly obesity.

In 1991, the WHO and UNICEF launched a global program titled, the Baby-Friendly Hospital Initiative (BFHI). The program supports hospitals by “giving mothers the information, confidence, and skills necessary to successfully initiate and continue breastfeeding their babies” (Baby-Friendly USA, 2022). BFHI provides information on safe preparation of infant formula and feeding to mothers that make an informed decision to not to breastfeed.

Formula is a healthy option for infant nutrition. Parents that choose infant formula, should choose one that is iron fortified and prepare it according to the package directions (USDA, 2019). The BFHI and the Minnesota Department of Health recommend “paced bottle feeding” for an infant’s bottle-feeding journey. Paced bottle feeding technique should be used for breastfed babies that use a bottle and formula fed babies (MN Department of Health, n.d.). Paced bottle feeding mimics the swallow and rest pattern of breastfed infants and promotes the bottle fed infant to self-regulate the amount they drink. The infant is held in a semi-upright position and the bottle is held horizontal to the floor. The nipple should only be half filled with breastmilk or formula while the infant is sucking. After the infant swallows three to five times, the bottle should be tipped downward, while keeping the nipple in the infant’s mouth, to give the infant a rest for about 20-30 seconds. When the infant begins to suck again, tip the bottle back up to allow breastmilk or formula to flow into the nipple. Continue the cycle of swallowing and rest until the infant shows signs of fullness. After several days of paced bottle feeding, the infant will learn to pace themselves.

Starting Solids

Starting solid foods too early can cause an infant's weight to increase disproportionately to their length and can result in increased weight for length percentages, this may raise concern for becoming overweight or obese (Hessler, 2015). Despite AAP recommending parents only give their infant breastmilk in the first six months, 32% of United States (U.S.) infants are given complimentary food or beverages before age four months (USDA, 2020). Parental exhaustion and desire for sleep has been found to be influenced by family and friend's recommendations to add cereal to the infant's bottle to promote sleep (AAP, 2021). There has been no scientific research to support this recommendation, therefore, parents should be discouraged from this practice. It is recommended that nothing, but breastmilk or infant formula be giving to infants until they are developmentally ready to eat solid foods. Introducing solid foods should begin when the child displays signs of being developmentally ready. These signs include the following:

- Shows an interest in the food others are eating
- Holds head up without support
- Sits upright in a highchair
- Opens mouth when food is near
- Moves food from the front to the back of the mouth
- Swallows food instead of using tongue to push it back out of mouth

If the period of developmental readiness is missed, the infant may have nutritional deficiencies, show signs of failure to thrive, and have difficulties learning to eat when introduced later (USDA, 2019). Parents or caregivers that do not recognize the infants feeding cues need to be referred to resources to educate them on infant feedings. The infant's healthcare provider, parenting classes, or USDA Women, Infant & Children (WIC) may be able to assist in teaching.

Parents need to be aware of what types of food to offer their infant. Once the infant shows signs that they are developmentally ready to start eating solid foods, the caregiver should offer single item pureed food, such as pureed squash, peas, bananas, or iron fortified infant cereal (Benson, 2020; USDA, 2019). Introducing a new, single ingredient, food item can be done every three to five days. Spacing the time between offering new food items allows for caregivers to watch for signs of allergies. Signs of an allergy include nausea, vomiting, diarrhea, abdominal pain, coughing, wheezing, itching, hives, and skin rashes. If parents or caregivers suspect an allergic reaction, feeding that item should stop and the parent should be encouraged to reach out to the infant's health care provider for further direction. Offering a variety of healthy fruits, vegetables, proteins, whole grains, and dairy will help the child develop a healthy food palate (Benson 2020; USDA, 2019).

Foods to Avoid

A healthy diet for infants and toddlers includes avoiding certain foods. Some foods are avoided because the infant's digestive system has not developed enough to digest the foods. Other foods do not provide nutrition and may lead to a palate preferring unhealthy items.

Honey should not be given to a child less than 12 months old (CDC, 2017). Honey can contain botulism spores that an infant may not be able to digest, causing a serious type of food poisoning. Cow's milk should not be given to infants in the first year of life (USDA, 2019). Regular cow's milk has higher concentrations of protein and minerals, making it more difficult to digest and can stress the kidneys. Cow's milk is lacking the required amount of iron, vitamin C, and other nutrients required for healthy growth and development in infants. At 12 months, whole cow's milk may be given to children unless directed otherwise by the child's healthcare provider (Benson, 2020; USDA, 2019).

Introducing sugar, syrup, and sugar-sweetened beverages early in life promotes tooth decay and increases the likelihood of taste preference to sweet items, leading to overconsumption later in life and an increased risk of being overweight or obese (USDA, 2019). Desserts such as cakes, cookies, candies, and pastries should be avoided, as they are higher in sugar and fat. Artificial sweeteners should also be avoided in young children. Since infants are growing rapidly, there is no need for low calorie food or beverages in their diets. There are limited studies regarding the consumption of artificial sweeteners in children and the AAP has no official recommendations, therefore, these items should be avoided.

Infant food does not need salt added to it. Like sugar, early exposure to salt can lead to taste preferences and sets the stage for over consumption later in life. Salty foods can lead to obesity, high blood pressure, and cardiovascular disease (USDA, 2019). Fried food, sauces, gravies, and processed meats should be avoided in infancy. They are high in salt and fats and are difficult for the infants developing digestive system to digest. These foods can also increase the likelihood of developing obesity.

Eating Environment

A child's environment has a direct influence on childhood obesity (Giampaoli et al., 2019). The environment should be calm, without loud noises or activities that may be distracting to the infant. Eating meals while watching TV or looking at a screen is associated with poor diet and eating patterns, such as overeating. Avoiding TV during mealtimes can relate to eating more vegetables and fruits and more mindful eating (Benson, 2020). Eliminating the distraction of the TV allows one to recognize satiety cues. Having family mealtimes together without the use of electronics is a way to model a healthy eating environment for children (Benson, 2020).

What foods a child chooses to eat is influenced by observing others (Lumeng et al., 2015). When possible, those at the meal should eat the same healthy foods to encourage and teach the infant to eat healthy too. As the infant grows, they will have been exposed to more food items and different textures, which will allow them to eat the same food as the other members of the family. For example, initially the infant may eat pureed carrots, while others at the table may eat raw carrot sticks; as the infant grows, they will be able to eat cut up pieces of cooked carrots, then small pieces of raw carrots, and then eventually carrot sticks. This process may take several months depending on the development of the child and the number of teeth the child has.

Barriers

Many barriers to preventing childhood obesity exist. Discovering the different barriers is needed to try to understand why childhood obesity continues to be a problem. Parental perceptions, using food to soothe an infant, and interactions with healthcare providers will be discussed in the following paragraphs.

Parental Perceptions

Parental perception of children's weight status can influence nutrition and feeding patterns in infancy. A study by Brown et al. (2016), found most parents perceived their child being at a healthy weight, regardless of the child's actual weight. Ten percent of healthy weight children were perceived as underweight. Parents who perceive their child as underweight may try to have their child gain weight, leading to unhealthy patterns of overeating. Brown et al. (2016) also found mothers who were overweight were more likely to underestimate their child's weight status. Parents that underestimate their child's weight are less likely to be concerned about their child's weight, don't seek interventions to manage weight or follow through with recommendations (Benson, 2020; Smith et al., 2020).

Feeding to Soothe the Infant

Feeding is often used by parents and caregiver to soothe a crying infant. Crying is a late sign of hunger, but all crying does not necessarily mean an infant is hungry. Using food as way to soothe an infant can lead to greater weight gain in infancy (Lumeng et al., 2015). A randomized clinical trial by Savage et al. (2018), taught parents' alternative strategies to soothe a crying infant, such as swaddling or non-nutritive sucking. The infants in the intervention group where the parents used alternative soothing strategies had slower weight gain during the first 6 months of life and reduced prevalence of overweight at one year compared to the control group (Savage et al., 2018).

Healthcare Provider Interactions

It is estimated that 90% of children under the age of two attend regular WCV (Benson, 2020). Healthcare providers are in a position where they can educate on healthy nutrition and feeding during infancy, however, limited time during WCVs makes it difficult for healthcare provider to deliver all necessary education appropriately (Benson, 2020; Hessler, 2015). During WCV, the provider must assess the child, review many topics of growth of development related to the child's age, and answer any questions or concerns the parent or child may have. When the provider does all the previously mentioned items, it leaves little to no time to discuss concerns related to childhood obesity.

