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Implications for nursing practice: Delivering the folic acid message

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IMPLICATIONS FOR NURSING PRACTICE:

DELIVERING THE FOLIC

ACID MESSAGE

by

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ABSTRACT

**Implications for Nursing Practice:
Delivering the Folic
Acid Message**

by

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In 1995, North Carolina (NC) had one of the highest prevalence rates of neural tube defects (NTDs) in the United States. Since the NC Folic Acid Council began focusing their efforts on educating women of childbearing age regarding NTDs in 1994, the prevalence of NTDs has declined overall by 40%; however, NTD prevalence among Hispanics in NC continues to be double the rate of non-Hispanics. Research has found daily consumption of a multivitamin with folic acid significantly decreases NTDs. Healthy People 2010 include in their objectives the need to increase folic acid consumption in women and reduce the NTD rates. It is estimated that 72% of women in the US between the ages of 18-45 do not take a multivitamin fortified with the recommended amount of folic acid regularly. Nurses play a pivotal role in educating women about the importance of folic acid and daily multivitamin use.

The purpose of this study was to determine acute care staff nurses' knowledge levels of folic acid and the relationship between knowledge level, self-efficacy level, and

selected sample demographics. Beliefs in the benefits of multivitamin consumption were explored along with the extent to which folic acid benefits are addressed by the acute care staff nurse in client teaching. A socio-demographic survey was administered to randomly selected acute care staff nurses in NC using the online survey platform Survey Monkey. Folic acid knowledge levels were determined using pre-established questions developed by the CDC while self-efficacy in the nurses' relationship with clients was measured using an item assessing confidence. A March of Dimes online video accessed thru YouTube served as the intervention. There were 143 participants, with 84 in the control group and 59 in the experimental group. The average nurse was 43-45 years old, held a BSN degree, and worked in the medical-surgical area of nursing. The hypotheses supported by the statistically significant findings included: confidence, or self-efficacy, played a significant role in how often acute care staff nurses discussed benefits of multivitamins when providing discharge teaching to their clients, and, acute care staff nurses who took part in the educational intervention showed an increase in folic acid knowledge level from the pre-test period to the post-test period. Health care providers play a vital role in disseminating the health benefits of folic acid to the clients they care for. It is critical for every woman of childbearing age to receive teaching on the health benefits of folic acid in an effort to reduce NTD rates, as well as provide potential benefit or prevention for other disease processes and defects. This can certainly be accomplished through the role of the acute care staff nurse.

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CHAPTER I

INTRODUCTION

Background and Significance of the Study

In 1995, North Carolina (NC) had one of the highest prevalence rates of neural tube defects (NTD) in the United States. In the western region of the state, neural tube defects were three times more likely to occur than in the rest of the world. Since the North Carolina Folic Acid Council (2009) began focusing their efforts on educating the women of childbearing age regarding neural tube defects, the prevalence of neural tube defects has declined by approximately 40% between the years of 1994 and 2004. Despite this reduction, prevalence of NTDs in the Hispanic population in NC continue to be double that of the overall state prevalence.

Statement of the Problem

The Southeastern region of the United States has a higher prevalence rate of neural tube defects, thought to be due in part to certain lifestyle risk factors, either modifiable or non-modifiable. Obesity and lower socioeconomic status are two risk factors, which, while modifiable, women in North Carolina (NC) continue to carry. Non-modifiable risk factors, such as ethnicity and maternal diabetes, also are higher among NC women than women in other parts of the US (NC Folic Acid Council, 2009).

Having a baby with a neural tube defect (NTD) presents major financial challenges, regardless of whether or not the parents have health insurance or Medicaid. Ouyang, Grosse, Armour, and Waitzman (2007) found medical costs for children ages 1to 17 with spina bifida average 13 times greater than the costs of medical care for children without spina bifida. More specifically, this study found caring for an infant the first year of life with spina bifida averages $50,000 due to the number of surgical procedures usually required during this first year of life.

The North Carolina Folic Acid Council suggests if women in NC were to take a multivitamin containing folic acid daily, costs for Medicaid to care for a baby with a NTD could decrease by $2 million to $4 million annually. Costs associated with consumption of a multivitamin with the recommended 400 mcg of folic acid range from $2 to $5 per month, or $24 to $60 annually. This is an extremely low cost compared to the costs associated with caring for an NTD-affected pregnancy, childbirth, and infant. As nurses educate clients regularly regarding benefits of multivitamin use, NTD rates in NC could further decline, causing a decrease in state healthcare expenditure.

Healthy People 2010 (US Department of Health and Human Services, 2000) indicates the need to increase folic acid intake by including in their objectives the goal to "reduce neural tube defects by 50%," "increase the number of women who consume 400 mcg of folic acid from 21% in the early 1990s to 80% by 2010 among non-pregnant women," and "increase the proportion of pregnancies begun with an optimum folic acid level" (p. 42). It is estimated by the North Carolina Folic Acid Council (2009) that 72% of women in the United States between the ages of 18 to 45 do not take a multivitamin fortified with the recommended amount of folic acid regularly. Furthermore, 23% of

women never heard of folic acid, much less its benefits. This study examined to what extent acute care staff nurses, as health care providers, were aware of the benefits of folic acid and whether or not they themselves take a daily multivitamin. No studies have been located to specifically examine this knowledge of acute-care staff nurses or their routine health behaviors in multivitamin consumption.

In 2008, the Food & Drug Administration celebrated the 10th anniversary since the mandated folic acid fortification took effect. Neural tube defects have declined approximately 26% since implementation of the fortification. While this decrease is a celebration, March of Dimes (2008) reports that in the year 2007, the number of women who took a multivitamin prior to pregnancy was approximately 40%. This indicates significant room for improvement. Looking at fortification from a global perspective, the United States is ahead of other countries with implementation. Canada followed suit with mandatory fortification in 1998, while the United Kingdom waited to mandate this practice until 2007. Other European countries have yet to require folic acid fortification. Australia reported in 2008 that after reviewing their own prevalence reports of NTDs, they have decided to join other countries in this endeavor by initiating mandatory folic acid fortification by September 2009 (Folic Acid Linked, 2008).

While fortification has helped NTD rates decline, there continues to be increasing numbers of Hispanic families immigrating to the NC region. Cultural factors specific to this group include the consumption of mesa flour used to make corn tortillas, which currently in the United States, is not fortified with folic acid. As corn tortillas are a staple food in the Hispanic diet, it would be inaccurate to generalize folic acid fortification of breads, grains, and flours being beneficial to all populations across the NC region.

Additionally, health disparities exist within this cultural group, often resulting in clients entering the healthcare setting. This presents acute care staff nurses with a prime opportunity to further educate clients and families regarding folic acid benefits given the fact Hispanic descent is a known risk factor, which cannot be modified. Acute care nurses are exposed to women of childbearing age in the healthcare setting and could use this opportunity to educate their clients on the benefits of multivitamin use and NTD prevention.

Statement of Purpose

The purpose of this study was to determine acute care staff nurses' knowledge levels of folic acid and the relationship between knowledge level, self-efficacy, and selected sample demographics. Beliefs in the benefits of multivitamin consumption was explored along with the extent to which folic acid benefits are addressed by the acute care staff nurse in client teaching.

Research Questions and Hypotheses

The following research questions and associated hypotheses were used to direct this study:

1. Does personal pregnancy history and prior folic acid education of acute care staff nurses make a difference in their knowledge level of folic acid benefits?

   Hypothesis 1: Acute care staff nurses who have experience with pregnancy will demonstrate higher knowledge of the health benefits of folic acid for women than those with no pregnancy experience. (Independent sample t-test)

Hypothesis 2: Acute care staff nurses who received prior folic acid education will demonstrate higher knowledge of the benefits of folic acid for women than those with no prior education. (Independent sample t-test)

2. Are there relationships between acute care staff nurses' level of education, years of nursing experience, folic acid knowledge and their level of self-efficacy when providing client discharge planning?

   Hypothesis 1: Nurses with higher levels of education will have higher self-efficacy scores than nurses with lower levels of education. (Spearman's ρ)

   Hypothesis 2: Nurses with more years of experience will demonstrate higher self-efficacy scores than nurses with less years of experience. (Pearson's *r*)

   Hypothesis 3: Nurses with higher folic acid knowledge levels will have higher self-efficacy scores than nurses with lower folic acid knowledge levels. (Pearson's *r*)

3. Which demographic, personal, and professional factors best predict the frequency of acute care staff nurses teaching their clients the benefits of multivitamins? (all hypotheses answered using multiple regression with dummy coding of nominal variables)

   Hypothesis 1: Educational level, years of experience, working in maternity areas, and self-use multivitamins will predict nurses' discussing the benefits of multivitamins with their clients.

Hypothesis 2: Folic acid knowledge levels will predict nurses' discussing the benefits of multivitamins with their clients.

Hypothesis 3: Self-efficacy levels will predict nurses' discussing the benefits of multivitamins with their clients.

4. Is there a relationship between acute care staff nurses' personal multivitamin consumption and how they counsel their clients about the benefits of multivitamin use?

   Hypothesis 1: There is a relationship between nurses' multivitamin consumption and how often they discuss benefits of multivitamins with their clients (Cross-tabulation with Chi-square analysis).

5. What is the effect of an educational intervention on acute care staff nurses' knowledge levels of the benefits of folic acid consumption?

   Hypothesis 1: Acute care staff nurses who participate in an educational intervention on folic acid will demonstrate an increase in knowledge scores from the pre- to the post-test period. (Paired sample t-test)

Definitions

Acute care staff nurse – healthcare providers licensed as a Registered Nurse employed in an acute-care setting; areas excluded include home health, public health, doctors offices, and outpatient clinics

Folate - a B complex vitamin, naturally found in food sources, such as green vegetables, orange juice, and liver

Folic acid – the synthetic form of folate, found in multivitamins

Folic acid knowledge level – scores on the ABCs of Folic Acid test created by the Spina Bifida Association

Folic acid educational intervention – viewing of a You Tube video created by the NC Folic Acid Council (Folic Acid for a Healthier Tomorrow, 2008).

Point of care – at the bedside

Self-efficacy – confidence in one's ability to take action; specifically defined in this study as how confident an acute care staff nurse is in teaching the clients they care for and measured by 5-point Likert scale item on the Socio-Behavioral & Demographic tool

Significance to Nursing

Research has shown consumption of 400 micrograms of folic acid daily significantly reduces the risk of neural tube defects in pregnancy as well as other disease processes, such as Parkinson's and coronary artery disease (Muller, Woitalla, & Kuhn, 2003; Stevenson, et al., 2000; & Tawakol, et al., 2005). Healthcare providers play a pivotal role in educating women about the importance of folic acid and daily multivitamin use (March of Dimes Gallup Survey, 2004). Nurses are educators from the very beginning when they develop teaching-learning plans during their undergraduate education. This role as educator only extends further as they become licensed and begin to practice as a Registered Nurse. They provide teaching on almost every encounter they have with their clients. However, it is questioned how confident acute care staff nurses are with health promotion teaching done during their client encounters and how often this type of teaching occurs. Perhaps more direct, straight -forward teaching is geared towards

tasks, such as dressing changes, insulin administration, or range of motion exercises rather than health promotion behaviors. Nursing has evolved over the centuries moving from the Nightingale Era of caring for the sick to the Healthy People Era, who in-turn promote health and wellness. Nurses today are equally involved in the role as a health promoter and illness preventer than as a problem fixer.

Acute care staff nurses have the most continual contact with clients in the inpatient setting and are the ones providing discharge teaching to their clients. Nurses in the acute care setting begin discharge teaching with clients upon admission to the hospital. Educating their clients is an ongoing continual process, not merely a checklist that is signed-off and provided to clients as they are discharged from the hospital in a wheelchair. However, the quality of the teaching can be dependent on several factors. The amount of health promotion teaching conducted by acute care staff nurses is thought to be dependent on their own health beliefs, knowledge levels of certain healthy behaviors, and the amount of time they have to spend teaching their clients. Furthermore, it is felt that all three of the aforementioned factors can act as barriers affecting the amount and quality of education provided to clients being discharged from the acute-care inpatient facility. Whether or not acute care staff nurses feel confident in providing the information in the discharge teaching was explored. If nurses believe consumption of a multivitamin is a health promotion activity and they feel confident in delivering this teaching, then one could suggest these nurses are self-efficacious.

Teaching is fundamental to nursing. Nurses are taught how to develop teaching and learning plans early on as part of their undergraduate nursing program. Nurses must be able to teach their clients what they need to know to continue their care upon hospital

discharge. A teaching opportunity exists every time they walk into their client's room. Third-party payors have more control than ever over length-of-stay; therefore, nurses must also be creative in the ways teaching is delivered to clients so that the main points are delivered without overwhelming the client in the short hospital stay that typically occurs.

For this study, acute care staff nurses as healthcare providers were surveyed to determine their participation in promoting health benefits such as consumption of a multivitamin, as well as their perceived benefits and barriers to taking a multivitamin. It was also of question whether or not these healthcare providers believe daily consumption of a multivitamin provides a health benefit and decrease illness at the same time. Prior research has documented perceived susceptibility as being a strong predictor of behavior, such as consumption of a multivitamin when someone believes the benefits of this behavior will outweigh the perceived barriers (Abood & Black, 2003). This study examined these questions to help determine if behavioral change is warranted, and if so, an increase in healthcare providers' self-efficacy assists in initiating that behavioral change.

CHAPTER 2

REVIEW OF RELATED LITERATURE

For this review of the literature, the researcher explored previous studies related to the research questions for this study. Studies addressed folic acid, its benefits, neural tube defects (NTDs) and their prevalence in the southeastern region of the United States, and client and healthcare provider knowledge levels of folic acid intake and NTDs are discussed. Healthcare provider (HCP) knowledge levels, as well as the influence of a HCP on client behavior are also explored. Additionally, acute care staff nurses' self-efficacy is investigated.

There are many documented health benefits of folic acid supplementation. Aside from prevention of NTDs, adequate folic acid was found to decrease the risk of oral cleft lips, reduce the progression of Parkinson's disease, and increase coronary artery dilation in clients with coronary artery disease (Muller, Woitalla, & Kuhn, 2003 & Tawakol et al., 2005). To maximize these benefits, men and women must consume an adequate amount of natural folate or folic acid thru daily supplementation. The literature review explores whether daily multivitamin use is considered a standard health behavior. Nurses, as health care providers, have access to client populations at the point of care. Nurses have many opportunities to discuss health benefits such as folic acid

supplements with their clients; however, whether nurses feel comfortable providing teaching during their interactions with clients has not been studied. This review of the literature attempted to provide a synopsis of completed studies that support the focus of the current study in order to answer the stated research questions and hypotheses, as well as fill a gap in the literature.

Folate vs. Folic Acid

Folate was first discovered by Lucy Wills in the late 1920s. Wills was known as an English pioneer of women in medicine and research. She identified folate as the 'Wills' factor" when she began studying hematology during the First World War. By the time the Second World War began, Wills was conducting a placebo trial of routine iron supplementation for pregnant women. Even though the discovery of folate emerged from the study of anemia, it was not known that this B-vitamin would play such an important role in prevention of spinal cord defects (Bastian, 2008).

