Healthcare Provider Influence on Health Behavior Modification in Gestational Diabetics

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HEALTHCARE PROVIDER INFLUENCE ON HEALTH BEHAVIOR MODIFICATION IN GESTATIONAL DIABETICS

by

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ABSTRACT
HEALTHCARE PROVIDER INFLUENCE
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The overall aim was to understand the process of healthcare provider influence by exploring associations between professional influence measures and patient engagement in health behavior modification in women with Gestational Diabetic Mellitus (GDM). An integrative literature review resulted in defining and developing the Healthcare Provider Influence (HPI) conceptual model based on the Integrated Theory of Health Behavior Change and Transformational Leadership theory. HPI is defined as a process wherein a purposeful interpersonal interactive, collaborative, and transformative relationship develops between a patient and a healthcare provider working together toward a specific focus of health behavior modification outcomes.

Measures for testing the HPI conceptual model were identified, modified, translated, and content validated. Using an observational, prospective, longitudinal, correlational and exploratory design, participants in control, non-GDMs (N=117) and study, GDMs (N=78) groups completed questionnaires at an initial high-risk GDM screening and subsequently at 34-36 weeks gestational age. To test the relationships in GDM patients, eight healthy eating, physical activity, and glucose monitoring behaviors were separately regressed on professional influence variables (social/professional influence, quality of information and interaction). Patient and healthcare provider characteristics were included in regression models to test for moderating effects. Self-efficacy was examined for a mediating effect. Differences in health behavior modification outcomes, by time and group (GDM, non-GDM) were explored.

Professional influence by maternity healthcare providers (HPs), and quality of information and interaction during teaching encounters by HPs and diabetic nurse-educators were significantly associated with increased breakfast frequency/weekly and self-efficacy ($p \leq .10$). Gender, race and language concordance and HP leadership style and specialty influenced healthy eating, physical activity and glucose monitoring behaviors ($p \leq .10$). Three healthy eating and one physical activity outcomes differences were found by group and time, for which variance was explained with small effects (2-9%) by language, race, and GDM history.

Patients' perception of their healthcare providers' influence, quality of information and interaction in teaching encounters and leadership style, and race, language, and gender concordance influence GDM patients' engagement in health behavior modifications. Self-reflection on practice, interaction, and leadership style could impact individual professional transformation and increase influencing potential for patient engagement in health behaviors.

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Chapter 1: Introduction

Diabetes mellitus (DM) and obesity are becoming increasingly prevalent and correlated global health problems. Type 2 Diabetes Mellitus (T2DM), a sub classification of DM, and heretofore simply called DM, is one of the top six leading causes of death in both the United States (US) and Canada with a mortality rate of 3.1% in the US and 3.6% in Canada, and approximately 40-50% greater than a rate of 1.9% in the rest of the world (Guariguata, Whiting, Weil, & Unwin, 2011; Toporowski et al., 2012). Globally, the average rate of obesity is 12%; however, the prevalence is much higher at 24% in the US and 15.3% in Canada (Toporowski et al., 2012). Obesity increases the risk of DM and is also one of the major risk factors for developing gestational diabetes mellitus (GDM), a type of glucose intolerance diagnosed initially in pregnancy (American Diabetes Association [ADA], 2013; C. Kim, Newton, & Knopp, 2002; Simmons, 2011). More than 60% of child-bearing age women in the US are either overweight or obese, prior to pregnancy (Center for Disease Control and Prevention [CDC], 2014; Sarwer, Allison, Gibbons, Markowitz, & Nelson, 2006). A history of GDM in one pregnancy increases the risk of developing GDM in a subsequent pregnancy and DM later in life (Bellamy, Casas, Hingorani, & Williams, 2009; Diabetes Prevention Program, 2002). During and following pregnancy, GDM can have significant consequences for women and children. Addressing GDM during pregnancy and vigilant follow-up in the postpartum period provides an opportunity to decrease the prevalence of DM and prevent these consequences short term during pregnancy and later in life.