A barrier to childhood obesity prevention may be related to the healthcare provider's comfort level in discussing issues related to the child's weight, especially if the parents were overweight (Hessler, 2015). Growth charts are essential tool to begin the discussion of weight status, however, parental denial and defensiveness make the conversation challenging. Parents may have excuses for why the child may be overweight. These excuses include the child is a

picky eater, obesity runs in the family, or they do not have time or resources to make healthy meals (Hessler, 2015). Motivational interviewing may support the provider in discussing with parents the sensitive issue of weight status. This is done by asking questions that allow the parents to come to realize issues related to their child's weight and how to manage it.

Treatment

The first line treatment for overweight and obesity in people of all ages is diet and lifestyle modifications. The long-term adherence to lifestyle modifications is low. Approximately one-third of individuals who achieved significant weight loss return to their original weight within a year, and almost all people will return to their original weight within five years (Tak & Lee, 2021).

Weight loss medications approved by the USDA include Orlistat, Liraglutide, Phentermine/Topiramate, and Naltrexon/Bupropion. Depending on the medication, pharmacotherapy for weight loss is approved for individuals aged 12 and older. Weight loss medications carry a variety of side effects, including nausea, vomiting, constipation, or diarrhea, which makes adherence to long term use of these medications difficult (Nicolucci, & Maffeis, 2022; Skelton, 2021; Tak & Lee, 2021). Cost of medications is another factor to maintaining compliance with pharmacotherapy for overweight and obesity. Once drug therapy for obesity management is discontinued, weight reduction is not sustained.

Bariatric surgery is an effective treatment for severe obesity (Heffron et al., 2020; Kansra et al., 2021; Kheniser et al., 2021; Nicolucci & Maffeis, 2022). Only one percent of patients eligible for bariatric surgery undergo surgery (Heffron et al., 2020; Kheniser et al., 2021). To be considered for surgery, adolescents must have completed most of their linear growth and need to have participated in a structured weight reduction program for at least six months. Surgeries for

weight loss require a multi-discipline approach including the bariatric surgeon, a pediatrician or primary care provider that specializes in adolescent medicine, endocrinology, gastroenterology, nutrition, registered dietitian, mental health provider and exercise specialist. Just like any surgery, bariatric surgery comes with risks. Some of the complications of or related to bariatric surgery include nutritional imbalances in iron, calcium, vitamin D and B12. The data for adolescent patients five years after bariatric surgery are promising, however, the lifetime outcomes are still unknown (Kansra et al., 2021). Despite bariatric surgery being the most promising treatment for sustained weight loss, patients must commit to a lifetime of nutritional supplements and dietary modifications to keep the weight off and maintain overall health.

Once obesity occurs, despite treatment, it tends to be a lifelong battle of trying to achieve and maintain a healthy BMI. Given the difficulties of obesity, the focus of health care providers, patients and parents should be preventing obesity from occurring. Just as treating obesity is multifaceted, prevention is too. Many of our behaviors related to eating patterns and food preference are learned during the first two years of life. Since the risks for obesity can be influenced in a child's early life, healthy nutrition habits must start in infancy.

Conclusion

If a parent, caregiver, or healthcare provider does not perceive an infant's weight as overweight or obese, opportunities will be missed to intervene and prevent a child's increased weight from becoming a lifelong issue. Responsive feeding promotes the infant in developing appropriate hunger and fullness cues to prevent overeating. Exclusive breastfeeding during the first six months should continue to be recommended, when possible, as research has shown there to be protective factors against developing obesity. Introduction of solid foods should wait until the infant displays signs of being developmentally ready. Environment plays an important role in

establishing eating patterns. After reviewing the literature, a need has been identified for educating parents and caregivers on healthy nutrition and feeding during infancy. This will give their child the best chance at developing lifelong healthy eating patterns.

CHAPTER 3: METHODS

Overall Project Design

The overall goal of the PIP was to implement childhood obesity prevention strategies and to identify what barriers exist for parents and caregivers regarding childhood obesity. A review of literature was completed and used to create an education session regarding nutrition and feeding during infancy. Finally, a parent-focused educational session was implemented to help mitigate the development of childhood obesity.

Implementation Plan

Evidence-based Practice Model or Logic Model

The Iowa Model of Evidence-Based Practice (EBP) was developed by nurses from the University of Iowa Hospitals and Clinics in the early 1990's (Buckwalter et al., 2017). The Iowa Model was based on the DOI theory and takes evidence found in research and uses that evidence to make a change. In 2012, the Iowa Model Collaborative revised the model to include seven steps of how to promote excellence in healthcare using EBP. The revised model is displayed in a streamlined, linear format and is easier to follow (Appendix A). Permission to use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care for this PIP was obtained from the University of Iowa (Appendix B) The following paragraphs will describe how the logic model will be used to guide this PIP.

Step 1. Identify Triggering Issues or Opportunities

Identifying a key issue is the start to any project that is being initiated. For this PIP, the triggering issue is childhood obesity. The prevalence of childhood obesity worldwide has increased from four percent in 1975 to over 18% in 2016 (WHO, 2021b). Once a child becomes obese, they are more likely to become obese adults (Smith et al, 2020; Tak & Lee, 2021). Being

overweight or obese contributes to many health problems, many of which are now being diagnosed in childhood. The treatment of obesity is multifactorial and includes, but is not limited to, diet, sleep, physical activity, mental health, screen time, home environment, and self-regulation (Smith et al., 2020). Due to the complexity of treatment, prevention is a simpler way to address the obesity epidemic in the U.S.

Step 2. State the Questions or Purpose

The second step in the Iowa model is the statement of purpose. The purpose of the PIP was to implement childhood obesity prevention strategies and to identify what barriers exist for parents and caregivers regarding childhood obesity. A review of literature was completed and used to create an education session regarding nutrition and feeding during infancy. Finally, a parent-focused educational session was implemented to help mitigate the development of childhood obesity.

Implementing childhood obesity prevention strategies, and identifying what barriers exist for parents needs to be a priority. What, when, and how much an infant is fed during the first two years of life, shapes the infant's growth and their dietary preferences (Savage et al., 2018). Educating parents on healthy nutrition and feeding during the first year of life will hopefully set the groundwork for teaching children healthy eating patterns for life.

Step 3. Form a Team

The third step in the Iowa model is developing a team. The team was made up of a dissertation committee from the North Dakota State University (NDSU) School of Nursing and education staff from an urban hospital in Fargo, North Dakota (ND). The dissertation committee members were chosen based on criteria developed by the NDSU graduate school. The committee chair is a Doctor of Nursing Practice (DNP) faculty member who has chaired several DNP

committee's previously and has been a DNP since 2008. The second member of the committee has been a DNP in the family practice setting for over 5 years and recently became a faculty member at NDSU in the graduate school of nursing. The third member of the team is a graduate school appointee. He is the Senior Associate Dean of the College of Health Professions at NDSU and has served on other DNP committees related to the topic of obesity. The fourth member of the team is a DNP from the community who has expertise in the topic of childhood obesity.

Step 4. Assemble, Appraise, and Synthesize Body of Evidence

An extensive review of literature was completed using online electronic databases and from the assistance of the university librarian. All resources were scholarly articles obtained from the North Dakota State Universities library database system. The articles were reviewed for relevance and reliability and validity. Journal articles from the last five years were analyzed to look for consistent findings among studies and publications. A thorough review of literature was completed, and sufficient evidence was found to support the need for preventing childhood obesity. The prenatal period up to age two are considered a critical time to preventing childhood obesity as this is the time when parents can teach healthy eating habits and children develop food preferences (Mameli et al., 2016; Savage et al., 2018).

Step 5 and 6. Design and Pilot the Practice Change. Integrate and Sustain the Practice Change

The purpose of the PIP was to implement childhood obesity prevention strategies and to identify what barriers exist for parents and caregivers regarding childhood obesity. After a thorough literature review, an educational session utilizing PowerPoint™ was created regarding infant nutrition and feeding for parents expecting a child. Dr. Ashely Benson (2020) completed a practice improvement project that developed a parent-focused educational curriculum for

healthcare providers to use at WCV. Her educational curriculum consisted of handouts that corresponded to each WCV from two weeks to three years old. Dr. Benson's PIP was used to guide the development of the educational session. The PowerPoint™ presentation included portions of her nutritional handouts for infants aged two weeks to 12 months.