Further research found that folate is a naturally occurring B-vitamin found in green leafy vegetables, legumes, and citrus fruits. Folic acid is the synthetic form of folate, which can be found in multivitamins. Breads, grains, and cereals have been fortified with folic acid in the past ten years, providing an additional food source for women to obtain the necessary amount. The easiest way, however, to meet the daily recommended 400-mcg dose of folic acid is to take a multivitamin, because this synthetic form is more bio-available than the naturally occurring folate due to its simpler chemical structure (Cowart, 2003).

The exact method of folate and folic acid affects fetal development is not clearly understood. Research showed inadequate levels of folate or intake of folic acid prior to

pregnancy may contribute to the interruption of fetal neural tube development. Failure of the neural tube to close by day 28 of pregnancy results in anencephaly, encephalocele, or spina bifida. The how and why of the development of neural tube defects are multi-factorial; however, research demonstrated maintaining folic acid levels prior to and during pregnancy greatly reduces a woman's risk (Geisel, 2003).

Many women know the benefits of some vitamins like vitamin C and vitamin E through television commercials, magazine advertisements, and word-of-mouth; however, the media does not often deliver the same message for folic acid. Whether or not a woman takes a multivitamin daily can make a big difference in the outcome of her pregnancies. From the literature reported on folate and folic acid, it is correct to say that diet alone does not provide the best insurance for adequate folate intake. Rather, daily multivitamin use was found to provide the daily-recommended amount of folic acid, and was better absorbed than food sources. Daily multivitamin use seems like a simple step to take to prevent the much more complicated outcome of a folic-acid-deficient pregnancy.

Neural Tube Defects

The neural tube of the developing embryo closes at the 28th day of gestation. This neural tube is the tissue that ultimately develops the central nervous system, including the brain and spinal cord. There are several different types of neural tube defects (NTDs), each depending on the area in which the neural tube is affected. The most common types of NTDs are known as anencephaly and spina bifida. With anencephaly, the brain does not develop above the brainstem; this defect is considered to be incompatible with life. Spina bifida refers to malformation of the spinal cord and meninges. Spina bifida can occur at different levels of the spinal cord, which result in varying degrees of sensory

loss. Folic acid deficiency is implicated in the incidence of NTDs (London, Ladewig, Ball, & Bindler, 2007).

Neural Tube Defects in the Southeastern Region of the U.S.

In a study conducted by deRosset, Mullenix, and Zhang (2009), knowledge levels, beliefs, and behaviors of Hispanic woman in North Carolina (NC) were compared with NTD prevalence rates. In NC, NTD prevalence rates decreased approximately 40% between the years 1995 and 2005, partly due to fortification efforts and partly due to educational interventions. NC has experienced a growth of Hispanic women over the past ten years, much like that of the United States. The researchers reported NTDs occurring within the Hispanic cultural group in NC account for nearly double the overall prevalence. This is also true at the national level. In 1995, the overall NC NTD prevalence rate was 9.95/10,000; in 2005, this decreased to 6.05/10,000. Within the Hispanic cultural group in NC, NTD prevalence rates were 19.94/10,000 in 1995; this decreased to 11.54/10,000 in 2005. Women of Hispanic descent carry a higher rate of NTD disparity than any other cultural group.

Surveillance of NTDs in South Carolina was conducted over 6 years (Stevenson, et al., 2000). This region of the United States is considered to be a high-risk region where the prevalence rate of neural tube defects was 1.89 per 1000 live births and fetal deaths in 1992. At the conclusion of 1998, the prevalence of neural tube defects decreased to 0.95 cases per 1000 live births and fetal deaths. The rate of periconception folic acid intake increased among women of childbearing years from 8% in 1992 to 35% in 1998. Researchers attributed the downward trend of NTDs to the increasing trend of folic acid consumption in the periconceptional period. Along with surveillance efforts, promotion

efforts of folic acid supplementation were encouraged by all practitioners caring for women of childbearing age, as recommended by the Centers for Disease Control and Prevention (1991). Promotion efforts included information pamphlets and colorful brochures for distribution to clients, public service announcements on the local radio stations, billboard announcements, and announcements in other high-visibility areas (Stevenson, et al., 2000).

Health Benefits of Folic Acid

Health benefits of folic acid have been investigated since the 1960s; however, it was in the 1990s when multiple studies specifically confirmed a reduced neural tube defect rate by oral administration of folic acid. The Medical Research Council Vitamin Study Research Group reported (1991) taking oral folic acid prevented 72% of neural tube defects such as spina bifida and anencephaly. Additionally, studies continued to confirm pregnant women with lower levels of folic acid had a higher incidence of neural tube defects (Botto, Mooew, Khoury, & Erickson, 1999; Locksmith & Duff, 1998).

Aside from reducing incidence of neural tube defects, folic acid has been found to prevent other defects and reduce clinical manifestations of other particular disease processes. Tawakol, et al. (2005) attempted to determine the acute effect of orally administered folic acid on fourteen clients with ischemic heart disease. The clients were males and females between the ages of 50 and 74 who had coronary artery disease. Participants were enrolled in a double-blinded, placebo-controlled, crossover study that used high-dose folic acid syrup for the experimental group and placebo syrup for the control group. Findings indicated a reduction in the mean arterial pressure ($p < 0.03$), as well as an increased dilator reserve by 83% ($p < 0.05$) in the experimental group. The

data obtained indicated high-dose oral folic acid acutely reduced blood pressure as well as improves coronary dilation in clients with coronary artery disease.

Muller, Woitalla, and Kuhn (2003) studied the effects of folic acid supplementation and the importance of reduction of homocysteine levels in clients with Parkinson's disease. This was a follow-up study conducted on 241 experimental subjects and 110 control subjects. Subjects in both groups were diagnosed with Parkinson's disease. Among the variables of age, sex, and daily levodopa use, no significant relationships were shown. Standardized measurement of homocysteine levels were obtained by means of plasma concentrations. Findings indicated additional folic acid supplementation with concomitant lowering of total homocysteine levels in levodopa treatment resulted in clients experiencing a reduction in the progression of Parkinson's disease.

Reduction of facial-oral defects, particularly cleft lip, was documented by three studies. First, the National Institute of Environmental Health Sciences reported in a case-controlled population-based study, folic acid supplements taken during early pregnancy reduced the risk of cleft lip by one-third (Wilcox, Lie & Solvoll, 2007). Second, the Harvard School of Dental Medicine completed a meta-analysis, which showed folic acid supplements taken during early pregnancy also protected against clefting of the lip (Badovinac, Werler & Williams, 2007). Finally, the Center for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities reported the prevalence of oral-facial clefts decreased with folic acid fortification in the United States (Yazdy, Honein, & Xing, 2007).

Most recently, a cohort study released in PLos Medicine (Bukowski et al., 2009) compared periconceptional folic acid supplementation with risk of spontaneous preterm birth. The cohort study involved 34,480 low-risk singleton pregnancies in which folic acid supplementation was begun prior to pregnancy and continued throughout the three trimesters of pregnancy. Compared to those with no supplementation, the pregnancies that maintained a folic acid multivitamin for at least one year prior to pregnancy had a 70% decrease in the risk of spontaneous preterm labor and birth between 20 and 28 weeks' gestation, and a 50% decrease between 28 and 32 weeks' gestation. There was no association with reduction in preterm labor and birth past 32 weeks' gestation. Other maternal characteristics were adjusted for, to include prior history, age, race, body mass index, education, marital status, smoking, and parity. While there was no other significant association with other complications of pregnancy, the association between folic acid supplementation and reducing spontaneous preterm birth could be promising since preterm birth continues to be the leading cause of neonatal mortality.

The literature provides four different examples of various disease processes and defects and how naturally occurring folate or synthetic folic acid interferes with or decreases symptoms of these diseases or defects in clients who sustain regular folate or folic acid levels. Additionally, while this study was being conducted, the United States Preventive Services Task Force released a statement increasing the range of recommended daily folic acid supplementation from 400 mcg to a recommended daily amount of 400 mcg – 800 mcg (Wolff, Witkop, Miller, & Syed, 2009).

Health Care Providers' Knowledge Levels of Folic Acid

Health care providers' folic acid knowledge levels and practices were assessed in a study conducted by Williams et al. (2006) between the years 2002 and 2003. Telephone surveys conducted by obstetricians and gynecologists, family medicine and general physicians, nurse practitioners, certified nurse-midwives, and physician assistants were used to assess the level of health care provider knowledge of folic acid and its benefit in preventing neural tube incidence. How often healthcare providers instructed their female clients on the importance of folic acid intake was also assessed. Overall results indicated healthcare providers were knowledgeable of folic acid benefits, and the most knowledgeable group was the certified nurse-midwives. As one might expect, providers in the obstetric-gynecological settings provided more multivitamin teaching to their clients than the family practice and general practice settings. Findings revealed family practitioners and general practitioners were the least likely to recommend use of a multivitamin while nurse practitioners were three times as likely to encourage multivitamin use. Female providers correlated with encouraging multivitamin use. Findings indicated practitioners in the family practice and general practice setting see a large number of female clients in their childbearing years (18 to 45) and therefore play an integral role in the encouragement of multivitamin use in their clients. Whether or not healthcare providers took a multivitamin was one of the strongest predictors of how often they recommend the same behavior to their clients. Those healthcare providers who took a multivitamin recommended this same behavior to clients more often than those health care providers who did not take a multivitamin.

Knowledge levels of student pharmacists on birth defect prevention and folic acid use were studied by Lynch (2002). These students participated in a pre-test, post-test experimental study by enrolling in an elective course on health promotion. Knowledge levels were obtained prior to beginning the ten contact hour course. Discussion of birth defects and folic acid was delivered in lecture format with one contact hour of the ten allotted for this topic. The majority of student pharmacists were aware that folic acid can prevent NTDs from occurring during pregnancy (93.9%); however, less were aware of the sensitive time frame to begin folic acid use (26.1%) and how much folic acid is needed (44%). The majority who were unaware of the need to begin folic acid use prior to pregnancy instead chose to initiate use once a positive pregnancy test had been obtained. After participating in the course, students were again asked the same questions to test knowledge levels. Awareness that folic acid could prevent NTDs increased to 100%. Awareness of the time when folic acid needs to be started increased to 98%, and awareness of the adequate amount of folic acid increased to 94.9%. All of these post-test findings were statistically significant. While this group of healthcare providers was aware of the benefits of folic acid, there is still a documented need to increase education of the specifics of folic acid use. Pharmacists too have encounters with clients in the community and can play a vital role in disseminating this important health message, especially to women of reproductive age.

In a study conducted by Hayes, Long and Mathers (2003), the beliefs of and practice in providing preconception care (PCC) was assessed in the United Kingdom. Health care providers, including general practitioners, hospital nurses, health visitors, and midwives, participated in the study. Questionnaires assessed those topics respondents felt

were important components of PCC. Although there were few written guidelines relating to PCC, respondents agreed on important topics to be included, such as smoking cessation, drug use, and folic acid intake. Dietary management, exercise, and screening for nutritional status were reported by respondents to be less important components in PCC. Findings included both quantitative and qualitative data. General practitioners generally felt they were not adequately trained in the area of PCC. In the general practice setting where women of childbearing age are often seen, general practitioners have an optimal opportunity to encourage healthy lifestyles associated with PCC. However, in this study, qualitative comments revealed there was a lack of priority and financial resources for the general practitioner to regularly provide PCC.

Edwards and Wyles (1999) studied the effectiveness of training sessions on folic acid benefits in pregnancy. These sessions were presented to midwives, practice nurses, and family planning staff. All disciplines had an increase in folic acid knowledge level following the one-hour training session. One component of the session addressed knowledge levels regarding what an average daily dietary intake of folic acid is without any supplementation. This was assessed through playing a nutrition game. The scores ranged from 279 to 550, with practice nurses scoring the lowest and dieticians the highest. Results of this study validated training sessions can increase health care providers' folic acid knowledge levels.

In summary, we cannot assume that acute care staff nurses are knowledgeable about folic acid and its health benefits. After implementing a folic acid teaching session for heath care providers, Helinski, Trauth, Jernigan, and Kerr (2004) indicated the need for an increased awareness level about the benefits of folic acid in women. Furthermore,

these authors claimed a public health need was in order, which would also increase health care providers' knowledge levels and awareness of folic acid benefits, and in turn lead to a positive behavior change for women of childbearing age.

In the studies described herein, it is noted that the advanced practice nurse was more knowledgeable. This is expected, as the advanced practice nurse may have an education level higher than the acute care staff nurse, and is trained to focus on health promotion and illness prevention; however, advance practice nurses are not as often at the bedside like the acute care staff nurse.

Further, barriers of time and finances were reported as concerns related to incorporating folic acid teaching into PCC. Healthcare professionals must determine economical, time-sensitive ways to first educate the nurses and second, to integrate the folic acid message into inpatient client teaching if there is to be a change in behavior: for both the nurse and the client.

Client Knowledge Levels of Folic Acid

Cleves et al. (2004) investigated the usage of folic acid among 322 women aged 18 to 45 years receiving annual gynecologic care at participating clinics in Arkansas. Participants completed a questionnaire containing questions relating to folic acid awareness, healthy behaviors, and general attitudes towards their physicians. Findings suggested women with higher education and higher income levels had significantly more folic acid awareness. Age, race, and marital status were not significantly related to folic acid awareness and its benefit in preventing birth defects. The findings also suggested there is a gap between women's folic acid awareness and their actual intake of it, suggesting even if women were knowledgeable, they didn't necessarily take it regularly.

Knowledge of folic acid and usage among women in North Carolina was assessed by Meyer, Wall, Morgan, Devine, and Powers (2002). Using the North Carolina Pregnancy Risk Assessment Monitoring System (PRAMS), data was gathered from 1780 women who delivered babies in 1999. Consistent with Cleves et al. (2004), knowledge levels were higher among the more educated. Ninety percent of women with greater than a high school education were knowledgeable of folic acid, while only 54% of women with less than a high school education were knowledgeable. Those women with higher levels of education also consumed multivitamins 3.7 times more than those women with less than a high school education. While the majority of North Carolina women who delivered in 1999 were knowledgeable of the benefits of folic acid, approximately half of them stated they had heard about folic acid from their physician. This indicates room for improvement in how the message about the importance of folic acid is disseminated. Additionally, physicians are not the only mode of message delivery; healthcare providers include nurses, midwives, pharmacists, and nurse practitioners, all who can deliver the folic acid message.

In a recent study conducted by deRosset, Mullenix, and Zhang (2009), knowledge, beliefs, and behaviors of folic acid, birth defects, and multivitamins were assessed of Hispanic women in North Carolina. Of the 896 eligible surveys, 54% were knowledgeable of folic acid specifically, while 64% were knowledgeable of multivitamins in general, and 79% were knowledgeable about birth defects. Even though greater than 50% were knowledgeable of the health benefits of folic acid and multivitamins, only 33% reported taking a multivitamin daily. Of the 66% reporting they did not take a multivitamin regularly, 99% said they would do so if recommended by

their healthcare provider. Knowing the Hispanic population is at higher risk for NTDs, this bears clinical significance for healthcare providers. Healthcare providers as the influencers should aim interventions at increasing both knowledge levels in the Hispanic population and encourage routine multivitamin consumption.