To improve health outcomes in the US, an evidence-based care systems approach using a simultaneous focus on three aims: improving the experience of care, improving the health of a population, and reducing the per capita costs of health care costs, has been recommended as a feasible and effective approach (Berwick, Nolan, & Whittington, 2008). Utilization of treatments and counseling determined to be evidence-based practice (EBP), including preventative care practices shown to improve patient health outcomes, care coordination to prevent fragmented care and subsequent complications, and measures to decrease wasteful spending (Berwick & Hackbarth, 2012) are strategies that have been suggested to accomplish these aims. On an individual level, these aims can be addressed in part by exploring the interaction between the patient and the healthcare provider (HP) and the influence the HP has on the patient's health behavior modification. In the case of GDM, the positive influence of the HP on the patient's modification of health behaviors, which have been determined to effectively treat and control GDM in pregnancy, can delay or prevent the future diagnosis of DM and its consequences. Continuation of these behaviors after pregnancy further contributes to DM prevention. An increased awareness of the interaction between the HP and the patient can also lead to improving the patient care experience and improving their health. This subsequently can reduce higher costs that can result from poor care experiences, including non-adherence, lack of follow-up, or lack of knowledge of preventative or treatment measures.

Gestational Diabetes Mellitus: A Global Health Problem with Long Term Maternal and Neonatal Consequences

Gestational diabetes mellitus (GDM) is defined as impaired glucose tolerance with onset or first recognition during pregnancy (ADA, 2013). Pre-pregnancy obesity and

increased pregnancy weight gain are associated with increased risk of GDM. The percentage of GDM that was attributed to overweight and obesity was 46% in one study (S. Y. Kim et al., 2010), while obesity was found to be a determinant for developing GDM at rates of 59.2% ($p<0.001$) when compared to those without GDM in a second study (Bener, Saleh, & Al-Hamaq, 2011). Results from a meta-analysis including 20 studies found that high maternal weight is associated with substantially higher risk of GDM: 2.14-fold higher if overweight, 3.56-fold higher if obese and 8.56-fold higher if severely obese compared to normal-weight pregnant woman (Chu et al., 2007). Concurrent with the escalation of obesity and DM over the past several decades, GDM prevalence rates have been reported in the US as approximately 9.2% (DeSisto, Kim, & Sharma, 2014). The range of GDM is reported to affect 1-19% and steadily rising incidence rates expected of up to 25% of all pregnancies in the US and 2.28-25.13% of all pregnancies globally (ADA, 2007; Guariguata, Linnenkamp, Beagley, Whiting, & Cho, 2014; Hartling et al., 2012; Nicholson et al., 2008; Vandorsten et al., 2013). The range of rates both in the US and globally depends on the screening and diagnostic criteria used and the population and demographics. Additional risk factors for GDM are advanced maternal age, higher parity, a family history of DM, non-white race, lower economic status, unhealthy eating habits, and lack of physical activity (PA) (Hunsberger, Rosenberg, & Donatelle, 2010; King, 1998; Ruchat & Mottola, 2013).

The prevalence of GDM is said to reflect the prevalence of DM and certain subsets of adult populations in the US, such as American Indians/Alaskan Native (15.9 %), Asian/Pacific Islanders (9.0%), African-Americans (13.2%), and Hispanic-Americans (12.8%) and subgroups within the latter, Mexicans (13.9%) and other women

immigrating from Central and South America (8.5%) are more vulnerable and at disparately higher risk for GDM and DM and the resulting complications (Bermudez & Tucker, 2003; DeSisto et al., 2014; DHHS, 2014; Ferrara, 2007; Fujimoto, Samoa, & Wotring, 2013). Other factors such as acculturation also increase the risk of obesity, DM, and GDM due to U.S. patterns of decreased physical activity levels and a substantial change in dietary patterns, with the introduction of more processed food, meats, dairy and sweets, and approximately two-thirds of calories derived from carbohydrates (Bermudez & Tucker, 2003).