Setting

The PIP took place during childbirth preparation classes conducted virtually through an urban hospital in Fargo, ND. Participants in the childbirth preparation class included parents or caregivers that were expecting or would be caring for a newborn child. Due to the COVID-19 pandemic the participating facility's childbirth preparation class was held virtually via Microsoft Teams™. The participants enrolled in the class were from the urban area and surrounding rural communities of Fargo, ND and rural Minnesota (MN).

Sample

Participants for the PIP included parents or caregivers that attended a childbirth preparation class through the participating facility. A description of the PIP and invitation to participate was emailed to the participants by the participating hospital's education staff member who coordinates the childbirth preparation classes (Appendix C). Participant consent was displayed at the beginning of the PowerPoint™ presentation and at the beginning of the post education survey. Consent was implied by the participant remaining in the virtual meeting during the time of the educational session (Appendix D). All participants were 18 years of age and older and English speaking.

Resources

An educational session was created using Microsoft PowerPoint™ and presented by the co-investigator. The session included recommended nutrition and feeding practices for infants

ages two weeks to 12 months based on the review of literature, AAP guidelines, USDA guidelines, and the WIC program recommendations. The educational session was presented live via Microsoft Teams™ to participants enrolled in childbirth preparation class conducted through an urban hospital in Fargo, ND.

A post educational session survey was created using Qualtrics (Appendix E). Qualtrics is an online software tool that is used to develop, send, and analyze surveys. The survey was available to participants via a quick response (QR) code at the end of the presentation. The QR code was also emailed to the participants by the hospital's education staff member after the childbirth preparation class was complete.

The intent of the survey was to obtain information to describe the population included in this PIP and evaluate if objectives two and three were met. The survey inquired about demographical data of age, gender, and race of the participants in the study. The co-investigator wanted to learn more about the population, such as marital status, education level, household members, employment status, average annual household income, and food insecurity, but the organization site limited what was included in the survey. The organization site was concerned that asking more about the participants demographical data would limit the ability to keep responses anonymous. Also, there was concern that if participants were to disclose food insecurities, there would not have been a way to follow-up with them.

Twelve Likert scale questions asked participants to rate their knowledge or confidence level regarding healthy nutrition and feeding during infancy prior to and after participating in the educational session. The questions were chosen based on the main objectives discussed during the presentation which included hunger and fullness cues, signs an infant is developmentally ready to eat solid foods, healthy foods choices, and foods to avoid during infancy. Asking

participants to rate themselves prior to and after implementing the educational session allowed to evaluate for an increase in knowledge. Two of the Likert questions asked about the importance of teaching children healthy eating habits and another question asked participants to disclose any perceived barriers to providing healthy nutrition to their child(ren). Asking about the importance of teaching healthy eating habits and perceived barriers was seeking for information from the participants to be compared to the literature review. Two open-ended questions allowed for participants to share what they felt was beneficial to them in the presentation and if there were other areas they would have liked to have seen included in the presentation. The open-ended questions were included so that if the organization continues to include healthy nutrition and feeding during infancy in the childbirth preparation class, that the participating organization could make changes to the presentation if needed. The survey also included a Likert scale question for participants to rate their level of satisfaction with the educational session.

Prior to initiation of the PIP, permission was obtained from North Dakota State University Institutional Review Board (IRB) (Appendix F) and the participating organization's approval of the project (Appendix G). All collected cohort data obtained was kept confidential. The primary and co-investigator do not know the participants names or date of birth. The survey results were kept online on a password protected computer.

Step 7. Disseminate Results

The project proposal was disseminated through a poster presentation at the North Dakota Nurse Practitioner Association Pharmacology Conference in September 2021. The findings from this PIP will be emailed to the project site's education coordinator. The project was disseminated to the project committee as partial fulfillment for the Doctor of Nursing Practice requirements

through North Dakota State University in April 2022. A final poster was created and presented at the Annual Research Day at North Dakota State University in May 2022.

Evaluation/Outcomes/Data Analysis

Objective 1

The first objective was to develop and implement educational session regarding infant feeding and nutrition for households with infants and children ages two weeks to 12 months. Objective one was met by the creation of a PowerPoint™ presentation titled, “Infant Nutrition and Feeding.” The presentation was successfully conducted in February 2022.

Objective 2

The second objective was to compare and contrast perceived barriers between the existing literature and the project participants regarding childhood obesity prevention. Objective two was evaluated by asking participants in the educational session to disclose barriers they perceive, such as time, money, knowledge, or access to healthy food. A Likert scale question on the survey asked participants to rate how important it was to teach their child(ren) healthy habits to prevent childhood obesity.

Objective 3

The third objective was to increase parent/caregiver knowledge regarding childhood obesity prevention in 10 households by providing education on infant feeding and nutrition. The participants in the childbirth preparation class who participated in the educational session were given the opportunity to complete a survey regarding the education session. The survey collected demographical data related to the participant including age, gender, and ethnicity. Questions with a Likert scale regarding knowledge of childhood obesity prevention, infant hunger and fullness cues, developmental signs an infant is ready to start eating solid foods, ability to identify healthy

food choices, foods to avoid for infants, and importance of teaching healthy food habits were asked. Surveys were analyzed to evaluate whether the educational session increased the participant's knowledge regarding childhood obesity prevention.

Conclusion

Being overweight or obese increases the risk of developing many chronic health conditions. The prevalence of childhood obesity continues to rise despite increased awareness and measures to treat obesity. The Diffusions of Innovations theory was applied to this PIP by taking an innovative idea of providing childhood obesity prevention education during childbirth preparation classes.

The objectives of the PIP were met through application of The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care. This logic model provides a step-by-step process to create, implement and evaluate the PIP. An educational session on infant feeding and nutrition regarding childhood obesity prevention was created and presented to participants in a childbirth preparation class. A post intervention survey was emailed to the participants. The survey was analyzed to gather data about perceived barriers to preventing obesity and to assess if participants reported an increase in knowledge regarding childhood obesity prevention through healthy feeding and nutrition during infancy.

CHAPTER 4: RESULTS

The co-investigator presented the educational session in February 2022 to parents enrolled in a childbirth preparation class conducted virtually via Microsoft Teams™ through an urban hospital in Fargo, ND. The educational session included a PowerPoint™ presentation regarding infant feeding and nutrition. The class was held virtually due to the COVID-19 pandemic. The virtual class was a synchronous presentation along with time for questions. A post education survey (Appendix E) was then made available for participants to complete via a QR code for those who attended the presentation.

Six of the twelve participants in the PIP completed the post education survey. The demographics of the group comprised of three males and three females. The age range of the participants was 19-30, with an average of 26.67 years old. The racial/ethnic distribution of the participants included two black/African American participants and four white/Caucasian participants. Table 1 illustrates demographical makeup of the PIP participants.

Table 1

Sample Population Demographics

Survey Response (N=6)	%	Count
Gender		
Male	50%	3
Female	50%	3
Non-Binary/third gender	0%	0
Prefer not to say	0%	0
Total	100%	6
Race/Ethnicity		
Black or African American	33%	2
White/Caucasian	67 %	4
Total	100 %	6

At the beginning of the presentation, the co-investigator asked the participants to reflect on previous knowledge regarding healthy nutrition and feeding during infancy. They were asked

to think about infant hunger and fullness cues, signs an infant is developmentally ready to start eating solid foods, healthy food choices for infants, and what foods to avoid during infancy. The participants were also asked about any barriers that would prevent them from providing healthy nutrition and feeding to their infant. The survey asked the participants to self-report what they knew about healthy nutrition and feeding during infancy prior to the session. Asking the participants to reflect on what they knew prior to implementing the project was done to help the participants recall how they rated themselves prior to the educational session. At the conclusion of the educational session, the participants were invited to complete a post educational session survey. The post education survey consisted of two qualitative and thirteen quantitative questions. Questions one through thirteen were answered using a Likert scale which assessed the participant's pre and post education knowledge regarding:

- Healthy nutrition and feeding
- Describing hunger cues and fullness cues
- Infant readiness to start solid foods
- Importance of healthy eating and foods to avoid during infancy

The qualitative questions assessed the benefits perceived by participants and other topics they would have liked to learn about.