A recent survey conducted by the Gallup Organization for the March of Dimes (North Carolina Folic Acid Council, 2009) indicated when women were told the health benefits of taking a multivitamin with folic acid, 66% stated they were "very willing" to buy and take a multivitamin and 22% stated they were "somewhat willing". This finding suggests women are willing to listen to health teaching and perhaps implement a change in their lifestyle if they are made aware of the benefits.

Chacko, Anding, Kozinetz, Grover, & Smith (2003) assessed folic acid knowledge of 387 women of African American and Hispanic decent. The women were polled as to whether or not they took multivitamins and ate fortified foods. Participants were given a three-month supply of multivitamins. An assessment questionnaire was distributed, which included demographic questions, recent sexual activity questions, and questions about pregnancy history and contraceptive use. The questions were derived from the Centers for Disease Control and Prevention surveys as well as previously tested pilot questions. The assessment questionnaire also contained 29 food-frequency questions with Likert-type responses.

A follow-up telephone survey was conducted three months into the implementation phase of distributing starter packs of vitamins. Findings showed women with an education appropriate to their age category had a higher awareness of folic acid.

There were no significant findings between the racial and ethnic groups and their knowledge of folic acid and its benefit in preventing birth defects. Despite the fact that 3-month starter packs of vitamins was distributed to each participant, daily adherence remained a challenge.

Continual counseling to young women about the importance of multivitamin intake was recommended by the findings. The study supported the need for folic acid awareness programs in clinics servicing adolescent and young adult women who seek care for preconception, birth control, and other reproductive health care. Chacko, et al. (2003), also recommended pediatricians promote daily vitamin usage since they quite often come into contact with the adolescent population.

Lolkje, Hernandez-Diaz, Werler, Louik & Mitchell (2005) looked at various trends and predictors of folic acid awareness in women of childbearing age over the years 1988 to 2002. There were 16,555 women interviewed from the Slone Epidemiology Center Birth Defects Study. The participants were asked questions that assessed their awareness of folic acid. A trend of 0 women in 1988 were aware, however, in 1992, a greater number were aware (50%). Towards the end of the trending years, the percentage leveled off at 40%. The proportion of women who were aware of folic acid and its benefits, and who also used folic acid regularly was approximately six times higher in the more educated women than in those with lower educational levels. Results indicated awareness was markedly increased among higher educated women. Women were more likely to take folic acid if they were aware it could reduce their risk of having a baby with a NTD. The most salient comment revealed in the discussion of findings was as follows: "Only through the development of better educational interventions will the population as

a whole benefit from the well-documented effects of folic acid on reducing the prevalence of NTDs" (p. 128).

Hilton (2007) conducted a comparison study of two groups of 18 to 24 year old females in the North Carolina region to determine folic acid awareness. This researcher discussed the importance of taking new steps in the delivery of the folic acid message to women of childbearing age in an effort to make the information easy to read and understand. Implications for practice gleaned from this study included the need for more educational opportunities for the 18 to 24 year old female. Hilton (2004) encouraged college clinic nurses, nurses in local clinics, and employee health nurses to take on the role of provider of folic acid education. Nurses caring for clients 18 to 24 years old should be particularly cognizant of the folic acid knowledge deficit in this population and be prepared to address this deficit with age-appropriate relevant material (Hilton, 2007; Geisel, 2003).

A study assessing college women's awareness and consumption of folic acid found similar findings (Quillin, Silberg, Board, Pratt, & Bodurtha, 2000). Seventy-one subjects agreed to participate in a pre-post test interventional study while attending Virginia Commonwealth University. Pre-test results yielded 69% of the subjects reported having heard of NTDs; however, almost just as many (68%) reported not currently taking a multivitamin. An even more alarming statistic is that only 5% of participants were able to correctly identify the accurate amount of folic acid recommended daily as 400 mcg.

The intervention consisted of a 5-minute educational session, with incorporation of the variables in the Health Belief Model (HBM) to include perceived benefits, perceived barriers, and perceived threats. Facts and figures of NTDs were discussed,

along with benefits of folic acid use. Immediately following the intervention, participants completed the same post-test, excluding the demographics. Post-test analyses revealed a significant increase in knowledge for folic acid ($p = 0.0001$) and NTDs ($p = 0.0002$). Likert-type questions addressing the variables of the HBM revealed a lack of association between positive health beliefs and multivitamin consumption. Also, participants' motivation to take multivitamins was not correlated with their beliefs that multivitamins can positively influence the outcome of a pregnancy. Additionally, participants were asked how likely were they to become pregnant within the next year. In a state where 50% of all pregnancies are unintended (North Carolina Folic Acid Council, 2009), an astounding 94% of participants responded it was either unlikely or very unlikely they would become pregnant within the next year To summarize, these findings indicated a lack of priority or need for preconception care in this group. Discussion of these findings included changing the way the folic acid message is delivered. Perhaps college females are not focused on becoming pregnant; therefore, they do not see the need to focus on multivitamin consumption.

In summary, the literature supports the concept that women with higher education also had more knowledge of folic acid and its benefits. While education levels make a difference in women's awareness of folic acid, compliance remains an issue. Just because women know of the importance of folic acid, one cannot assume they will take it daily. The need for positive behavior change continues to exist; the question remains just how to facilitate that behavior change in women.

Influence of Healthcare Providers on Client Behaviors

Women between the ages of 18 and 45 years old were enrolled in a study to determine the effects of a physician intervention program during routine gynecological exams (Robbins, et al., 2005). Women were assigned to either the control group, which did not receive any new information, or the intervention group, which received folic acid counseling and a starter bottle of folic acid tablets. Participants in the intervention group also received a phone call one to two weeks after their visit with the physician to remind them of the benefits of folic acid as it relates to prevention of NTDs in pregnancy.

The results of this randomized controlled trial indicated that by taking the extra time to explain benefits of folic acid, practitioners can have a positive impact, which increases a woman's regular intake of folic acid. The starter bottle of folic acid tablets did make a difference in 26% of the intervention group in that they were not previously taking any folic acid but did begin once the bottle was given to them. The study recommended adding folic acid counseling to include starter pills of folic acid as an added component to the routine gynecologic visits.

Nurses' Self-Efficacy

Few studies were found to have assessed self-efficacy in nurses. In one study, Barta and Stacy (2005) looked at nurses' self-efficacy in relation to smoking cessation counseling provided to patients. This study asserted nurses as being the largest group of health care professionals in the United States who have a significant role in dissemination of health benefits. This further supports the vital role that the acute care staff nurse plays in the dissemination of health information to the clients they care for.

Six million or more smokers are hospitalized each year, which places the nurse in a prime situation to deliver health teaching. It was the intent of this study to improve nurses' self-efficacy and promote positive behavior through smoking cessation counseling with their patients. This type of counseling can be used as a model for folic acid counseling as well.

Results indicated a training session taught to nurses on how to deliver this type of counseling did in fact increase self-efficacy from pre-intervention to post-intervention. Nurses, however, continue to have time constraints placed upon them and heavier workloads on the nursing unit which inhibits their ability and prevents them from being able to attend such training sessions.

A nonexperimental study conducted by Manojlovich (2005a) investigated interactions between structural empowerment, self-efficacy, and nursing leadership to determine if self-efficacy in nurses could lead to more professional nursing behaviors. When self-efficacy mediated the relationship between structural empowerment and professional practice behaviors on the nursing unit, participants perceived strong leadership. This indicates the need for nurse managers to provide opportunities for nurses to increase self-efficacy, perhaps through managers' role modeling and use of verbal persuasion, both components of the Self Efficacy Theory.

An additional study conducted by Manojlovich (2005b) attempted to understand how nursing leadership on a unit-level affected the relationship of structural empowerment and nursing self-efficacy on nursing practice behaviors. Nursing leadership was studied at both the organizational and unit level. Again, self-efficacy, structural empowerment, and nursing leadership were assessed for interactions through

use of mediation. Instruments used in this study included the Caring Efficacy Scale, Conditions for Work Effectiveness-II, the Manager's Activities Scale, and the Nurse Activity Scale. Path analysis indicated effects of strong and weak nursing leadership on certain variables of interest. Findings indicated nursing leadership in fact contributed to the effects of empowerment and self-efficacy on nursing practice behaviors, even more so with strong nursing leadership. In fact, nursing leadership explained 46% of the variance in nursing practice behaviors. This study further suggested the need for strong nursing leadership. Nurses are able to practice more professionally when this is the culture. With strong nursing leadership in place, nurses may also have higher self-efficacy, which lends to more professional nursing practice behaviors.

Self-efficacy in nurses is dependent upon various factors. These studies revealed a strong connection between nursing leadership and nurses' self-efficacy. The use of role modeling as well as verbal persuasion had an effect on nurses' self-efficacy. Nursing leaders should take a more active approach in promoting health and modeling the same. Additionally, nurses need to be empowered through education in order for self-efficacy to increase. One resource is the continuing education departments of hospitals. This department has the ability to provide experts who can deliver different types of health promotion and teaching programs through educational sessions within the hospital, while keeping the costs of time and travel for nurses to a minimum.

Conceptual Framework

The theoretical framework for this study is the Health Belief Model (HBM). First developed by social psychologists in the 1950s, it aims to explain why people choose not to take part in programs developed to prevent or identify disease (Stretcher &

Rosenstock, 1997). This model, a value expectancy theory, means people who personally feel, or value they are susceptible to illness and injury have a certain degree of likelihood or expectancy that they will be able to decrease the seriousness of that illness or injury through their own personal behaviors and actions.

This model was developed based on concerns of the Public Health System in the 1950s. One concern included failure of adults to participate in tuberculosis screening even though it was available free-of-charge. Since development of the model, the HBM not only focuses on screening and compliance, but is also used as a means to explain health-related behaviors and interventions for encouraging such.

The HBM has since been used in various studies to explain the methods that will increase screening for breast and cervical cancer, increase behaviors for acquired immunodeficiency syndrome (AIDS) protection (Rankin, Stallings, & London, 2005), as well as methods for smoking cessation (Strecher & Rosenstock, 1997). Additionally, as aforementioned, Quillin, et al., (2000) used the HBM to assess college women's awareness and consumption of folic acid in a southeast section of the United States.

The HBM has evolved over the last fifty years into four various components that attempt to explain why individuals may or may not take part in healthful behaviors. *Perceived susceptibility* is the first component, which seeks to measure how susceptible one feels they are at contracting a health condition or illness. To apply this component, one would ask, to what degree do women feel their pregnancy will result in a NTD? *Perceived severity* is the second component, which addresses how serious one feels contracting that illness would be, and whether or not they should treat it based on that severity. In order to address perceived severity as it relates to NTDs, one should analyze

what the serious effects of NTDs are. As addressed in an earlier mentioned study, there are considerable financial concerns with caring for a child with a NTD. Caring for an NTD-affected child is a definite expense, not only at birth but also throughout their life. There are also psychological and emotional costs to all family members. How severe the defect is depends on the level at which the neural tube fails to close. This extent determines how little motor control, including bowel and bladder, the child may have. Together, perceived susceptibility and perceived severity can be combined and labeled *perceived threat*.

Perceived benefits is the third component of the HBM, which explores how one feels taking a course of action will either benefit them. To address perceived benefits of multivitamin consumption, one must consider what they believe those benefits are. In this study, participants were asked to select from a list of perceived benefits of multivitamin consumption. The choices of benefits include: energy, illness prevention, a way to ensure the daily nutrient needs are met, and hair, skin, and nail health. Opposite of perceived benefits, *perceived barriers* looks at the negative aspects of multivitamin consumption. There is an added cost-effect to taking multivitamins daily, although it averages less than $10 per month. Additionally, current healthcare flex-spending options prevent one from using pre-tax dollars to pay for multivitamins unless prescribed by a physician. Obtaining a prescription for multivitamins requires a visit to a healthcare provider, which could be a barrier. Side effects of multivitamins use such as nausea and constipation sometimes discourage individuals from taking them.

Self-efficacy was first defined as a concept by Bandura in 1977. Self-efficacy is an important part of the HBM, which seeks to explain outcome expectation, such as a given

behavior leading to an outcome. There are many definitions of self-efficacy; however, Bandura defines self-efficacy as "the conviction that one can successfully execute the behavior required to produce the outcomes" (Bandura, 1977). In this study, the researcher examined whether or not acute care staff nurses felt self-efficacious, or confident in the teaching they delivered to their clients. Additionally, Bandura explored and supported positive self-efficacy in initiation and maintenance of behavioral change. If acute care staff nurses had high self efficacy scores, were they more apt to engage in health behaviors such as multivitamin use and encourage multivitamin use in the clients they care for?

When determining self-efficacy in nurses, there are four components of the Self-Efficacy Theory to keep in mind (Rankin, Stallings & London, 2005). These components can be applied to nurses in the acute care setting. *Personal mastery* includes participant modeling. In other words, if nurses engage in healthful behavior such as multivitamin use, then perhaps other nurses would be more likely to model that healthful behavior. *Vicarious experience* is another component of the Self Efficacy Theory that can be applied in this research. Aside from nurses encouraging multivitamin use, if Registered Nurses (RNs) modeled the healthful behavior on the acute care units, this could also increase self-efficacy, especially if the nurses who are in leadership roles participate. Nurses who take on leadership roles, such as a charge nurse or unit manager should model through verbalization in support of multivitamin use. *Verbal persuasion* involves giving suggestions to encourage multivitamin use. Nurses in leadership roles can become active health advocators by working with the hospital pharmacies to offer a variety of multivitamins for employees to choose from, which may tailor to needs other than folic

acid consumption. For example, providing a variety of types of vitamins, such as chewable, liquid, various sizes, generic, or senior versions may appeal to more nurses. Perhaps providing vitamins at a discounted rate to hospital employees would give them greater incentive to purchase.

Providing *physiologic feedback*, such as the physiologic benefits of multivitamin use could increase self-efficacy in nurses. Discussion of the many benefits of multivitamins, such as nail and hair growth and increased levels of energy, as well as how to decrease any negative side effects of multivitamin consumption should be discussed. Encouraging nurses to take multivitamins at the end of the day at bedtime to discourage nausea might be helpful. Nurses can also use this information in delivering the message to their clients.

Summary of the Literature Review

According to a March of Dimes study (2004), women are more likely to take folic acid if it is recommended to them by their health care provider. Eicholzer, Tonz & Zimmerman (2006) reported women feel health care providers' communications are the most effective means of promoting the folic acid message, followed by television ads and other advertising media. However, a gap remains in the awareness level of health care providers and the actual client intake of folic acid (Robbins et al., 2005). An effort to bridge this gap may be to focus on increasing acute care staff nurses' knowledge levels of folic acid.

Studies have addressed the need for increasing nurses' awareness of folic acid health benefits (Chacko et al., 2003; Stanner, 2005). Stanner (2005) examined the benefits of health supplements to include folic acid, vitamins B6, B12, and D; Iron and

antioxidants. Stanner reiterates the earlier findings that younger, less educated women and women of lower socioeconomic status take folic acid less often. The researcher also suggests that practicing nurses are actually performing public health practice and have an important role in educating women on the benefits of folic acid, especially as they relate to healthier pregnancies.