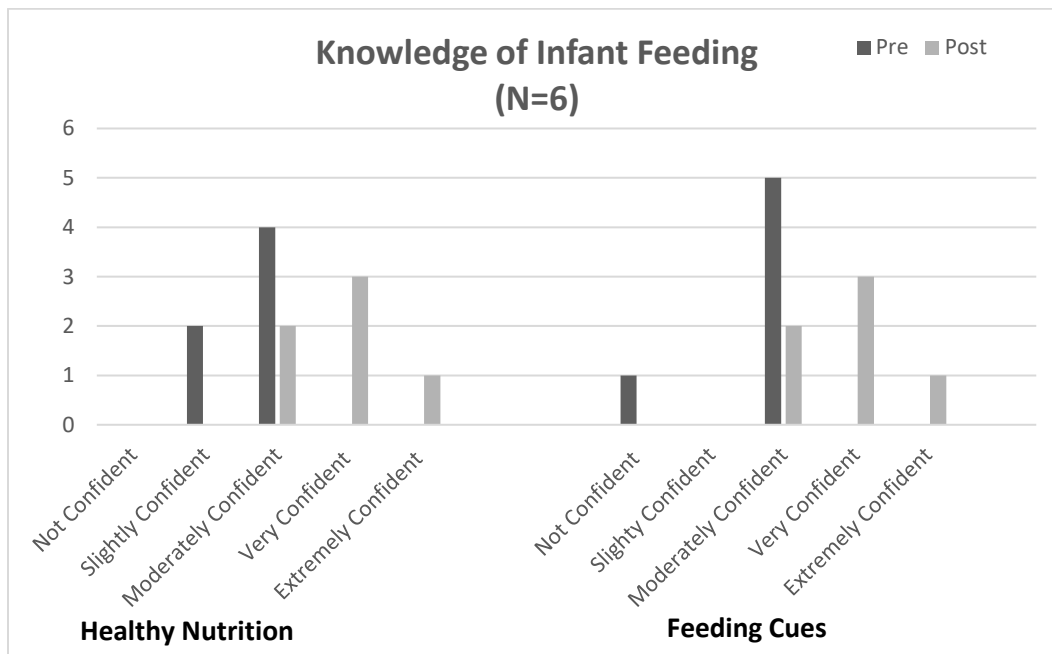
Pre and post assessment allowed for evaluation of change in participant knowledge after implementation of the educational session. Questions one, three, five, seven, nine and eleven evaluated previous knowledge participants had regarding healthy nutrition and feeding during infancy using Likert scale questions. Questions two, four, six, eight, ten and twelve evaluated participants knowledge regarding healthy nutrition and feeding during infancy after the educational session, using Likert scale questions. Question 13 evaluated the participants

satisfaction with educational session. Question 14 instructed participants to select all that apply. Questions 15 and 16 contained a text box for participants to write their answers.

The participants were queried at the end of the educational session regarding their self-reported knowledge about healthy infant nutrition and hunger cues which are illustrated in Figure 1.

Figure 1

Participant Knowledge of Infant Feeding and Hunger Cues



The mean pre-session knowledge regarding infant healthy nutrition and feeding was 2.7 on a 5-point Likert scale. The median pre-session assessment was 3 on a 5-point Likert scale, and the mode was 3 on a 5-point Likert scale. Participants were also asked to identify knowledge regarding healthy nutrition and feeding during infancy after completing the educational session. The participant mean for infant healthy nutrition and feeding knowledge post education sessions was 3.8 on a 5-point scale.

The mean self-reported pre-session confidence level in describing infant hunger and fullness cues was 2.7 on a 5-point Likert scale. The fourth question asked the participants to

identify their confidence level in describing infant hunger and fullness cues after completing the educational session. The mean self-reported confidence level in describing infant hunger and fullness cues post education session was 3.8 on a 5-point Likert scale.

The fifth question asked the participants to assign their confidence level describing developmental readiness for progressing to solid foods prior to the educational session. Figure 2 illustrates the participants responses to understanding the readiness to start solid foods which was assessed by questions five in the survey.

Figure 2

Describing Signs of Readiness to Start Solids



The mean self-reported pre-session confidence level in describing developmental readiness for progressing to solid foods was 2.7 on a 5-point Likert scale. The sixth question asked the participants to identify their confidence level in describing developmental readiness for progressing to solid foods after completing the educational session. The mean self-reported

confidence level in describing developmental readiness for progressing to solid foods post education session was 3.8 on a 5-point Likert scale.

The seventh question asked the participants to assign their confidence level identifying healthy food choices for infants prior to the educational session. The mean self-reported pre-session confidence level identifying healthy food choices for infants was a 3 on a 5-point Likert scale. The eighth question asked the participants to identify their confidence level in identifying healthy food choices for infants after completing the educational session. The mean self-reported confidence level in identifying healthy food choices for infants post education session was 4.2 on a 5-point Likert scale.

Figure 3 illustrates the responses regarding health foods in infancy along with foods to avoid which were assessed by questions nine and ten in the survey. The ninth question asked the participants to assign their confidence level in identifying foods that should be avoided during infancy prior to the educational session. The mean self-reported pre-session confidence level identifying foods to avoid in infancy was 3.2 on a 5-point Likert scale. The tenth question asked the participants to identify their confidence in identifying foods that should be avoided during infancy after completing the educational session. The mean self-reported confidence level in identifying foods to avoid in infancy post education session was 4.2 on a 5-point Likert scale.

Figure 3

Identifying Healthy Foods and Foods to Avoid

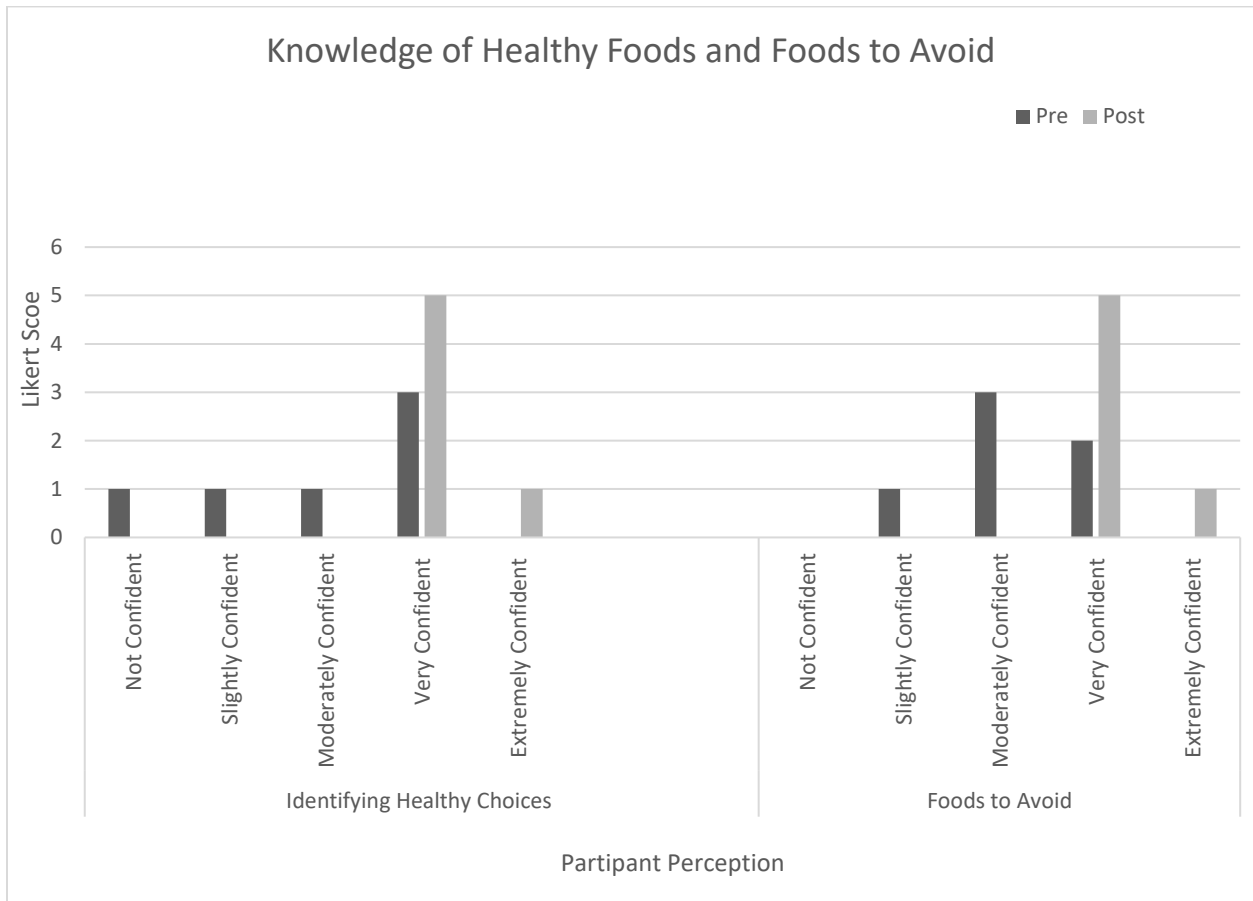
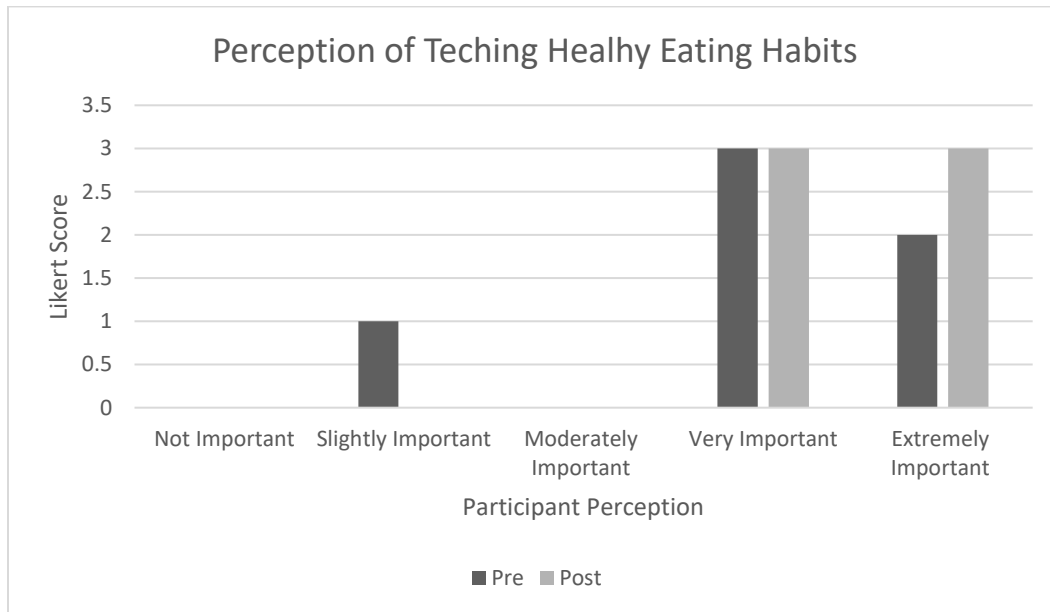


Figure 4 illustrates participants perceived importance of teaching healthy eating habits to their child which was related to questions eleven on the survey. The eleventh question asked the participants to describe how important it is to teach their child healthy eating habits to prevent childhood obesity prior to the educational session. The mean self-reported pre-session level of importance of teaching healthy eating habits to prevent childhood obesity was 4 on a 5-point Likert scale. The twelfth question asked the participants to identify their confidence regarding healthy eating habits to prevent childhood obesity after completing the educational session. The mean self-reported confidence level in identifying healthy eating habits to prevent childhood obesity post education session was 4.5 on a 5-point Likert scale.

Figure 4

Perceived Importance of Teaching Healthy Eating Habits



The participants were also asked about their satisfaction regarding the infant nutrition and feeding education session. The thirteenth question on the post education survey used a 5-point Likert to describe satisfaction from one, being extremely dissatisfied, to five, being extremely satisfied. Three participants responded that they were somewhat satisfied, and three participants responded with being extremely satisfied.

The fourteenth question on the post education survey assessed perceived potential barriers participants may have to providing healthy nutrition to their child. Participants were asked to select all that may apply from the following: time, money, access to food, knowledge, and “I’m not concerned with providing healthy diet to my child”. There was also a choice of ‘other’ with space provided to free text. One participant chose money as a perceived barrier, three participants chose “I’m not concerned about providing a healthy diet to my child”, and two participants chose money and “I’m not concerned about providing a healthy diet to my child.”

The final two questions on the post education survey were open ended questions with a space for free text answers. The fifteenth question was, “What made this presentation beneficial to you?” The sixteenth question was, “What other areas would you have liked to learn about regarding healthy nutrition during infancy?” Table 2 lists the responses to question fifteen and sixteen from the six participants that completed the post education survey.

Table 2

Survey Results for Questions 15 & 16: Open Ended Responses

Question 15	Question 16
What made this presentation beneficial to you?	What other areas would you have liked to learn about regarding healthy nutrition during infancy?
Lots of good information	Any nutrition tips for mothers breast feeding
Learning how to feed the baby	Fruits
Continued knowledge of pediatric nutrition	N/A
Informative	None
Informative	None
Information was clear and concise.	None that I can think of.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

Summary

Childhood obesity continues to be a problem in the United States and worldwide. Growth trajectories estimate 57% of the US children today will be obese at age 35 (Deal et al., 2020). Treating obesity is difficult, so prevention of obesity is key to a healthier population (Benson, 2020). As noted, a child who becomes obese is likely to be an obese adult. Currently, the modalities of treating adults who are overweight and obese are diet restrictions, physical exercise, pharmacotherapy, and weight loss surgery (Tak & Lee, 2021). For children, modalities are typically focused on diet and physical activity. Being able to prevent obesity in children will mitigate against lifelong treatments as an adult which could include modalities of varying intensity and invasiveness.

This PIP reviewed the literature and recommendations for healthy nutrition and feeding during infancy. Barriers to providing healthy nutrition were also reviewed. An educational session for expectant parents regarding healthy nutrition and feeding during infancy was developed and implemented during a childbirth preparation course conducted virtually through an urban hospital in Fargo, ND. A post educational session survey determined that parental knowledge regarding healthy nutrition and feeding during infancy increased after the project implementation. Increased parental knowledge may help prevent their infant from developing childhood obesity in the future.

Discussion

Objective One

Objective one was to develop and implement an education session for expecting parents regarding infant nutrition and feeding for newborns to age 12 months. The objective was met by

creating a PowerPoint™ presentation using recommendations from the AAP, the USDA, and a review of literature. The presentation consisted of 29 slides that described hunger and fullness cues during infancy, how often and what an infant should eat, and the developmental signs an infant is ready to start solid foods.

Objective Two

Objective two was to compare the perceived barriers regarding childhood obesity prevention between the existing literature and what the participants describe as barriers. Objective two was not met. The questions on the post education survey intended to evaluate participant barriers was not clearly written making it difficult to accurately compare barriers. The review of literature found barriers to childhood obesity prevention that included the following topics: parental perceptions, using food to soothe an infant, and interactions with healthcare providers. Overcoming barriers to preventing childhood obesity is crucial to the success of raising a generation that can maintain a healthy weight.

Parental perceptions of an infant or child's weight directly relates to the types of foods offered and if behavior modifications are implemented. Researchers have found that feeding an infant to soothe them, when they are not hungry, leads to unhealthy eating behaviors, overeating, and weight gain. Parents were taught the hunger signs an infant may display, including the importance of not using food to soothe an infant that is not hungry. The confidence level in the participants ability to describe hunger and fullness cues increased as a result of the educational session presented. Understanding the hunger and fullness cues, and that a crying infant does not always need to be fed will help the participants overcome the barrier of feeding to soothe their infant.

Healthcare providers' comfort level with discussions on obesity can also be a barrier to preventing obesity (Hessler, 2015). Parents that refuse to acknowledge their child's weight status make it difficult for healthcare providers to effectively counsel parents on how to address a child's weight. Time constraints during WCVs continues to be a barrier to providing all the necessary education. Introducing parents to healthy nutrition and feeding for infants at a childbirth preparation class can help to alleviate that barrier.