As discussed by Cowart (2003), nearly 50% of pregnancies are unintended. The neural tube section of the fetus' spinal cord closes by the end of the 28th day following conception, which is approximately 14 days following a missed period. If women are not aware of the need to take folic acid prior to becoming pregnant, it is less likely they will begin taking folic acid until directed to do so by a health care provider, which could be at their first prenatal visit. This first prenatal visit often occurs well after the neural tube has closed. This is why it is crucial for health care providers to get the message to women of childbearing age before they even plan to become pregnant. Nurses may have the opportunity and exposure to clients of childbearing age and thus, are able to educate women about their need for folic acid.

The literature reveals numerous studies that examined level of folic acid awareness in women of childbearing years (deRosset, Mullenix, & Zhang, 2009; Cleves, et al., 2004; Chacko, et al., 2003; Lolkje, et al., 2005). No literature was found that addressed the knowledge level of nurses and their awareness of the importance of folic acid. Nurses working in an acute-care setting have a valuable opportunity to provide clients with knowledge regarding folic acid benefits in an effort to encourage multivitamin use and increased dietary folate. Studies reviewed presented the benefits of folic acid use and these benefits include: (a) reduced incidence rate of neural tube defects

in childbearing women (North Carolina Folic Acid Council, 2009; Stevenson, et al., 2000); (b) decreased blood pressure and increased coronary dilation in clients with coronary artery disease (Muller et al., 2003); (c) slowed progress in clients with Parkinson's (Tawakol et al., 2005); (d) decreased overall incidence of oral-facial clefts (Yazdy, Honein, & Xing, 2007); and (e) a decrease in risk of spontaneous pre-term labor in those women who took multivitamins prior to and throughout pregnancy (Bukowski, et al., 2009).

Chivu, Brezis, Tulchinsky, Soares-Weiser, & Braunstein (2007) conducted a systematic review of the literature and examined all studies that contained interventions designed to increase the awareness and knowledge of folic acid in healthcare professionals and in women ages 15-49 years. The purpose of this systematic review was to determine which interventions were most effective in increasing knowledge, awareness, and folic acid consumption before and during pregnancy. A variety of studies were analyzed and included randomized controlled trials, quasi-experimental interrupted time-series, follow-up studies, case-control studies, and pre-test and post-test studies. These studies were conducted during the time span of 1995 to 2005. Studies not including data for both the pre- and post-tests were excluded from this review.

The interventions used with health professionals in these studies included printed materials, training, professional publications, letters, personal communication, incentives for participating such as mugs and notepads, and a reminder prompt on the patient history form. Results from this review indicated an increase in health professionals' knowledge levels of the recommended daily amount of folic acid in the pre-intervention-phase of the study; this increase ranged from 13% to 58%. In the post-intervention-phase of the study,

this increase ranged from 51% to 70%. While the researchers concluded the effectiveness of these interventions were limited, folic acid remains a safe, inexpensive, and effective means of preventing NTDs; however, this information about folic acid is poorly disseminated. The researchers stated, "While health professionals may play an important role counseling the women on folic acid supplements, they often fail to do so" (p. 1).

An additional finding of interest from this review was how mass media positively influences society's awareness and knowledge; however, people are more likely to change their health behaviors, such as multivitamin consumption, if encouraged to do so by their healthcare providers. As discussed earlier in this study, nurses are in a prime position to be the connection between folic acid recommendations and uninformed members of society.

In summary, there are recurring significant themes based on the literature and the current findings within North Carolina that supported the need for this study. First and foremost, nurses are educators. According to the studies presented herein, the more educated nurses know more about folic acid. Second, education about folate consumption is an important component of NTD prevention. Women have to be educated that folate consumption, best achieved with the use of folic acid within a multivitamin, must be initiated prior to getting pregnant. Nurses cannot assume clients will plan a pregnancy, as nearly 50% of all pregnancies are unintended. As revealed, clients are more apt to take a multivitamin if encouraged to do so by their healthcare provider. For the reasons discussed above, this study attempted to explore how confident acute care staff nurses were when teaching their clients. Nurses have the power and control to make a difference; however, they too must be knowledgeable on folic acid and its benefits.

Nurses must recognize the benefits of folic acid in the form of a multivitamin as being an important part of health behavior if they are to recommend it to their clients. These studies supported the need to further explore acute care staff nurses and their folic acid knowledge levels.

CHAPTER 3

METHODOLOGY AND DATA DESCRIPTION

This chapter addresses the study design, sample, and procedure for sampling and data collection. Power analysis and ethical considerations are discussed. The educational intervention is described as well as the instruments used in this study. The research questions are presented with a discussion of the statistical tests used for analysis.

Research Design

The design of this experimental study was a pre-test, post-test control group design with random assignment. This true experimental study examined North Carolina Registered Nurses who are employed in the acute-care setting. The three criteria for a true experimental design were met. The researcher manipulated the experimental variable by selecting the appropriate intervention for the experimental group. There was one experimental and one control group in the study. Subjects were randomly assigned to both the experimental and control groups using the select-cases function in Statistical Package for the Social Sciences (SPSS), version 16.0.

Specific research questions to be answered included the following: (1) What is the relationship between acute care staff nurses' demographic and personal variables and knowledge of the health benefits of folic acid for women? (2) What are the relationships between acute care staff nurses' demographic and personal variables, their knowledge of

the health benefits of folic acid for women, and their self-efficacy in providing discharge teaching to their clients? (3) Which factors best predict the frequency of acute care staff nurses recommending multivitamin supplement use to their clients? (4) Is there a relationship between acute care staff nurses' personal multivitamin consumption and how they counsel their clients about the benefits of multivitamin use? and, (5) What is the effect of the educational intervention to increase acute care staff nurses' knowledge of the benefits of folic acid consumption?

Dependent variables tested included nurses' folic acid knowledge levels and nurses' level of self-efficacy. Independent variables included age, gender, level of education, county of residence, pregnancy history, personal multivitamin consumption, specific area of practice, and number of practice years since graduation.

Sample and Sampling Procedure

The sample consisted of North Carolina Registered Nurses (RNs) who were currently employed in the acute-care setting. A listing of all acute care RNs in NC was accessed and purchased from the North Carolina Board of Nursing. As of July 22, 2008, there were 77,194 RNs practicing in North Carolina, with 44,146, or 57% of those being employed in the acute care setting. This random sampling assisted the researcher in accessing a more homogenous sample by excluding nurses who work in settings not likely to have clients who receive in-depth discharge teaching, such as Hospice, Long-Term Care, or the Public Health Department. The Public Health Department was a prior target population for the NC Folic Acid Campaign and quite likely received formal teaching on folic acid and its benefits within the past one to two years. A representative from the NC Board of Nursing confirmed prior to start of this study that these groups of

nurses would be excluded by purchasing the strata of acute care staff nurses as explained herein.

The names were purchased from the NC Board of Nursing once the exclusion criteria was provided; however, there was a gap in time from when the estimate of names was obtained and February 2009, when the names were actually purchased. This time lapse was due to awaiting approval from the requested funding source as well as approval from the Office of Protection for Research Subjects (OPRS) at University of Nevada, Las Vegas (UNLV). Because this research was being funded by a grant, the estimate in numbers was used for budgeting purposes. The researcher decided any difference in the quantity of names would not change the proposed number of the sample size, which was to be 4400.

The researcher received an Excel file of 31,265 names electronically via email from the NC Board of Nursing. It was previously determined that 10%, or 4400 of the proposed 44,146 target population would be asked to participate; however, when the listing of names was obtained, there were 31,265 instead of 44,000. The names and addresses were received in an electronic file and imported into SPSS for randomization. Once 4400 random names were obtained, the names and addresses were loaded into an Excel file. From the 4400, the group was split into two equal groups of 2200 each. Labels were created with names and addresses and envelopes were prepared for mailing.

Power Analysis

The desired sample size was based on power analysis. For this study, an 80% power level was desirable in order to prevent a Type II error. A medium effect was expected, as the researcher anticipated folic acid knowledge levels would increase on the

post-test scores. The alpha level set by the researcher for this study was α=.05. With the statistical tests conducted for the hypotheses stated, a desirable sample size for each group needed to be at least 36, with 57 desired in each group (Gall, Gall, & Borg, 2007). Because the researcher anticipated it would be difficult to get an adequate return rate from mailed flyers, an oversampling was done by sending out 4400 flyers with an expected return rate of 100 participants per group.

Ethical Considerations for Human Subjects

This research study was given final approval by the University of Nevada, Las Vegas, Institutional Biomedical Review Board (See Appendix G). Informed consent was obtained on the home page of the online survey, which stated he or she was in no way required to participate in this study and continuously had the option to opt out at any point desired. There were minimal risks to the participants completing this study. These included the social risk of concern that scores on the folic acid knowledge questions would be released to the public, their peers, or their employer. Additionally, participants could have concerns their names and the associated scores on the folic acid knowledge questions would be disclosed to the school where they obtained their undergraduate nursing education, since this information is recorded on the Socio-behavioral and Demographic Data form. It is unlikely that any given harm occured since the risks are minimal and could be protected against.

Names of the participants were not shared with anyone other than those involved in this study. Additionally, participants were not required to include their name unless they chose to apply for the free contact hour for participation. Awarding the contact hour occurred independently from the data obtained from the online survey. No data gathered

was linked to a participant's name. Scores were correlated with specific schools of undergraduate nursing education, however, no participants' names were used or entered into the set of data. All data, including the original listing of names from the NC Board of Nursing, the Excel file containing the randomized names and addresses, the Microsoft Word file containing the mailing labels, the Survey Monkey results, the data output from SPSS, and the individual certificates were maintained in a secure file in the office of the researcher, and then shredded and disposed of at the conclusion of three years following completion of the study.

Participants who completed the pre-test, viewed the video, and completed the post-test were eligible to request one (1) contact hour awarded by the Southern Accreditation for Colleges and Schools (SACS). No contact hour was provided if the participant did not complete all 3 components (pre-test, post-test, and video). Participants in the control group were given the option to access and view the video at the completion of their post-test. Regulatory guidelines for awarding the contact hour require equal time spent in order to be able to award the contact hour to both groups. Since the researcher could not control who watched the video and who did not, to encourage the control group to view the link, the link to the video was placed in the survey before the questions related to receiving the contact hour for participation. At the conclusion of the survey, participants requested the complimentary contact hour by entering their name and email address in separate fields. These columns were extracted from the spreadsheet before any data was interpreted and entered into a separate Microsoft Word document so the certificates could be prepared and distributed electronically while protecting the participants' names from their associated scores on the post-test.

There are particular benefits the researcher hoped the participants would attain as well as potential societal benefits. Acute care staff nurses would hopefully become more knowledgeable regarding folic acid and its health benefits, and may use and increase their own frequency of multivitamin consumption after learning of the associated benefits. Benefits for society include more likelihood in reaching Healthy People 2010 goals related to folic acid and decreasing the incidence of NTDs across the state of North Carolina. Healthy behaviors for both acute care staff nurses and their clients would increase and this in turn would decrease third party payor reimbursements.

Recruitment of Subjects

A flyer was created and used as the letter of contact sent to the randomly selected nurse participants (See Appendix F). The flyer was copied on bright green paper, signifying the folate-rich foods of green leafy vegetables. There were two different flyers created: one for the control group, and one for the experimental group. The only variance between the two flyers was the link to the online survey, since one contained the embedded intervention and one did not. The flyer was approved by the OPRS at UNLV.

The flyers were mailed using first-class bulk mail rate on March 18, 2009. This allowed the researcher to obtain a lower rate of postage, however, one drawback was the inability of the United States Postal Service to forward any pieces in which the address was no longer current. There were approximately 100 pieces returned for incorrect addresses or expired forwards. The researcher used the search engine whitepages.com to locate those whose forward address was not listed on the return label. If current addresses were obtained, the researcher re-addressed the envelopes and re-mailed the flyers to the corrected address one time. The envelopes containing the flyers were not opened;

therefore, the contents were not manipulated. If the recipient had originally been mailed an experimental group flyer, that remained the case, and likewise with the control group. If envelopes were returned a second time, the researcher considered them to be undeliverable. In total, there were 48 undeliverable envelopes, or 1% of the total amount originally mailed. Of the 48, 25 were from the experimental group and 23 were from the control group.

Data Collection Procedure

All nurses who agreed to participate were directed to go on-line and enter the given web address into the address bar on his or her computer. All subjects took the identical on-line pre-test. Names identified as the experimental group (n=2200) received the letter with the link to the pre-test, and placed at the end of the survey, the link connected them to a You Tube video titled: *Folic Acid for a Healthier Tomorrow* (2008). Those who were identified and placed in the control group (n=2200) also received the letter with the link to the pre-test; however, there was no link to the video at the end of this test. Finally, all participants were asked to enter any generic email address so that the post-test could be delivered via email in 2 to 3 weeks.

Testing Procedure

Initially, the online pre-test was available for a two-week time period once the letters were mailed. This allowed participants to consent to participate by accessing the link to the pre-test. This allowed adequate time for participants to consent to participate, access the link to the pretest, and take the pretest. After the 2 weeks of access to the pre-test, one additional week extension was implemented due to the number of returned envelopes for invalid addresses. Five weeks after the letter of contact containing the link

to the pre-test was mailed, the link was disabled and no longer accessible. The time period of access was set to limit participants' discussion amongst others within the period of testing. At the end of the pre-test, participants were asked, but not required, to enter a valid email address so the post-test link could be delivered electronically. This helped control costs of the study, prevented a delay in the mail delivery, and ensured all participants received the link at the same time.

The post-test contained the identical information as the pre-test, minus the demographic and personal behavior questions. The post-test was emailed using Survey Monkey as the host, which created ease for the participants in completing the post-test, because the link was embedded in the email sent by Survey Monkey. Participants merely clicked on the link in the email to be directed to the beginning of the post-test, as opposed to having to type in the link as they were required to do in order to access the pre-test. Participants' responses were logged according to their email address and not their name. Using Survey Monkey as the host for delivery of the post-test afforded the researcher the opportunity to periodically assess how many participants had responded, opted out, or simply not opened the email. Each week for two weeks after sending the initial email for the post-test, the researcher sent a second and third request only to those who did not respond or opted out. At the conclusion of the third week following opening of the post-test to the participant, the link was disabled and the data was downloaded to an Excel spreadsheet. At the conclusion of the post-test, participants were directed to the home page for the NC Folic Acid Campaign, www.getfolic.com.

Once the post-test deadline ended, the researcher electronically sent the certificates awarding the contact hour to the participants who had requested the contact

hour (See Appendix H). The researcher facilitated this by entering the participant's name on the electronic certificate, saving the certificate as a secure pdf file, and then emailing the participant their individual certificate. Saving each individual certificate as a pdf file allowed the researcher to maintain the security of the certificates, thereby discouraging anyone from replication or manipulation of the certificates. The individual certificates saved as pdf files were stored electronically with the rest of the study data documents and files, and discarded three years following completion of this study. The Continuing Education Department of Cabarrus College of Health Sciences was provided a roster with the names of those participants who received the certificate in an effort to maintain control and quality as required by SACS, their accrediting body. This was an in-kind contribution received from Cabarrus College of Health Sciences and was provided to the participants gratis for completion of the three components of the study (pre-test, intervention, and post-test).