The 14th question on the post education survey asked participants to disclose any perceived barriers. One of the choices was "I'm not concerned about providing a healthy diet to my child." Five of the participants chose this answer. The co-investigator was seeking to find if parents don't believe providing a healthy diet is important to prevent obesity, which relates to literature review findings on parental perceptions of childhood obesity. Question 12 asked the participants to report how important it is to teach their child healthy eating habits. All participants reported very important or extremely important. This led the co-investigator to believe the option of "I'm not concerned about providing a healthy diet to my child" was not clear. This option may have been interpreted by participants as "I'm not concerned about 'my ability' to provide a healthy diet to my child." The lack in clarity made it challenging to compare barriers.

Objective Three

Objective three was to increase parental knowledge regarding childhood obesity prevention. Object three was met. An overall increase in knowledge regarding healthy feeding and nutrition to prevent childhood obesity was achieved and verified using a post education survey. The following paragraphs discuss the breakdown of the survey in relation to increased parental knowledge.

Helping families establish healthy lifestyles, especially during the first two years of life, is important to prevent comorbidities and reduce long-term adverse health consequences caused by childhood overweight and obesity (Henderson, 2021). Teaching parents about nutrition and feeding during infancy at a childbirth preparation class was shown to be an effective way of increasing parental knowledge on the subject. Topics covered during the educational session included infant hunger and fullness cues; what to feed an infant, how much to feed an infant, and how often an infants need to be fed; signs an infant is developmentally ready to eat solids; healthy food choices for infants; foods to avoid during infancy; and what role the environment plays in developing eating habits. Overall, the parents responded with an increase in knowledge regarding nutrition and feeding during infancy. Arming parents with this knowledge will help them to establish healthy nutritional lifestyles for their child(ren) and reduce their child's(ren's) risk of becoming overweight or obese.

As stated in chapter two, responsive feeding is feeding according to hunger and fullness cues (Benson, 2020; Savage et al., 2018). During the educational session for this PIP, emphasis was placed on understanding infant hunger and fullness cues throughout infancy to foster healthy feeding patterns early on in life. Parents were provided information on both the benefits of breastfeeding and bottle feeding. Paced bottle feeding allows for the infant to learn feelings of satiety and prevents the infant from overeating (MN Department of Health, n.d.; Baby-Friendly USA, 2022). Infant led feeding, which is defined as feeding when the infant shows signs of hunger, is also recommended (Benson, 2020; USDA, 2019). Prior to implementation, participants reported they felt either not at all confident or moderately confident in describing hunger and fullness cues. Signs an infant is hungry include a very awake baby, a baby putting their hands to their mouth, sucking, or smacking lips, opening, and closing their mouth,

“rooting” which is turning their head side to side, and flexing their arms and legs. The importance of terminating the feeding when signs of fullness were noticed was reviewed during the educational session as well. Fullness cues include spitting out the nipple, turning head away, slowing down or stops sucking, extending arms and legs, relaxing fingers, closing lips, and falling asleep. After educating parents on feeding cues, the responses in the ability to describe hunger and fullness cues increased. Two participants reported feeling moderately confident, three reported being very confident and one reported being extremely confident. Feeding is often used by parents and caregivers to soothe a crying infant. Crying as a late sign of hunger was discussed, along with not all crying means an infant is hungry. Crying was included in the discussion of hunger and fullness cues. Examples include instructing parents to appropriately identify what their infant’s cry means and encouraging parents to not use food to soothe their infant every time they cry or become upset. Feeding to soothe a crying infant can lead to stomach discomfort, more spit ups, increased gas, and unhealthy weight gain (Savage et al., 2018). Parents who can recognize and respond to their infant’s hunger and fullness cues will allow infants to develop healthy eating habits regarding hunger and satiety.

Infants need to be developmentally ready prior to introducing solid foods. Early introduction of solid foods is thought to be linked to overeating and may raise concern for becoming overweight or obese (Hessler, 2015). Despite the AAP and WHO recommending exclusive breastfeeding for the first six months, 32% of U.S. infants are given complimentary food or beverages before age four months (USDA, 2019). Prior to the educational session, only one participant felt very confident in describing signs an infant is ready to start solids, the other five reported that they were either slightly confident or moderately confident. The educational session recommended parents wait until their infant is six months old prior to introducing solids

as this is what is recommended by AAP, American College of Obstetricians and Gynecologist, American Academy of Family Physicians, the WHO, and UNICEF. Waiting until age six months helps ensure the infant will be developmentally ready to start eating solids. Parents should understand the developmental signs prior to starting solids. The developmental signs an infant is ready to start solid foods were reviewed. The signs include the following:

- Shows an interest in the food others are eating
- Holds head up without support
- Sits upright in a highchair
- Opens mouth when food is near
- Moves food from the front to the back of the mouth
- Swallows food instead of using tongue to push it back out of mouth

The post education confidence rate increased to 50% feeling very confident and 17% feeling extremely confident. Encouraging parents to wait until six months or until their infant is developmentally ready to eat solid foods is one way to prevent unnecessary weight gain in infancy which can lead to obesity later in life.

Once the infant displays signs they are developmentally ready to eat solids, pureed, single-ingredient foods can be introduced every three to five days. There is no evidence about a best food to try first. However, iron fortified cereal, pureed vegetables or fruits are some possible foods to try first. The iron supply at birth starts to diminish around six months and breast milk does not provide enough to meet the recommended amount. Breastfeeding mothers should offer their infant pureed meats as one of the first types of solid foods. Portion size and daily intake recommendations for infants at each developmental milestone was reviewed during the educational session. Parents were provided a copy of the PowerPoint™ presentation via email by

the hospital's educator staff member responsible for coordinating the class. The PowerPoint™ included tables with examples of types of foods and portion sizes for infants at six months, nine months, and 12 months of age. Healthy foods, such as fruits, vegetables, and meats; yogurt; eggs, cheese; cereal; bread; and crackers were reviewed, along with how to properly prepare foods to promote safety and prevent choking were discussed.

How to safely introduce peanuts to prevent allergy was also reviewed. Early introduction of peanuts has been shown to reduce the development of peanut allergies when compared to avoiding peanuts in infancy (Benson, 2020; Comberiati et al., 2019). Once an infant has started eating solid foods, and the infant does not have eczema or an egg allergy, parents can begin feeding their infant baby-friendly peanut foods as often as they like. If the infant has mild to moderate eczema, parents can feed their infant one to two teaspoons of baby-friendly peanut foods, three times a week after starting solids. If an infant has severe eczema, an egg allergy, or both, parents were instructed to talk to their pediatric provider before introducing peanut foods. Peanut butter alone is too sticky and thick for infants. Education was provided on baby friendly peanut foods, such as adding two teaspoons of peanut butter powder mixed with a favorite pureed fruit or vegetable or mixing two teaspoons of creamy peanut butter mixed with equal parts breastmilk, formula, or water (Benson, 2020).

Prior to educating the parents on healthy food choices, 67% of parents felt slightly or moderately confident identifying healthy food choices for their infant, and only 33% of the parents felt very confident, (Figure 3). After the educational session, 83% of the parents felt very confident and 17% of the parents felt extremely confident. The typical dietary intake in America has progressively increased in the consumption of sugar sweetened beverages, low nutrient dense, and high saturated fat foods (Mameli et al., 2016; Savage et al., 2018; Smith et al., 2020).

The increase in the consumption of unhealthy, processed and sugar sweetened beverages may be due to economic factors related to parents working outside the home causing little time to prepare nutritious meals (Giampaoli et al., 2019, Kansra et al., 2021). The educational session during this PIP explained that healthy food choices are vital to healthy growth and development in infants. After participating in the PIP's education, parents increased their confidence in being able to identify healthy food choices for their infant. All participants reported they felt very confident or extremely confident in identifying healthy food choices for their infant. Offering infants healthy food choices sets their palate up to favor healthy foods throughout their lifetime.

After the implementation of the PIP, parental knowledge regarding foods to avoid, was increased. Figure 3 displays the results from the post educational survey for questions related to healthy food choices and foods to avoid. Similar results were found for parental confidence level in identifying foods to avoid during infancy and healthy food choices. After the educational session, all participants reported confidence levels of very confident or extremely confident in their ability to describe foods to avoid during infancy.

One of the most important foods to avoid during infancy is honey (CDC, 2017). Honey can contain botulism spores that an infant may not be able to digest, causing a serious type of food poisoning and can lead to death. While honey is not known to be linked to childhood obesity, it was an important item to discuss during the educational session on infant nutrition in feeding as it is part of providing a healthy diet to infants.