Educational Intervention Treatment

The intervention included a nine-minute video created by the NC Folic Acid Campaign (http://www.youtube.com/watch?v=KW938qQHWxs). At the time of this study, this 9-minute video was used to educate physicians, physician assistants, and advance-practice nurses within the office setting, as well as college students and other target groups within North Carolina. It is available in English and Spanish. At the time of this study, acute care staff nurses had not received any formal folic acid education by the North Carolina Folic Acid Campaign. The video defines NTDs, discusses its incidence and prevalence, discusses some of the myths regarding folic acid recommendations, and presents the associated costs of caring for a pregnancy and birth affected by a NTD. All

questions assessing folic acid knowledge levels in the pre- and post-test were answered at some point during the nine-minute video. The video was specific to North Carolina statistics.

Instruments

Socio-Behavioral & Demographic Form

Instruments used included a socio-behavioral & demographic form developed by the researcher, which included the respondent's age, gender, level of education, county of residence, pregnancy history, beliefs and practices of multivitamin consumption, specific area of practice, and number of practice years since graduation (See Appendix D). NTDs in NC are calculated and reported according to region and county of residence. Areas with higher NTD rates received a heavier concentration of education and intervention by the NC Folic Acid Campaign. For this reason, the researcher asked about county of residence and was interested in comparing folic acid knowledge levels with county of residence. Additionally, particular colleges and universities in NC have purposely added folic acid as an educational component in their undergraduate-nursing curriculum. The researcher's intent was to determine if acute care staff nurses who received folic acid education as part of their undergraduate curriculum had higher knowledge levels of folic acid and therefore asked the participant about folic acid education during their undergraduate nursing program.

Folic-Acid Knowledge Test

The folic acid knowledge level was determined using ten questions obtained from the Spina Bifida Association (See Appendix E). The questions were either dichotomous true/false or multiple-choice. At the time of this study, the Spina Bifida Association

(SBA) has an online Continuing Medical Education (CME) credit-based survey that assesses knowledge levels and provides educational modules about folic acid. This CME activity is approved for health care providers, specifically physicians, to obtain ongoing required CME hours. The title of the online module used by the SBA at the time of this study was *The ABCs of Folic Acid*. According to Adriane Griffin, MPH, Director of Health Promotion and Partnerships for the SBA, the questions were developed based on audience research SBA conducted over a two-year process in collaboration with the Centers for Disease Control and Prevention (CDC). Based on the purposes of this research study, these identical questions were used; however, the intervention was different. Evidence of reliability and validity of these questions was not established.

Self-Efficacy Item

Nurses' self-efficacy was determined using a single-item Likert-type question regarding confidence levels in providing folic acid teaching on the Socio-Behavioral & Demographic Data survey. The specific question was: "How confident are you in your ability to provide teaching on folic acid to the clients you care for?" The responses were based on a 0-4 Likert scale, with very confident = 4, confident = 3, somewhat confident = 2, not very confident = 1, and not confident at all = 0. Nurses need to first feel confident as an educator and possess knowledge about the topic before they can be expected to deliver information, such as discharge teaching, in an effective manner. Furthermore, to determine whether or not teaching sessions are effective, nurses must determine if learning has occurred in their clients. As discussed earlier, clients are more apt to take a multivitamin if recommended by their healthcare provider. Therefore, establishing a

positive nurse-client relationship is key. The stronger the relationship between the nurse and client, the more favorable the learning environment.

Statistical Tests

A variety of statistical tests were used to answer the research questions and directional research hypotheses. The first research question asked whether or not personal pregnancy history and prior folic acid education made a difference in acute care staff nurses' level of folic acid benefits. To determine whether acute care staff nurses who have experience with pregnancy also have a higher folic acid knowledge level than women with no experience, an independent samples t-test was run. The sample containing nurses' pregnancy experience is a group of data independent to the responses on the folic acid knowledge questions. The independent samples t-test was also used to answer the second hypothesis for the first research question, which is whether or not acute care staff nurses who have received prior folic acid education would demonstrate higher folic acid knowledge than those with no prior education.

The second research question explored if there were any relationships between acute care staff nurses' level of education, years of experience, folic acid knowledge level, and level of self-efficacy when providing their clients discharge teaching. These questions were answered using correlational studies. Correlational studies examined the strength of the relationships between these variables by determining how changes in one variable are associated with the changes in the other variable, as evidenced by correlational coefficients. The first hypothesis, which states nurses with higher levels of education will have higher self-efficacy scores than nurses with lower levels of education, was tested using the Spearman's ρ, as educational level is ranked data. The

second and third hypotheses compared nurses' years of experience with self-efficacy scores, and folic acid knowledge levels with self-efficacy scores. These hypotheses were rejected or accepted using Pearson's *r*, because the variables are measured on intervals, there is a normal distribution of at least one variable, there are no observational pairs within these variables, and homoscedasticity of equal variance of the variables can be assumed.

The third research question was answered using multiple regression, because this question asked which variables predicted how often acute care staff nurses recommend multivitamin supplement use to their clients. The researcher wanted to determine what specific factors most accurately predicted the nurses' frequency in recommending multivitamin supplement use to their clients. Specifically, the researcher wanted to know if there were one or more independent variables that influenced the dependent variable.

The fourth research question assessed if a relationship existed between nurses' personal multivitamin use and how often they discussed the benefits of multivitamin use with their clients. To answer this question, cross-tabulations were computed with chi-square analysis to determine whether these two variables are independent or related (Burns, & Grove, 2005). The data met the assumptions for this nonparametric test.

The fifth research question addressed any effect the educational intervention had on acute care staff nurses' knowledge levels of folic acid consumption. To answer this question, a paired samples t-test was run. Because there were two groups in this experimental study, both a control group and an experimental group, both groups' pre-test and post-test scores were analyzed. Means of both groups' scores were compared to determine if those who participated in viewing the interventional video after taking the

pre-test had an increase in folic acid knowledge when taking the post-test as compared with those without the intervention.

CHAPTER 4

FINDINGS

This chapter presents the findings from data analyses conducted to answer the research questions and stated hypotheses. The information includes a description of the sample, descriptive statistics, and the analyses from the statistical tests run.

Response Rate

There were 4400 flyers mailed to a random-sampled population of North Carolina acute care staff nurses. Of those 4400, 171 (3.8%) chose to participate by accessing the online survey. Approximately 100, or 2%, were returned for incorrect addresses; however, the researcher was able to find deliverable addresses for 53 of them. Of the 171 who chose to participate, 98 (57.3%) of those were in the control group, and 73 (42.7%) were in the experimental group. Participants must have included their email address at the end of the pre-test in order to receive the post-test. Those who did not include their email address were removed from the data set and excluded from the analysis. In the control group, 14 of the 98 (14.3%) did not include an email address and were therefore removed from the original set of pre-test data. In the experimental group, 14 of the 73 (19.2%) chose not to include an email address and were therefore removed from the data set. The remaining participants comprised a total group membership of 143, with 84 in the control group, and 59 in the experimental group. This included participants who

completed both the pre-test, post-test, and intervention components, if applicable, of the study.

Demographics of Study of Sample

The average age for participants in the experimental group was 43.3 years old (SD = 11.82). In the control group, the average age was 45.8 years old (SD = 12.01). Skewness and kurtosis were examined and suggested that the data were normally distributed for these groups. For both groups, females were more common than males, with 88% of the experimental group and 90% of the control group being female. Of note, there were nine participants who chose not to answer this gender question; six in the experimental group and three in the control group. Fisher's Exact test was used to determine whether or not there was a proportional difference in the responses between this dichotomous data according to the gender type; results were insignificant (p = .502).

Level of education ranged from Diploma to Masters degree. While Doctorate was an option, the highest level of nursing education reported was a Masters degree. Educational level varied between the two groups, with more Associate degree prepared nurses (47.5%, n=28) participating in the experimental group than any other degree-type, and more Baccalaureate degree prepared nurses participating in the control group (47.5%, n=39). Two participants in the control group chose not to respond to this question. See Table A1 for specific data related to educational background.

Participants were asked to select their current area of practice within the acute-care setting. Overall, there were more participants employed in the critical care area (24.5%, n = 35) than any other area of practice. More specifically, for the control group, there were more participants employed in the medical-surgical area (26.2%, n = 22) than

any other area, with critical care to follow (23.8%, n = 20). For the experimental group, critical care was the most frequently-occurring area of practice (25.4%, n = 15). Maternity and operating suite followed, with 10 nurses participating from each area. Of note, the operating suite category consisted of nurses who worked in the pre-operative setting, the operating room, and the post-anesthesia care unit. See Table A2 for data regarding specific area of practice.

The researcher questioned whether or not participants received folic acid education as a component of their undergraduate nursing curriculum. More participants did not (n = 73, 51.8%) receive folic acid as a component in their undergraduate nursing education than did (n = 68, 48.2%). One participant from the control group chose not to provide a response to this question. See Table A3 for frequency data regarding folic acid education as a component in the undergraduate nursing curriculum.

Participants were asked whether or not they had taken part in or had been exposed to any education on folic acid since becoming licensed as a Registered Nurse. If participants had in fact learned of folic acid since becoming licensed they were then asked to select in what mode the education was delivered. Options included continuing education units, website, radio/television, conversation with a midwife or physician, and/or a guest speaker. Multiple options could have been selected. A total of 34, or 23.7% had taken part in post-licensure continuing education on folic acid. Of the modalities selected, 13 (38.2%) chose continuing education, and 11 (32.3%) selected physician or midwife as being the vehicle for delivery of the folic acid content. Website and radio/television delivery was chosen third and fourth, each with four participants

(11.8% each). Guest speaker was the most infrequent option chose (n = 2, 5.9%). See Table A4 for specific frequency data related to source of folic acid education received.

Experience with pregnancy was also explored. Of the 143, 114 (79.7%) reported having experience with pregnancy, while 29 (20.3%) did not. Participants were then asked several socio-behavioral questions on multivitamin use, beliefs, and barriers to usage, as well as confidence levels in teaching their clients on multivitamin use. First, participants were asked how often they take a multivitamin. Responses were ranked on a likert-type scale, with *never* receiving a score of 0, *rarely* receiving a score of 1, *sometimes* receiving a score of 2, *often* receiving a score of 3, and *always* receiving a score of 4. The majority of nurses stated they took a multivitamin always, or on a daily basis (n = 54, 37.8%), with 21 reporting they never took a multivitamin (14.6%). See Table A5 for specific data regarding participants' multivitamin use.

Benefits and barriers of multivitamin use were explored with the participants. Participants' perceived benefits of multivitamin use were assessed by asking them to select any or all they felt were benefits. These options included: energy, hair, skin and nail health, illness prevention, and a way to ensure daily nutrient needs are met. Participants selected taking multivitamin as a way to ensure daily nutrient needs are met most frequently, and multivitamins as a means for hair, skin, and nail health least frequently. Barriers were also assessed by asking participants to respond to whichever barriers they felt contribute to their consumption of multivitamins. Options included cost, time, side effects, and size of pill. Participants selected time as a barrier most frequently and side effects least frequently. See Table A6 for data regarding these perceived benefits and barriers.

Statistical Analyses of Research Questions and Hypotheses

In order to test the hypotheses and answer the research questions, a variety of statistical tests were run using SPSS version 16.0. Data was screened for normality by analyzing skewness and kurtosis, and presence of any outliers.

Research Question #1

The first research question was: Does personal pregnancy history and prior folic acid education of acute care staff nurses make a difference in their knowledge level of folic acid benefits? The hypotheses were answered using results from independent sample t-tests. The first hypothesis stated acute care staff nurses who had experience with pregnancy would demonstrate higher knowledge of the health benefits of folic acid for women than those with no pregnancy experience. An independent samples t-test was run. Levene's Test for Equality of Variances revealed non-significant 2-tailed results; therefore equal variances could be assumed. The result of the t-test indicated insignificance ($t(140) = .332$, $p = .741$); therefore, it was determined pregnancy experience had no effect on folic acid pre-test knowledge levels. This directional hypothesis was therefore rejected.

The second hypothesis used to answer the research question stated acute care staff nurses who had received prior folic acid undergraduate education would demonstrate higher knowledge of the folic acid benefits than those with no prior education. Equal variances were assumed by analyzing Levene's Test for Equality of Variances. The difference between the two means of knowledge levels at the pre-test for those who had received folic acid education ($\bar{x} = 6.74$, SD = 1.27) in their undergraduate curriculum and those who had not ($\bar{x} = 6.57$, SD = 1.27) revealed insignificant results ($t(138) = .775$, $p =$

.440). It was determined that prior folic acid education had no effect on knowledge level. Therefore, this hypothesis was rejected.

Research Question #2

The second research question asked whether there were any relationships between acute care staff nurses' level of education, years of nursing experience, folic acid knowledge, and level of self-efficacy when providing client discharge planning. The first hypothesis stated nurses with higher levels of education would have higher self-efficacy scores than nurses with lower levels of education. In order to test this hypothesis, a Spearman's rho correlation was examined using this ordinal data. Results indicated insignificant values for nurses in both the pre-test self-efficacy levels (r_s = -.037, p = .665) and the post-test self-efficacy levels (r_s = -.018, p = .862). As educational levels increased, nurses' self-efficacy decreased. Therefore, this hypothesis was rejected. See Table B1 for the Spearman's correlation matrix for this hypothesis.

The second hypothesis stated nurses with more years of experience would demonstrate higher self-efficacy scores than nurses with less years of experience. A Pearson's *r* correlational test was conducted on this interval data which revealed insignificant values when years of experience was compared both with pre-test self-efficacy levels (r = -.049, p = .565), and post-test self-efficacy levels (r = -.014, p = .890). These results were insignificant despite adequate power; therefore, this hypothesis was rejected. See Table B2 for the Pearson's correlation matrix for this hypothesis.

The third hypothesis stated nurses with higher folic acid knowledge levels would have higher self-efficacy scores than nurses with lower folic acid knowledge levels

(r = -.056, p = .506, n = 142). To test this hypothesis, a Pearson's r was conducted. None of these comparisons were significant, both with pre- and post-test folic acid knowledge levels, as compared with pre- and post-test self-efficacy scores. Post-test self-efficacy when compared with post-test folic acid knowledge level revealed insignificant correlations (r = .080, p = .428, n = 100). See table B3 for correlation matrix data.

Research Question #3

The third research question asked which demographic, personal, and professional factors best predicted the frequency of acute care staff nurses' discussion of multivitamin benefits to their clients. The first hypothesis stated educational level, years of experience, working in maternity areas, and self-use of multivitamin supplements would predict nurses' recommending multivitamin supplements to their clients. To answer this question, correlations were calculated using the following variables: how often discussion of the benefits of folic acid in discharge teaching with clients occurs, educational level, years of experience, nurses who worked in the maternity setting, and nurses' frequency of multivitamin consumption. Significant correlations existed between nurses' frequency in multivitamin consumption and frequency of discussing benefits of folic acid with clients, as well as years of experience with frequency in multivitamin consumption. This assisted the researcher in determining which factors may predict how often nurses recommend the benefits of multivitamins in their discharge teaching. See Tables B4 for descriptive data and B5 for correlation matrix.