Foods high in sugar, saturated fat and salt can negatively affect an infant's growth and development. Feeding infants these items can cause unnecessary weight gain, tooth decay, and can set up unhealthy food preferences, which can lead to overconsumption later in life and an increased risk of being overweight or obese (USDA, 2019). Avoidance of sugar, syrup, and

sugar-sweetened beverages was discussed during the educational session. Likewise, early salt exposure can lead to taste preferences and sets the stage for over consumption later in life. Salty foods can lead to obesity, high blood pressure, cardiovascular disease, and an increase likelihood of developing obesity (USDA, 2019). It is recommended prepackaged foods, fast food, and salty foods are avoided during infancy.

The PIP's educational session stressed the importance of teaching healthy nutrition and feeding beginning in infancy, as behaviors related to food preferences and eating patterns are developed during this period. Figure 4 displays the results from the post education survey for the questions regarding how important it was for parents to teach healthy eating habits to their child(ren) to prevent childhood obesity. Only two of the participants reported a change in how they felt regarding the importance of teaching healthy eating habits. Both changes were positive or showed an increase in level of importance. One participant reported the importance of teaching healthy eating habits to prevent childhood obesity increased from slightly important to very important. The other change from pre and post education sessions was from very important to extremely important. All participants responded teaching healthy eating habits to prevent childhood obesity was either very important or extremely important after the educational session. Parental understanding of the importance will hopefully lead to actions that set up their child(ren) to develop healthy lifestyles early on in life to prevent childhood obesity.

Recommendations

Educating parents on how to provide healthy nutrition and feeding during infancy is recommended to prevent childhood obesity. Food preferences and eating habits are learned during the first two years of life. If parents can instill in their child to eat when hungry, stop

when full, along with providing nutritious foods low in added salt and sugars, they may help prevent their child from becoming obese.

Based on the PIP findings, it is recommended the project site continue to include healthy nutrition and feeding during infancy in conjunction with the childbirth preparation class. Educating parents on healthy nutrition and feeding during infancy using the presentation created for this PIP could be included in both virtual and in person classes. The education session presented to the parents for this PIP covered healthy nutrition and feeding from birth to age one. Education could be provided for ages one to three at WCVs to continue to build on healthy behaviors learned during the first year of life. Additional information on a healthy diet for breastfeeding moms is recommended to be included in future educational sessions.

Another recommendation was to develop a handout for pediatricians or primary care providers to give parents containing healthy nutrition and feeding information at each well child visit. The information from the PIP's PowerPoint™ presentation could be used to make handouts for additional review of what is recommended at each developmental milestone. Handouts could also be developed until age three as this critical period for developing healthy eating habits. All handouts should be reviewed by experts within the field of infant and pediatric nutrition to verify validity of content. By age three, a majority of one's food preference and eating habits have been developed and will likely carry on throughout life. Providing handouts allows parents to take home written information for future reference to help increase their personal knowledge and hopefully improve adherence to healthy infant eating habits. If time would have allowed, handouts could have been created after implementing the project and reviewed by the organization for approval. The organization's sponsor for this project has indicated they would like to pursue the opportunity for handouts in the future.

Dissemination

The project proposal was disseminated through a poster presentation at the North Dakota Nurse Practitioner Association Pharmacology Conference in September 2021. The findings from this PIP will be emailed to the project site's education coordinator. The project will also be disseminated to the project committee as partial fulfillment for the Doctor of Nursing Practice requirements through North Dakota State University. A three-minute thesis video will be created to disseminate the project further. A final poster was presented at the Annual Research Day at North Dakota State University in May 2022. This project will be made available to the public and other health professional students through publication on North Dakota State University's ProQuest website.

Strengths and Limitations

Strengths

A strength of this PIP was considering the abundance of literature that has been published about childhood obesity. While this may have made completing a thorough review of literature more difficult, it ensured there was plenty of data to support that childhood obesity is a major health concern and needs to be addressed. Focusing on providing education to parents made it easy to find participants, as they were already enrolled in the childbirth preparation course. The organization held the childbirth preparation course virtually due to the COVID-19 pandemic. Interestingly, the virtual format was discovered to be a strength as there was an increase in enrollment due to no travel barriers. Participants were located in Fargo, North Dakota, and surrounding communities, along with participants in rural areas in Minnesota.

Limitations

Published research must include any limitations or delimitations to upgrade the profession (Theofanidis & Fountouki, 2018). Limitations include any potential weaknesses that are out of the researcher's control. Delimitations are consciously set by the author.

The childbirth preparation class covered additional topics including, but not limited to, labor, delivery, what to expect when at the hospital, what to expect after being discharged from the hospital, breastfeeding, safe handling of an infant, and postpartum depression. One significant limitation of the PIP was the time for the presentation. The participating organization set the allotted time for 15 minutes which included time for questions, to educate the participants on healthy nutrition and feeding during infancy. The co-investigator had to summarize findings to fit information within the set time limit. An ideal timeframe to cover all information would have been 30 minutes. The increased time would allow for more interaction with the participants and allow for more questions. If there was more time, the following would have been covered during the educational session:

- Well-balanced diet for breastfeeding mothers
- Alternative ways to soothe a crying infant
- How to deal with picky eaters

In an ideal situation, the participants would have completed two surveys instead of one. Conducting a survey prior to the intervention would have allowed for a more accurate self-report, as the participants would not have been exposed to the information provided in the PowerPoint™ presentation yet. The post intervention survey would then ask the same questions to assess for an increase in knowledge regarding healthy nutrition and feeding during infancy.

Another limitation was the post educational session survey asked participants to disclose any barriers parents had to providing healthy nutrition to their child(ren). The choices for perceived barriers included in the survey were: time, money, access to food, knowledge, I'm not concerned about providing a healthy diet to my child, and other, which included a space to free text perceived barriers. Participants were instructed to select all that applied to their situation. The fifth choice, I'm not concerned about providing a healthy diet to my child was intended to seek out parents that do not believe providing a healthy diet is important to preventing obesity. The wording of the fifth choice may have been interpreted as, "I'm not concerned about 'my ability' to provide a healthy diet to my child." The lack of clarity in the response limited the accuracy of interpreting the results, as there is no way to determine the participants understanding of the fifth choice. The survey should have listed the choices as: time, money, access to food, knowledge, I don't believe I need to provide my child healthy nutrition, I have no barriers to providing healthy nutrition to my child, and other.

Selection bias may have been a limitation. Prior to implementing the educational session, five of six participants felt it was important to teach their child(ren) healthy eating habits to prevent childhood obesity. The participants may have had interest in the topic, which may have influenced their decision to complete the post education survey, when compared to the general population. To gain a better understanding of the effectiveness of the educational session regarding infant nutrition and feeding, the educational session should have been conducted over several months to capture a larger audience. Having more participants complete the survey would help decrease the selection bias. If time had allowed handouts regarding healthy nutrition in infancy could have been created, approved, and disseminated to parents at well child visits as well.

Conclusion

The Doctor of Nursing Practice (DNP) is a dynamic role that blends clinical expertise and advance nursing knowledge to diagnose and treat health conditions to all people while emphasizing health promotion and disease prevention. The DNP role includes promoting health and preventing disease, starting during infancy and throughout the lifespan. Obesity is an independent risk factor of developing many diseases, including type-2 diabetes, hypertension, heart disease, asthma, sleep apnea, and others (CDC, 2017; Smith et al., 2020). Once obesity occurs, the condition is likely to persist lifelong. As a result, childhood obesity continues into adolescence and adulthood. Many of the diseases related to obesity in adulthood, such as hypertension, type II diabetes, and obstructive sleep apnea, are now presenting in adolescence (Benson, 2020; Smith et al., 2020).

This PIP reviewed the literature in regard to childhood obesity prevention, barriers to preventing obesity, and healthy nutrition and feeding during infancy. An educational session was created and implemented to parents enrolled in a childbirth preparation class. A post educational session survey found that a parent's perceived knowledge and confidence regarding healthy nutrition and feeding during infancy increased after the PIP was implemented. DNP's can and should use the information gathered from this PIP, to provide their patients with the knowledge and tools to provide healthy nutrition and feeding to their child(ren) that can help combat the childhood obesity epidemic.