The regression model consisted of educational level, maternity as an area of practice, nurses' frequency in multivitamin consumption, and years of experience as independent variables, or the predictors. The dependent variable was how often nurses

discuss benefits of multivitamin consumption with their clients in discharge teaching. The regression model was found to be tenable and significantly different from zero ($F = 3.231$, $p = .014$). The regression model yielded results indicated 9% (adjusted $R^2 = .062$) of the variance was accounted for (R^2) with the predictors. Nurses' frequency in multivitamin consumption ($\beta = .248$; $p < .01$) contributed the greatest amount toward predicting how often nurses recommend multivitamin consumption. This hypothesis was statistically significant. Its clinical significance is discussed in Chapter 5. Also, see data in Table B6 for the multiple regression output.

The second hypothesis stated folic acid knowledge levels would predict nurses recommending multivitamin supplements to their clients. Correlations of folic acid knowledge scores with nurses' frequency of discussing benefits of multivitamin use were conducted and a multiple regression model was built. Both were found to be insignificant ($F = .350$, $p = .555$). There were no statistically significant findings and no relationships between these factors; therefore, this hypothesis was rejected.

The third hypothesis stated self-efficacy levels would predict nurses' frequency in recommending multivitamin supplements to their clients. To answer this question, a 2-step linear regression model was created. Initially, Pearson's correlation tests were run to determine which factors would most likely be significant for the model. Of the independent variables, frequency of discussing multivitamin usage with clients, as compared with nurses' frequency of multivitamin consumption, was significant ($r = .258$, $p < .01$). Additionally, pre-test self-efficacy level was significant with nurses' frequency of discussing multivitamin usage ($r = .183$, $p = .029$). Nurses' self-efficacy level with folic acid teaching significantly correlated with nurses' pre-test frequency of discussing

benefits of folic acid with clients ($r = .372$, $p < .01$). The number of years of nursing experience positively correlated with nurses' frequency of multivitamin consumption ($r = .188$, $p = .026$).

The two-step linear regression model was created using the results from the above correlations. The first model consisted of pre-test self-efficacy levels along with folic acid discharge teaching and nurses' frequency of multivitamin consumption to predict how often nurses recommend multivitamin consumption when providing discharge teaching to their clients. The regression model was found to be tenable and significantly different from zero ($F = 14.677$, $p < .001$). The results of this multiple regression model indicated 18% of the variance was accounted for (adjusted $R^2 = .163$). Both the pre-test self-efficacy levels and nurses' frequency of multivitamin consumption do show statistically significant predictive qualities for how often nurses discuss health benefits of multivitamin consumption when providing discharge teaching to their clients. Pre-test self-efficacy levels with folic acid teaching ($\beta = .319$; $p < .01$) contributed the greatest amount toward predicting how often nurses recommend multivitamin consumption, followed by the frequency in which nurses consume multivitamins ($\beta = .152$; $p < .05$). See Table B7 for multiple regression coefficients. This hypothesis was statistically significant. Its clinical significance is discussed in Chapter 5.

Research Question #4

The fourth research question asked if a relationship existed between nurses' personal multivitamin consumption and how they counsel their clients about the benefits of multivitamin use. The hypothesis stated a relationship would exist between nurses' multivitamin consumption and how often they discuss benefits of multivitamin

supplements with their clients. In order to address this hypothesis, cross-tabulations were computed to determine if the differences in the frequencies were independent or related. The likelihood ratio revealed insignificant results; therefore, there was no significant relationship between nurses' personal multivitamin consumption and how they counsel their clients about the benefits of folic acid use for either the control group ($G^2 = 17.74$, df = 16, $p = .544$) or for the experimental group ($G^2 = 15.40$, df = 16, $p = .495$).

Research Question #5

The fifth research question asked what the effect was of an educational intervention on acute care staff nurses' knowledge levels of the benefits of folic acid consumption. To answer this question, a hypothesis was written which stated acute care staff nurses who participated in an educational intervention on folic acid would demonstrate an increase in knowledge scores from the pre-test period to the post-test period. To test this hypothesis, a paired samples t-test was run using the pre-test and post-test scores of the experimental group. Results indicated there was a statistically significant difference ($t = -3.421$, df = 45, $p < .01$) in those scores. See Table B8 for results of this paired-samples t-test.

Summary of Results

The sample of this study consisted of 143 North Carolina nurses, with 84 in the control group and 59 in the experimental group. The average nurse was 43-45 years old, held a BSN degree, and worked in the medical-surgical area of nursing. Of the ten hypotheses of the study, three were supported with statistically significant findings. Several factors were analyzed to determine if they played a role in how often nurses discuss the health benefits of multivitamins including folic acid with clients during

discharge teaching. The factors showing statistical significance included how often nurses consumed a multivitamin and how confident, or self-efficacious nurses were when providing discharge teaching to their clients. Nurses who took part in the educational intervention showed an increase in folic acid knowledge level from the pre-test period to the post-test period. Only the experimental group showed a significant increase in knowledge scores from pre-test to post-test; the control group scores were not statistically significant. The remaining seven hypotheses were not supported in this study.

CHAPTER 5

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

This chapter discusses the findings of the study related to the research questions first presented in Chapter 1. The implications for nursing practice, the limitations of the study, and the recommendations for future studies are also addressed.

The purpose of this study was to determine the folic acid knowledge level of acute care staff nurses employed in North Carolina and the relationship between self-efficacy level and selected demographics. Beliefs in the benefits and barriers of multivitamin consumption as well as how often nurses discuss multivitamin consumption with their clients was also explored.

Description of the Comprised Sample

The response rate for this survey was 3.8%. While the researcher looked forward to a higher return rate, it was anticipated that using a flyer delivered by regular mail might limit the number of responses. For this reason, the researcher chose to oversample in an effort to obtain a reasonable number of participants. In order to keep with the design of the study, the researcher chose to select a random sample of the list of names provided by the NC Board of Nursing. Based on the power analysis, there was a minimum of 36 participants needed for each group, with 57 participants desired. This was met, as the final sample consisted of 143 total, with 84 in the control group, and 59 in the experimental group. These numbers represent the total number of participants who chose

to complete both the pre- and post-tests. There is a difference in size of the two groups, as the control group had 25 more participants than the experimental group. Clearly, those in the experimental group had more steps to complete while the study was being conducted since these participants had to watch the 9-minute video during the pre-test phase. This could explain why there was a smaller number of participants in the experimental group. In an effort to not lose valuable responses and to maintain the randomization, the groups were not adjusted for inclusion of an equal number of participants in each.

Participants' level of education averaged between Associate and Baccalaureate-prepared nurses. There were no doctoral-prepared nurses participating in either group. This was expected, as this study focused on the acute care staff nurse. It is believed by the researcher the majority of doctorally prepared nurses are not practicing at the bedside.

The medical-surgical and critical care areas were more often the areas of practice for those nurses participating in the study. These two areas are typically the larger units of the hospital with a more consistent client census and steady exposure of the nurse to clients. Even though oncology and operating room nurses were represented in this sample, nurses working in these areas may not have as much time with the clients at the point-of-care and therefore less opportunity for teaching regarding multivitamin use. There were no clinical areas on the survey with 0% response; therefore, nurses came from a variety of backgrounds.

There are a total of 100 counties in North Carolina. Participants in this study represented 50 of the 100 counties and were spread geographically across the state. The most often represented counties were Mecklenburg and Wake, which is representative of

the statistics for North Carolina, as these two counties have the largest population in the state.

Those who received folic acid education as a component in their undergraduate nursing education were asked to list the school in which the folic acid component was taught. The University of North Carolina (UNC) has made a concerted effort to incorporate this content into their nursing curriculum, as have other NC private and public schools. It was an interest of the researcher to determine if there were trends noted in those who had received undergraduate folic acid teaching and those who had not, but even more specifically to determine if participants who were receiving this information had received it from UNC schools. There were 69 participants who reported having received folic acid in their undergraduate nursing program curriculum. This constitutes 48% of the total sample, which indicates almost half of the nurses participating did in fact recall learning of folic acid during their nursing program education. Twelve of these 69 participants graduated from the UNC system. Whether or not nurses had received folic acid education in their undergraduate education did not make a difference in their knowledge levels in this study.

Benefits and Barriers

Perceived benefits and perceived barriers are components of the Health Belief Model that were explored in this study (See Appendix C). Benefits explain how one feels taking a course of action which either benefit them or treat a particular illness. Participants reported more often the benefit of a multivitamin serving as a way to ensure daily nutrient needs are met. This implies nurses believe multivitamins can perhaps be

used as a form of insurance, to fill in the gaps of a diet that may not contain all the necessary vitamins through diet alone.

Time was the most often response selected as a barrier for multivitamin consumption. This finding of time as a barrier was consistent in the literature as well (Robbins et al., 2005). In this fast-paced society of the 21st century, many do not have time to stop and think about taking a multivitamin unless it is part of their routine. Nurses are no exception. Their workday most often consists of 12-hour shifts, with an hour before and after spent in preparation for and the briefing following the shift. This results in 10 hours left of the day, not accounting for sleep. In order for a certain activity to become a habit such as taking a multivitamin, the multivitamin should be easily located in the same place and taken at the same time every day. The North Carolina Folic Acid Council has developed creative reminder items available to the public and healthcare providers free of charge. Such items include nail files, lip balm, key chains, refrigerator magnets, and mirror clings. If hospitals would permit, nurses could distribute these reminder items as well as a brochure explaining the importance of folic acid to clients upon discharge.

Understanding of these beliefs and barriers of multivitamin use can be encouraging for Registered Nurses as they prepare teaching plans for their clients. By nurses understanding the barrier of time, they can motivate their clients to overcome this by encouraging use of those helpful reminders previously discussed. Making a behavior become a habit requires routine practice of that behavior. Nurses can encourage their clients through education on specific ways to make an activity become routine, or habit. This can be accomplished by taking a multivitamin at the same time every day when one

completes a regular task, such as brushing their teeth. Positioning the multivitamins in an area clients are exposed to each day, such as at the bedside, could enhance their ability to remember to take it, and decrease the time it takes to locate the multivitamins in the first place.

Personal Pregnancy History & Prior Education

To answer the first research question, personal pregnancy history and prior education were examined to determine if there was a difference in folic acid knowledge levels. Neither having a personal history of pregnancy nor receiving prior folic acid education made a difference in how nurses performed on the pre-test folic acid knowledge questions. This indicates just because you have been pregnant, or someone close to you has experienced pregnancy, one cannot assume that one is knowledgeable about the benefits of folic acid. Nurses who had learned of folic acid in prior education did not translate this learning to a higher folic acid knowledge level. This does not mean nurses did not learn of folic acid benefits in their nursing program, as 48% did. It does mean however that it did not make a significant difference in their knowledge level on this test. Nursing curriculums tend to be content-heavy and are not designed to develop a nurse who knows and remembers all; rather, they aim to develop the critical thinker and attempt to model the lifelong learner. Nurses require continuing education in order to stay current with evidence-based practice guidelines. A short one-hour module could be developed using the same intervention that was used in this study for Registered Nurses in North Carolina; this was similarly done with pharmacists in a prior study (Lynch, 2002).

Demographic Variables & the Relationship with Self-Efficacy

In prior studies, educational level made a significant difference in folic acid knowledge or awareness (Cleves et al., 2004; Chacko et al., 2003; Lolkje et al., 2005; Meyer et al., 2002). Those who had higher educational levels also knew more about folic acid and its health benefits. One would assume that higher levels of education would indicate an increase in depth of knowledge due to more exposure to the literature, more experience in the clinical setting, and more years to learn and develop. Therefore, it was postulated that those with higher levels of education would also feel confident, or self-efficacious in their delivery of teaching on health benefits of multivitamins. This was not found to be the case in this study. As educational levels increased, levels of self-efficacy decreased. This was not an anticipated finding. It is a concerning finding in this study that the higher the level of education a nurse has, the lesser self-efficacy one expressed. Perhaps this is due to acute care staff nurses caring for higher-acuity clients, increasing client loads due to the economic downturn, and minimal length-of-stay governed by third-party payors. All contribute to the effectiveness of the nurses' care with clients and the amount of time a nurse has to spend teaching their clients. Confidence develops over time with repeated opportunities to teach. If those opportunities are minimal or non-existent, one cannot expect the nurse to increase their level of confidence.

It was first thought that nurses who had more years of experience would report higher self-efficacy scores, however, this was not found to be the case in this study. There was no significant correlation with years of experience and level of self-efficacy. Prior studies measuring health care providers' knowledge levels on folic acid health benefits had not reported significant correlations with years of experience either (Williams, et al.,

2006). In fact, few studies have been done that measure self-efficacy levels of nurses. While it is assumed that the longer one works as a nurse, the more experiences with clients one would have, based on the results of the correlation findings for this study, it cannot be assumed that one would develop more confidence in their teaching ability, specifically towards folic acid health benefits.

One additional relationship explored was whether or not nurses who had higher folic acid knowledge levels would also have higher self-efficacy scores. Perhaps those who were more knowledgeable were also more confident. This was rejected after analyzing a correlations table comparing the two. Knowing more about folic acid did not mean the nurse was more confident in the delivery of such teaching.

Therefore, there appears to be no relationships existing between acute care staff nurses' level of education, years of nursing experience, folic acid knowledge and their level of self-efficacy when providing client discharge teaching, despite the aforementioned hypotheses. The researcher felt there was a large *N* with sufficient power to address these hypotheses, which therefore further supports the insignificance of these correlations.

Factors That Predict Frequency of Recommending Multivitamins

Participants were asked to respond to certain socio-demographic questions to assist the researcher in determining whether or not any of these factors played a significant role in predicting the frequency of nurses recommending multivitamins containing folic acid to their clients. Using educational level, maternity as an area of practice, nurses' frequency in self-consumption of multivitamins, and years of experience, a multiple regression was computed. While these predictors significantly

accounted for 9% of the variance, the researcher does not feel this bears clinical significance. It was of interest that nurses' frequency in their own personal multivitamin consumption contributed the greatest amount towards this model in determining their frequency of recommending the same behavior to their clients. This is consistent with the HBM and supports the concept of personal mastery, a component of the Self-Efficacy Theory. Nurses who model the behavior by taking a multivitamin regularly recommend this to their clients. This finding was supported by the literature (Williams, et al., 2006). This finding led the researcher to believe those who model this behavior would have a higher level of self-efficacy.

Consistent with the researcher's belief and the literature, self-efficacy levels and nurses' frequency of multivitamin consumption did statistically predict how often nurses recommend multivitamin consumption to their clients during discharge teaching; however, this accounted for only 18% of the variance. The nurses' level of self-efficacy prior to the intervention contributed the greatest amount towards prediction of frequency recommending multivitamin consumption to their clients. This has limited clinical significance, although further supports the components of the Self-Efficacy Theory which include *personal mastery, vicarious experience, verbal persuasion,* and *physiologic feedback*. Personal mastery is accomplished through participant modeling. Nurses modeling this health behavior of multivitamin consumption have more confidence in encouraging their clients to take multivitamins. Evidence of vicarious experiences would imply that nurses could model this healthy behavior in the clinical setting. While live modeling would not be realistic for clients to actually observe nurses taking their multivitamin, it would be plausible for nurses to promote their healthful behavior using

small lapel pins, similar to the ones some may wear in support of other behaviors such as donation of blood. Through the use of verbal persuasion, nurses could recommend multivitamins as a healthy behavior by first assessing their clients to determine if they include multivitamins in their daily routine. Those clients who do take multivitamins could further be supported by nurses recognizing this as a healthful behavior. Those clients who do not regularly take multivitamins could be encouraged to do so through education by the nurses who care for them. The literature revealed numerous studies that supported clients being willing to take a multivitamin if recommended by their healthcare provider (March of Dimes, 2004; Eicholzer, Tonz & Zimmerman, 2006; North Carolina Folic Acid Council, 2009). This study revealed that nurses believe their consumption of a multivitamin serves as a benefit in the way of ensuring daily nutrient needs are met. Providing this type of physiologic feedback to their clients contributes to the level of self-efficacy in nurses. This can trickle down to clients in the acute care setting through nurses communicating the known health benefits of multivitamins, not only with the benefit of ensuring daily nutrient needs are met, but even more significantly with the reduction of NTDs.

Effect of the Educational Intervention

The results of this study indicate there was in fact a significant difference in the knowledge levels from pre-test to post-test of those nurses who completed the educational intervention. Findings were similar to prior intervention studies conducted on folic acid knowledge (Hilton, 2007; Lynch, 2002; Quillin et al., 2000). Nurses' knowledge levels increased from baseline pre-test to post-intervention testing. This is clearly the most salient finding of this study. One can presume that it was the educational

intervention that contributed to the increase in knowledge level. This was only true in the experimental group, as the results did not indicate the control group's knowledge levels significantly increased. One of the concerns with conducting this study was that nurses in the control group could plausibly educate themselves on folic acid in the time period between pre- and post-testing. One can safely assume this did not occur since the differences in knowledge levels of the control group did not vary significantly. One of the aims of this study was to see if an educational intervention would make a difference in acute care staff nurses' knowledge levels of folic acid. Knowing this did in fact occur, it provides encouragement that nurses can be the vehicle of knowledge for their clients.

This study also demonstrated that educational programs do not have to be complex in presentation, of a specified minimum duration, or address large issues to be useful and important. Small areas of knowledge deficit can be easily addressed with a focused educational program and have the potential for a significant impact on a group. This understanding can also be encouraging to the nurse who may only have limited time frames to address personal educational opportunities or to provide client teaching.

Significance to Nursing

This study is significant to nursing on several different levels. First, analysis of the findings confirmed nurses can increase their knowledge levels through education. It further supports nurses as lifelong learners and that learning is not exclusive to formal undergraduate or graduate nursing education. Through the use of a short video clip, nurses were able to learn healthful information that could prove valuable if communicated regularly to their clients. The literature supports nurses being the mode of delivery of such health teaching. Similar to the study conducted by Lynch (2002) with

student pharmacists, nurses and pharmacists may have encounters with clients on perhaps a more frequent basis than physicians. Prior studies have focused on the physician or midwife as the healthcare provider responsible for delivery of folic acid teaching; however, healthcare provider extends into the role of the pharmacist, the nurse, and other members of a healthcare team. Utilizing the teaching learning skills of the nurse is a promising way to deliver vital public health messages to clients and a way for nurses to expand their own learning.

In this current state of economic downturn, nurses are feeling the scrutiny of time in ways they never have before. Nurse-client ratios are pushed closer to the maximum more so than in the past. Nurses are constantly being asked to 'do more with less'. Third party payors limit the length-of-stay, which further decreases the amount of time nurses have to educate their clients. Many times, the discharge teaching is accomplished through checking off a list of important need-to-know items or providing the client with a handout. Nurses can become too focused on this checklist and perhaps not remember to encourage multivitamin consumption as a recommended behavior if it is not included in the teaching topics.

There are avenues nurses in the acute care setting could take to facilitate recommendation of multivitamin consumption, especially for those female clients of childbearing years. Assessment of multivitamin use could be accomplished through adding a specific question to the admission assessment completed upon entry to the acute-care setting. Nurses ask which medications the client is currently taking, but may or may not assess for multivitamin use.

Many facilities have adopted the medication reconciliation record as an ongoing document that begins upon admission and continues through discharge. Multivitamins could specifically be a category on that reconciliation record and if not checked as being a routine supplement could become a prompt for nurses to educate their clients on those health benefits. In North Carolina (NC), reminder items are provided by the NC Folic Acid Campaign and are free, evidence-based, and written at a literacy level appropriate to the community. Reminder items are also provided in both English and Spanish, significant to the Hispanic population with higher neural tube defect rates in the state of NC.

Given the literature provided in this study along with the study's significant findings, a future goal would be to gain physician support for multivitamin recommendation, especially for the childbearing female client. This could be accomplished through obtaining physicians' and advanced practitioners' approval to add a standard multivitamin containing folic acid to the routine orders in the acute care setting and to the client's routine medications if seen in the outpatient setting as a daily recommendation, unless contraindicated. As reported in the literature (deRosset, Mullenix, & Zhang, 2009), healthcare providers need to be cognizant of their vital role as disseminators of this information to clients they care for.

The supported literature and findings gained from this study have potential for policy change at a higher level than that of the acute care setting. At the time of this study, multivitamins were not considered a reimbursable expense through the Flexible Spending Healthcare Account. Through nurses as lobbyists, and with the support of national organizations such as March of Dimes and the Spina Bifida Association, this

could potentially be changed. Cost is a perceived barrier of multivitamin use. Multivitamins are known to be a healthy behavior that could reduce millions of dollars each year through reduction of NTDs. Therefore, multivitamins should be considered a reimbursable expense using pre-tax dollars to pay for them just as other prescription medications may be paid for. Again, it has been discussed in this study that the focus of nursing has shifted from caring for the sick to promoting health and preventing injury. However, it cannot be concluded that people on every level are in agreement with this health promotion philosophy if consumers are only offered tax relief when purchasing medication for a problem and not when purchasing medication as a way to keep a person healthy to begin with.

Limitations of the Study

When the names for the sample were purchased from the NC Board of Nursing, there was no option for purchasing email address. In this technologically-driven world, email has become a primary communication tool and is perhaps used more frequently than US mail. Additionally, the flyer that was mailed contained the link to the survey, however those who chose to access the survey had to enter the web address into their address bar by hand, which was subject to human error. If the NC Board of Nursing provided email addresses in addition to physical addressed of RNs, this may have allowed for an improved response rate.

Even though the sample of participant names was random, selection of the 2200 per group created a limitation on who could participate in the study. Some Registered Nurse names were filtered before random sampling as they did not meet the selection

criteria based on place of employment (acute care). With the random sampling, not every acute care staff nurse in North Carolina was given the option to participate.

While the acute care staff nurse was the target group for this study, the findings of this study can be generalized only to those nurses registered and licensed in North Carolina. The findings of this study cannot be applied to any other healthcare provider. This does also limit how these findings can be interpreted in areas other than North Carolina.

The item that addressed self-efficacy was a single item measurement written in Likert-scale format. The questions used to test folic acid knowledge level were obtained from the SBA. Prior validity and reliability testing has not been done on this self-efficacy item or on the folic acid questions obtained from the SBA.

Recommendations for Further Study

There are several opportunities that exist for further study on folic acid knowledge revealed from the findings in this study. Even though North Carolina was the target area for this study, it would be interesting to examine knowledge levels of acute care staff nurses from other states. Future studies could consist of multi state samples to determine variations in nursing knowledge. North Carolina was the target population for this study as NTDs have been meticulously studied and monitored since the development of the Folic Acid Council in 2004. One could determine areas in the United States with the highest and lowest NTD rates and compare knowledge levels of acute care staff nurses from both areas.

As North Carolina continues to have increasing numbers of migrant farm workers move into the state from Mexico, and because the NTD rate within the Hispanic

population in NC is double that of the overall rate, it would be of interest to look at prevalence rates of NTDs in Mexico in comparison with that of the United States and North Carolina specifically. Hispanic ethnicity has been demonstrated to be a risk factor for NTDs (North Carolina Folic Acid Council, 2009). While the United State fortifies bread and other wheat products, many of the products found in the grocery stores that are base components of traditional Mexican foods are not fortified. For example, mesa flour, a basic ingredient used to make corn tortillas, is not routinely fortified.

In order to take a more in-depth examination of self-efficacy in the acute care staff nurse, future research could be aimed at developing a self-efficacy instrument specifically focused in the area of nursing education. There are many avenues within nursing where self-efficacy could be examined. Health teaching was just one area of focus in this study.

Another opportunity for future research could be assessing the time when pregnant women initiate multivitamin use and whether or not this occurs during the preconception period or once the pregnancy is confirmed by the obstetrician. This would be an important study to conduct because of the narrow window of opportunity present to prevent failure of the neural tube to close. As this 28-day time frame is a critical juncture in the development of a pregnancy, whether women begin taking a multivitamin containing folic acid on their own prior to receiving a prescription for a prenatal vitamin, would be important to determine. The literature in this study supported clients' willingness to take a multivitamin if told to do so by their healthcare provider. Future studies could determine whether pregnant women wait for their obstetrician's direction to take a prenatal vitamin or whether they initiate it on their own. Further research could

address these same issues among populations who do not necessarily seek prenatal care. Do women in these groups take multivitamins?

Based on the changing demographics of the physician support system in private practices, one would note that there are more Medical Office Assistants (MOAs) and fewer Registered Nurses employed in this practice area. This can have significant implications for the education component that is to occur in the office setting. Physicians may not have the time to educate the clients. In the past, this teaching was completed by the Registered Nurse. The MOA is taught the skills necessary to perform tasks and are provided with lists of specific directions to give to the client; however, the teaching component would not be included in these MOA roles. The MOA may give the direction to take a medication and how often to take it and for what duration, but who is the one to teach the client action, side effects, and potential complications? How the education gap can be filled by the current support system in place in the office setting could be a viable option for future research.

An additional option for research could be to look at free clinics or sliding scale cost clinics where minorities and people of lower socioeconomic status with inadequate healthcare present for treatment. It would be of interest to determine whether these clients take multivitamins on their own without being recommended to do so. One of the effects of lower socioeconomic status may be that clients in these clinics do not spend money on multivitamins as other obligations requiring money, such as housing, food, and transportation, may be immediately more crucial. A study may also look at methods to address these financial barriers.

Finally, North Carolina has made great strides in the reduction of NTDs; however, there continues to be the need for education, specifically with the Hispanic population. Future studies that are culturally sensitive should be targeted towards the Hispanic population, with various interventions investigated to determine ones that would increase folic acid knowledge levels the greatest within this population.

This study has demonstrated the importance of folic acid education and multivitamin consumption, in an effort to diminish the incidence of NTDs. Understanding the benefits and barriers to the teaching learning process related to the importance of folic acid in the prevention of NTDs has been explored as well as the prevalence of multivitamin consumption among North Carolina acute care staff nurses. This study has provided a basis of understanding and yields a number of additional research areas that are important in addressing NTDs.

APPENDIX A

TABLES RELATED TO STUDY SAMPLE

Table A1

Frequency Data for Education

Level of Education	Control	Experimental	Total
Diploma	10	5	15
ADN	27	28	55
BSN	39	24	63
MSN	5	2	7
Other	1	0	1
Total	82	59	141

Table A2

Frequency Data for Area of Practice

Area of Practice	Control	Experimental	Total
Med-Surg	22	8	30
Critical Care	20	15	35
Maternity/Nursery	14	10	24
Peds	3	1	4
Oncology	3	2	5
OR	8	10	18
ER	5	6	11
Mental Health	4	3	7
Other	5	4	9
Total	84	59	143

Table A3

Frequency Data for Previously Receiving Folic Acid Education

Question	Responses	Control	Experimental	Total
Did you receive Folic Acid in Undergraduate Curriculum?	No	43	30	73
	Yes	39	29	68
Total		82	59	141

Table A4

Frequency Data for Source Of Folic Acid Education

Question	Responses	Control	Experimental	Total
Where did you get the content?	Continuing Ed	8	5	13
	Website	3	1	4
	Radio/TV	0	4	4
	MD/Midwife	6	5	11
	Guest Speaker	0	2	2
Total		17	17	34

Table A5

Frequency Data for Multivitamin Use

Question	Responses	Control	Experimental	Total
How often to you take a Multivitamin?	Never	12	9	21
	Rarely/Few Month	17	12	29
	Sometimes/Once Week	11	10	21
	Often/4-5 days/wk	9	9	18
	Always/daily	35	19	54
Total		84	59	143

Table A6

Respondents' Perceived Benefits & Barriers Of Taking A Multi-Vitamin

	Increases Energy	Prevents Illness	Healthy Hair/Skin	Nutritional Value
N	56	66	50	111
% of Respondents Selecting This Option as a Benefit	39.2%	46.2%	35%	77.6%

	Cost	Time	Side Effects	Pill Size
N	28	52	13	36
% of Respondents Selecting This Option as a Barrier	19.6%	36.4%	9.1%	25.2%

Note: N=143 (Respondents could select more than one benefit and/or barrier)

APPENDIX B

TABLES RELATED TO RESEARCH QUESTIONS

Table B1
Correlation Matrix for Question 2 – Spearman's rho

Variable	Years of experience as an RN	Highest level of education	Pre-FAQ Total	Post-FAQ Total	Pre-Self-Efficacy	Post-Self-Efficacy
Years of experience as an RN	1.000					
Highest level of education	-.098	1.000				
Pre-FAQ Total	.037	-.012	1.000			
Post-FAQ Total	-.193	-.026	.341**	1.000		
Pre-Self-Efficacy	-.037	.093	-.050	.59	1.000	.505**
Post-Self-Efficacy	-.018	-.079	-.032	.023	.505**	1.00

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

Table B2
Correlation Matrix for Question 2 - Pearson

Variable	Years of experience as an RN	Highest level of education	Pre-FAQ Total	Post-FAQ Total	Pre-Self-Efficacy	Post-Self-Efficacy
Years of experience as an RN	1.000					
Highest level of education	-.055	1.000				
Pre-FAQ Total	.020	-.014	1.000			
Post-FAQ Total	-.208*	.006	.357**	1.000		
Pre-Self-Efficacy	-.049	.097	-.056	.061	1.000	
Post-Self-Efficacy	-.014	-.090	-.037	.080	.520**	1.00

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

Table B3

Correlation Matrix for Question 2 - Pearson

Variable	Pre-test FAQ Total	Post-test FAQ Total	Pre-Self-Efficacy	Post-Self-Efficacy
Pre-test FAQ Total	1.000			
Post-test FAQ Total	.357**	1.000		
Pre-Self-Efficacy	-.056	.061	1.000	
Post-Self-Efficacy	-.037	.080	.520**	1.000