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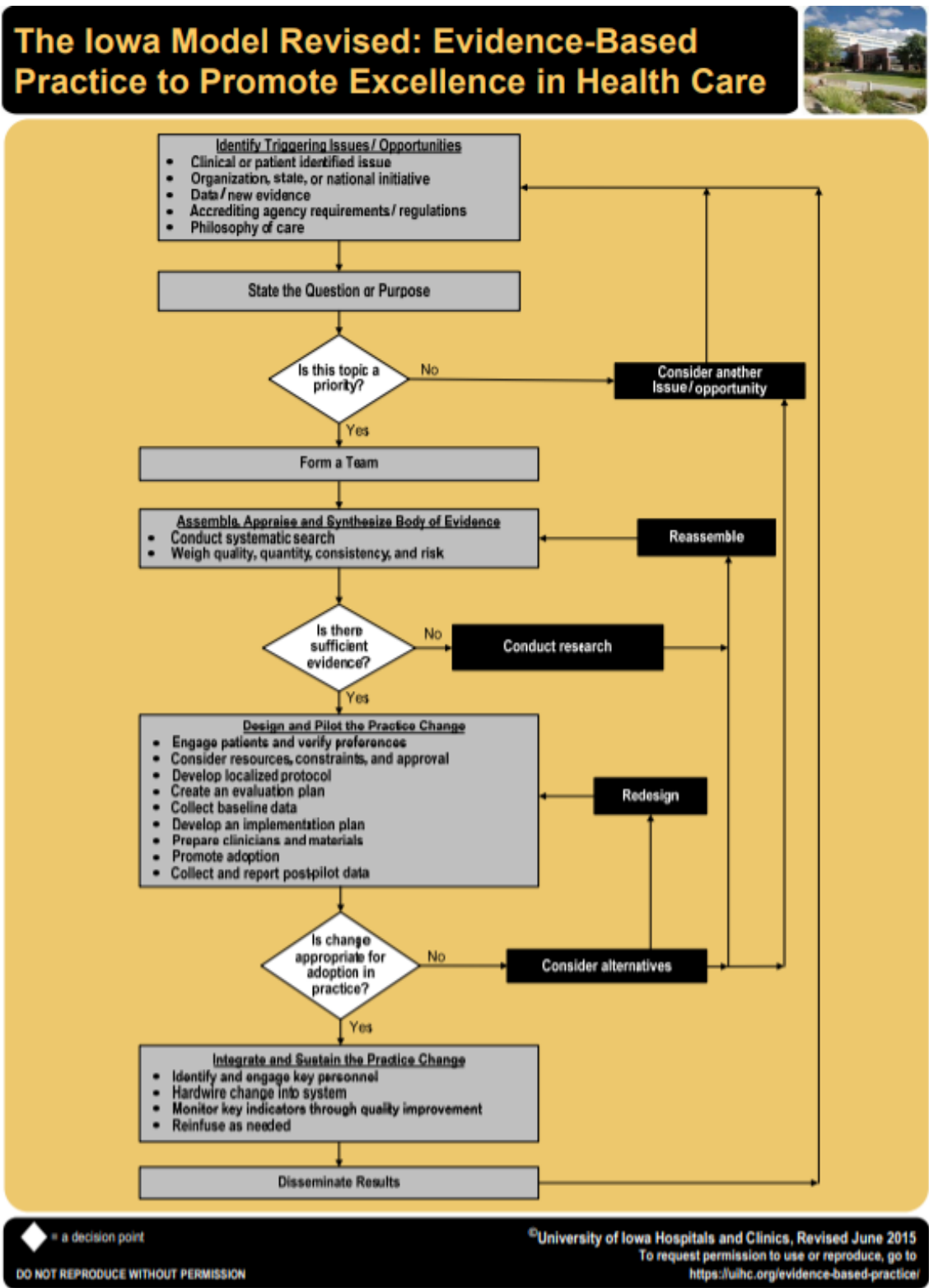
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APPENDIX A: THE IOWA MODEL REVISED: EVIDENCE-BASED PRACTICE TO PROMOTE EXCELLENCE IN HEALTH CARE





APPENDIX B: UNIVERSITY OF IOWA HOSPITALS AND CLINICS PERMISSION

LETTER

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Kimberly Jordan - University of Iowa Hospitals and Clinics <survey-bounce@survey.uiowa.edu>  

Tue 12/7/2021 10:17 AM

To: Mecklenburg, Candace

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Please contact UHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

APPENDIX C: LETTER TO PARTICIPANTS

Dear expecting parent,

My name is Candace Mecklenburg. I am a graduate student in the Doctor of Nursing Practice program at North Dakota State University. I am conducting a practice improvement project to educate parents on healthy nutrition and feeding practices for infants during the first year of life.

As a participant enrolled in the childbirth preparation course at Essentia Health you have to opportunity to participate in this practice improvement project. Your participation is entirely voluntary, and you may change your mind or quit participating at any time, with not penalty to you.

If you have any question, please reach out to me. I look forward to seeing you soon at the Childbirth Preparation class.

Warm regards,
Candace Mecklenburg

candace.mecklenburg@ndsu.edu
651-485-8563

APPENDIX D: INFORMED CONSENT

Title of Practice Improvement Project: Childhood Obesity Prevention: Nutrition and Feeding Guidance During Infancy

This practice improvement project entails a **10-15 minute education session** covering nutrition and feeding guidance during infancy. There will be time for you to ask the researcher questions. At the end of the educational session there is a link to a **follow-up survey**.

It is not possible to identify all **potential risks** in practice improvement projects, but we have taken reasonable safeguards to minimize any known risks. There are minimal risk associated with the educational session and follow-up survey.

The **benefits** of participating in this project include increasing your knowledge regarding healthy nutrition and feeding for infants up to 12 months of age.

This study is **anonymous**. That means that no one, even members of the dissertation committee, will know that the information given comes from you.

If you have **any questions** about this project, please contact me at 651-485-8563, or candace.meceklenburg@ndsu.edu. You may also contact my advisor, Dr. Adam Hohman at 701-231-8016, or adam.hohman@ndsu.edu.

You have rights as a research participant. If you have questions about your rights or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program at 701-231-8995 or toll-free at 1-855-800-6717, or by email at ndsu.ird@ndsu.edu.

By completing the post education session survey, it means that:

You have read and understand the consent form

You have had your questions answered, and

You have decided to participate in this practice improvement project.

APPENDIX E: INFANT FEEDING & NUTRITION EDUCATION SURVEY

Demographical data of person completing this survey

1) Gender

- Male
- Female
- Other: _____
- Prefer not to answer

2) Age _____

3) Which race/ethnicity best describes you?

- American Indian or Alaskan Native
- Asian/Pacific Islander
- Black or African American
- Hispanic American
- White/Caucasian
- Multiple ethnicity/other (please specify): _____
- Prefer not to answer

15) What made this presentation beneficial to you?

16) What other areas would you have liked to learn about regarding healthy nutrition during infancy?

APPENDIX F: IRB DETERMINATION



02/09/2022

Dr. Adam G Hohman
Nursing

IRB Approval of Amendment to Protocol #IRB0004054 , "Childhood obesity prevention: Infant nutrition and feeding education"

Co-investigator(s) and research team:

- Adam G Hohman
- Candace Mecklenburg

Funding Agency:

The protocol amendment request and all included documentation for the above-referenced project have been reviewed and approved via the procedures of the North Dakota State University Institutional Review Board. Current protocol approval expires - 01/02/2025.

Thank you for cooperating with NDSU IRB procedures, and best wishes for a successful study.

NDSU has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

APPENDIX G: PROJECT SITE APPROVAL



Essentia Health

February 1, 2022

To whom it may concern,

Re: Childhood Obesity Prevention: Infant Nutrition and Feeding Education

Thank you for submitting the Human Subject Research Determination Form and information for the project listed above. Based on a review of the documentation you provided, this project does not meet the definition of research with human subjects, according to the Office of Human Research Protections (OHRP) [guidance](#): "Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge."

Because the project does not meet the federal definition of human subjects research, it will not require further review by the Essentia Health Institutional Review Board or a scientific review committee. If during the process of data collection or analysis it becomes clear that findings could be generalizable or benefit others, please submit your project for IRB review at that time.

If you have any questions concerning this letter, please contact me at IRB@EssentiaHealth.org.

I wish you success with your project.

Sincerely,

Deneice Kramer, MBA, MA, CCRP
Compliance Manager, Human Research Protection Program