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

Table B4
Descriptive Statistics for Multiple Regression Data

	M	*SD*	N
Pre Frequency of discuss benefits of FA use	.971	1.169	137
Highest level of education	2.50	.917	137
Years of experience as an RN	16.61	11.548	137
How often do you take multivitamin?	2.39	1.501	137
Maternity as area of practice	.175	.382	137

Table B5

Correlation Matrix For Multiple Regression Variables

Variable	Pre Frequency of discuss benefits of FA use	Highest level of education	Years of experience as an RN	How often do you take MVI?	Maternity Service Area
Pre Frequency of discuss benefits of FA use	1.000				
Highest level of education	-.034	1.000			
Years of experience as an RN	-.008	-.051	1.000		
How often do you take multivitamin?	.254	-.057	.186	1.000	
Maternity as area of practice	.160	.124	.191	.125	1.000

Table B6

Unstandardized Regression Coefficients (B) and Intercept, the Standardized Regression Coefficients (β), t-values, and p-values for Variables as Predictors of Perceived frequency of discussing benefits of Folic Acid

Variables	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
	B	Std. Error	β		
(Constant)	.709	.354		2.004	.047
Highest level of education	-.055	.107	-.043	-.512	.609
Years of experience as an RN	-.009	.009	-.085	-.988	.325
How often do you take a Multivitamin?	.193	.066	.248	2.918	.004
Maternity as area of practice	.461	.263	.151	1.754	.082

Dependent Variable: Perceived frequency of discussing benefits of Folic Acid

Table B7

Unstandardized Regression Coefficients (B) and Intercept, the Standardized Regression Coefficients (β), t-values, and p-values for Variables as Predictors of Perceived frequency of discussing benefits of Folic Acid

Variables	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
	B	Std. Error	β		
(Constant)	.241	.177		1.358	.177
Self-Efficacy	.353	.075	.319	4.720	.000

Dependent Variable: Perceived frequency of discussing benefits of Folic Acid

Table B8
Descriptive Statistics for Paired Samples t-test

Variables	N	*M*	*SD*
Pre Folic Acid Question Total Score	46	6.478	1.188
Post Folic Acid Question Total Score	46	7.239	1.689

Maximum score possible is 10.00

APPENDIX C

KEY CONCEPTS OF THE HBM AND APPLICATION TOWARDS FOLIC ACID CONSUMPTION

Concept	**Definition**	**Application to the Model**
Perceived susceptibility	One's opinion of chances of getting a condition	Who is at risk for having a pregnancy with an NTD?
Perceived severity	One's opinion of how serious a condition and its sequelae are	Quality-of-life issues, financial concerns with a child who has an NTD
Perceived benefits	One's opinion of the efficacy of the advised action to reduce risk or seriousness of impact	Multivitamin use reduces NTD risk by 70% Other benefits of multivitamin use includes hair and nail growth, increased energy levels
Perceived barriers	One's opinion of the tangible and psychological costs of the advised action	Financial concerns re: ongoing purchases for multivitamins Having the time to spend discussing benefits with clients in the acute-care setting
Cues to action	Strategies to activate one's "readiness"	Reminder items such as magnets, stickers, toothbrush holders, lip balm labels, mirror clings, billboards, radio & television ads
Self-efficacy	One's confidence in one's ability to take action	Encourage education on multivitamin use Give positive reinforcement Assist in developing a plan to incorporate multivitamin use into a daily routine

APPENDIX D

SOCIO-BEHAVIORAL & DEMOGRAPHIC TOOL

APPENDIX D

SOCIO-BEHAVIORAL & DEMOGRAPHIC TOOL

Age: _____years

Gender:

Male _____ Female_____

Highest Level of Education in Nursing:

Diploma _____ Associate Degree _____ Bachelors Degree _____

Masters Degree _____ Doctorate_____

Other (please explain)_____

Did you receive folic acid education as part of your nursing undergraduate education?

Yes_____ No_____

If yes, where did you attend nursing school? _____

Have you received any training or continuing education regarding folic acid separate from your undergraduate education? If so, in what form?

Yes_____ No_____

If yes:

Continuing Education content _____ Website _____

Radio/Television advertisement_____ Billboard _____

Physician/Midwife _____ Guest Speaker_____

How many years of experience do you have working as a Registered Nurse?

_____years

County of Residence: _____

Specific Area of Practice:

Med-Surg _____ Critical Care _____ Maternity/Nursery _____

Pediatrics _____ Oncology _____ Operating Room _____

Emergency Room _____ Psychiatry _____

Other: (please specify) _____

Multivitamin Use:

How often do you take a multivitamin?

Always (daily)_____ Often (4-5 days/week)_____

Sometimes (once per week)_____ Rarely (few times per month)_____

Never_____

What, if any do you feel are benefits to your consumption of multivitamins?

Energy _____ Hair, skin, & and nail health _____

Illness prevention _____ Way to ensure daily nutrient needs are met _____

What, if any, do you feel are barriers to your consumption of multivitamins?

Cost _____ Time _____ Side Effects _____

Size of pill _____

Pregnancy History:

Do you have direct experience with being pregnant, either yourself or a

partner/spouse/family member? _____yes _____no

Encounters with Clients

How confident are you in your ability to provide teaching on folic acid to the clients you

care for?

Very confident _____ Somewhat confident _____ Confident _____

Not very confident _____ Not at all confident _____

How often do you discuss the benefits of folic acid/multivitamin use with your clients in the discharge planning phase?

Always _____ Often _____ Sometimes _____

Rarely _____ Never _____

APPENDIX E

FOLIC ACID KNOWLEDGE QUESTIONS

APPENDIX E

FOLIC ACID KNOWLEDGE QUESTIONS

1. All women who could possibly become pregnant should consume ____ mcg of folic acid by supplement or fortified foods every day.
    a. 200 mcg
    b. 400 mcg
    c. 800 mcg
    d. 1000 mcg
2. The most common of the Neural Tube Defects – a group of serious birth defects of the brain and spinal cord – is spina bifida. *True*/False
3. Folate is a water soluble B-vitamin that helps make healthy cells. *True*/False
4. Only women who are planning a pregnancy need to be counseled to take folic acid to prevent Neural Tube Defects like spina bifida. True/*False*
5. Women can get all the folic acid they need if they eat a relatively healthy diet most of the time. True/*False*
6. Studies have shown that if all women who could become pregnant were to take a vitamin with folic acid, the risk for birth defects of the brain and spine could be reduced by up to 70%. *True*/False
7. Synthetic folic acid is absorbed more easily by the body than is naturally-occurring folate found in foods. *True*/False
8. Certain breakfast cereals provide all the folic acid a woman needs in one serving to meet the daily requirement. *True*/False

9. Folic acid is important for all women of childbearing age, whether they are planning a pregnancy or not, because about _____% of all pregnancies in the United States are planned.

    a. 25%

    b. 30%

    c. 50%

    d. 90%

10. Generic or store-brand multivitamins won't give women enough folic acid.

    True/*False*

APPENDIX F

LETTER OF CONTACT

APPENDIX F

LETTER OF CONTACT

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

NORTH CAROLINA RN

ATTENTION

You have been randomly selected to participate in an online survey, powered by Survey Monkey.

This survey is part of a research study for a North Carolina RN's dissertation. Participation is appreciated!!

Completion of this short survey qualifies you for
****FREE CONTINUING EDUCATION UNITS****
Access the survey by entering the following information into your web address bar:
http://www.cabarruscollege.edu/survey1

HURRY! LINK TO SURVEY WILL ONLY BE ACTIVE FOR 2 WEEKS!

NO OBLIGATION TO PARTICIPATE **** RESULTS KEPT CONFIDENTIAL

If you have any questions or concerns about the study, you may contact Principal Investigator Carolyn Sabo, RN, EdD, CNE at Carolyn.sabo@unlv.edu or Student Investigator Kimberly E. Little, RN, MSN, CNE at klittle@cabarruscollege.edu

APPENDIX G

OPRS APPROVAL

APPENDIX G

OPRS APPROVAL

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

UNLV IRB Approved FEB 2 7 2009 Expires FEB 2 6 2010

Biomedical IRB – Expedited Review
Approval Notice

NOTICE TO ALL RESEARCHERS:
Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.

DATE: March 2, 2009

TO: **Dr. Carolyn Sabo**, Nursing

FROM: Office for the Protection of Research Subjects

RE: Notification of IRB Action by Dr. John Mercer, Chair JM
Protocol Title: **Implications for Nursing Practice: Delivering the Folic Acid Message**
Protocol #: 0901-2982

This memorandum is notification that the project referenced above has been reviewed by the UNLV Biomedical Institutional Review Board (IRB) as indicated in regulatory statutes 45 CFR 46. The protocol has been reviewed and approved.

The protocol is approved for a period of one year from the date of IRB approval. The expiration date of this protocol is February 26, 2010. Work on the project may begin as soon as you receive written notification from the Office for the Protection of Research Subjects (OPRS).

PLEASE NOTE:
Attached to this approval notice is the **official Informed Consent/Assent (IC/IA) Form** for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through OPRS. No changes may be made to the existing protocol until modifications have been approved by the IRB.

Should the use of human subjects described in this protocol continue beyond February 26, 2010 it would be necessary to submit a **Continuing Review Request Form** *60 days* before the expiration date.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRSHumanSubjects@unlv.edu or call 895-2794.

Office for the Protection of Research Subjects
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UNLV
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Implications for Nursing Practice:

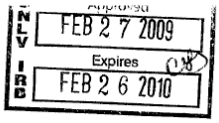
Delivering the Folic Acid Message

INFORMED CONSENT

This is a study being conducted by Kimberly E. Little, MSN, RN, CNE, who is completing the dissertation component of the PhD degree program at the University of Nevada.

Purpose of the Study:
The purpose of this study is to examine acute-care staff nurses' knowledge levels about the benefits of folic acid for women, the relationship between knowledge level, self-efficacy level, and selected sample demographic characteristics, and the effectiveness of an intervention to increase acute-care nurses' knowledge levels about the benefits of folic acid for women. Acute-care staff nurses' beliefs in the benefits of multivitamin consumption will be explored, as well as the extent to which folic acid benefits are addressed by the staff nurse in client teaching.

Procedures:
Participants will consist of randomly selected North Carolina Registered Nurses who are currently employed in the acute-care setting, ages 18 to 75. Nurses who work in settings not likely to have clients who receive in-depth discharge teaching, such as Hospice, Long Term Care, or the Public Health Department will be excluded.
You will complete an online survey, which will take approximately 30 minutes. The survey includes questions about your education, work experience, current vitamin use, and any prior knowledge you have of folic acid. There are 12 questions, which will assess your knowledge level of folic acid. General demographic information (e.g., age, gender, level of education) will be asked so that general traits of the group of participants in this study can be described.
If you are in the first group, you will be given a link to an online video hosted by YouTube, which will take 9 minutes to view following your completion of the initial survey.
After you complete the survey and watch the video, you have completed the first module of this study. The second module will consist of a second survey, to be emailed to you two weeks following your initial module. This survey will take approximately 20 minutes.
If you do not receive the link to access the online video after completion of the initial survey, you will wait to receive the second survey, which will be emailed to you two



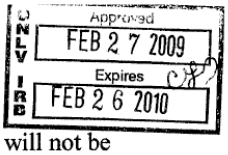
weeks later. At the completion of this second survey, you will be given the link to the online video hosted by You Tube, which will take 9 minutes to view.
Whether you are in group one or group two, you will have the same opportunity to complete two separate surveys and watch the online video. You will then be able to apply for the complimentary continuing education unit.

Benefits of this Study:
As a nurse, you may become more knowledgeable regarding folic acid and its health benefits. You may be more aware of the amount of health teaching provided to your clients and may increase your own frequency of multivitamin consumption after learning of the associated benefits.
Benefits for the society include more likelihood in reaching Healthy People 2010 goals related to folic acid, decreasing the incidence of neural tube defects across the state of North Carolina thereby decreasing third party payor reimbursements, and increasing healthy behaviors for both registered nurses and the clients you care for.

Compensation
Upon completion of all components of the study, you will be provided an email address to which you may submit your name for credit of continuing education units approved by the Southern Association of Colleges and Schools and sponsored by the Educational Enhancement Center of Cabarrus College of Health Sciences. This contact hour is free-of-charge; a certificate will be sent electronically to the email address you provide. You are in no way required to submit any identifying information if you do not desire the continuing education units. This submission of your name in no way connects you to any of the data or your scores obtained from the survey.

Risks or discomforts of the Study:
Minimal risks associated with your completion of this study include the social risk of fearing your scores on the folic acid questions will be released to the public, your peers or employer. Additionally, you may fear your name and the associated scores on the folic acid knowledge questions would be disclosed to the school where you obtained your undergraduate nursing education having listed that information on the demographic portion of the instrument.
Your name will not be linked to your scores at any time during this research. You will be assigned a number from Survey Monkey which will be used to enter the data into the statistical program.
Minimal risks or discomforts are anticipated from taking part in this study. If you feel uncomfortable with a question, you can skip that question or withdraw from the study altogether by simply closing out of the survey without submitting your responses. If you decide to quit at any time before you have finished the survey, your answers will not be recorded.

Confidentiality:
Your responses will be kept completely confidential. We will NOT know your IP address when you respond to the internet survey. Survey Monkey will not release this



information; instead, your responses will be assigned a participant number and will not be linked to you at all. If you choose to submit your name and email address for the complimentary contact hour, your information will NOT be stored with your data nor will it be connected to your data. The names submitted for contact hours will be stored electronically in a password-protected folder; a hard copy will be stored in a locked filing cabinet. Three years following completion of the study, any and all records will be destroyed.

Decision to quit at any time:
Your participation is voluntary; you are free to withdraw your participation from this study at any time. If you do not want to continue, you can simply leave the website. If you do not click on the "submit" tab at the end of the survey, your answers and participation will not be recorded.

How the findings will be used:
The results of this study will be used for education purposes only. The results from the study will be presented in educational settings and at professional conferences, and the results could be published in a professional journal in the field of nursing.

Contact information:
If you have any questions or concerns about the study, you may contact Carolyn Sabo, RN, EdD, CNE at Carolyn.sabo@unlv.edu or Kimberly E. Little, RN, MSN, CNE at klittle@cabarruscollege.edu. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office for the Protection of Research Subjects at 702-895-2794.**

By accessing this survey online, you acknowledge that you have read the information and consent to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty.

APPENDIX H

CONTINUING EDUCATION CERTIFICATE

EEC # 618WS
CEUs: .1

CABARRUS COLLEGE OF HEALTH SCIENCES

CONTINUING EDUCATION

401 Medical Park Drive Concord, NC 28025

CERTIFICATE OF COMPLETION

has attended the following continuing education activity:

Implications for Nursing Practice: Delivering the Folic Acid Message

April 2009

Janet Wright, RN, MSN, BC
Director
Continuing Education

Cabarrus College of Health Sciences is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Lane, Decatur, Georgia 30033-4097: Telephone number 404-679-4501) to award associate and baccalaureate degrees.

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