Numerous immediate and long-term maternal and neonatal complications can result from GDM. These include preterm delivery, polyhydramnios, macrosomia, possible maternal and fetal birth injury related to shoulder dystocia, neonatal hypoglycemia, neonatal jaundice, transient neonatal morbidity, ketonemia, urinary tract infections in mother and infants, increased induction of labor or operative Cesarean delivery, increased rates of stillbirth or fetal death, and development of obesity later in baby's life (Bener et al., 2011; Langer, Yogev, Most, & Xenakis, 2005). Even more serious complications of maternal hypoglycemia, miscarriage, genetic malformation, and pre-eclampsia can occur in women who have DM prior to pregnancy. Improperly managed GDMs experience a four-fold higher rate of infant mortality in the US (Fujimoto et al., 2013). GDM can reoccur in subsequent pregnancies at a rate of 35-50% and the risk for developing DM later in life is 15-74% (Bellamy, Casas, Hingorani, & Williams, 2009; Diabetes Prevention Program, 2002; Kim et al., 2002). Therefore, addressing GDM adequately in pregnancy and the postpartum period can prevent the

incidence of GDM or DM in a future pregnancy as well as DM in women and children later in life.

GDM and DM Prevention: Role of the Patient and the HP

Arriving at the diagnosis and effective treatment of GDM are the mutual responsibilities of the patient and the HP. During pregnancy, it is important that all women are tested for GDM. The Gestational Diabetes Act was enacted in August 2012 in the U.S. to ensure that all pregnant women would receive routine and if high-risk, early screening for GDM (Fujimoto et al., 2013). Testing for GDM, including type and timing has been discussed by multiple national and international organizations. Despite differences in recommendations regarding screening/diagnostic laboratory tests and results, there is general agreement that routine screening should occur in the second trimester, after 24 weeks gestation. Women identified as having greater risk factors, such as, obesity, previous history of GDM, first degree relative with DM, history of previous stillborn infant should be tested in the first trimester (American College of Obstetrics and Gynecology [ACOG], 2013; Moyer, 2014; Vandorsten et al., 2013). As soon as the GDM diagnosis is determined, patients should be informed about the disease, and receive education and counseling regarding blood glucose monitoring, dietary modifications, and physical activity (PA) recommendations. Timely implementation of EBP guidelines for treating GDM in pregnancy and immediate and consistent patient initiation of appropriate health behavior modifications is recommended and encouraged throughout the pregnancy to decrease pregnancy-related complications (Ruchat & Mottola, 2013).

Involvement and support from partner and family for health behavior modification should be evaluated and encouraged as women have identified a lack of

social support with GDM as a barrier to self-care in pregnancy (Collier et al., 2011). Strong social supports were identified as key influencers in helping women modify and maintain their health behaviors through pregnancy and the postpartum period (Collier et al., 2011). HPs may play a role in providing significant social support if lacking from partner or family sources.

Health behavior modifications initiated in pregnancy should be continued into the postpartum period to prevent the development of subsequent GDM and DM later in life (Ruchat & Mottola, 2013). Education regarding screening for DM in the postpartum period as well as on a routine basis for life should also be initiated in the pregnancy and repeated in the postpartum period. Most women who had a diagnosis of GDM reported that they were unaware of the recommendation for postpartum screening and their future increased risk for developing DM later in life and thought their diabetes would go away when they delivered and that they could eat the way they wanted to (Collier et al., 2011; Stasenko et al, 2010, 2011). Increased counseling efforts have been shown to increase adherence to postpartum screening follow-up (Stasenko et al, 2010, 2011). HPs should provide appropriate care and support postpartum as well as between pregnancies to prevent DM or reoccurrence of GDM (Tieu, Bain, Middleton, & Crowther, 2013).

Other barriers to care that women with GDM identified were HP-related communication difficulties, including a lack of time for discussion, not being heard about their needs and inability to control sugars, not receiving enough information verbally or in written form about how to self-care for GDM, and language barriers (Collier et al., 2011). A full understanding of HP-patient communication issues that impact health behavior modification in GDMs is imperative to achieve improved health outcomes.

Communication and Behavior Modification Outcomes

Extensive research has been conducted on communication in the healthcare setting involving the HP and patient. Numerous findings have been described regarding HP-patient non-verbal and verbal communication patterns, interactions, characteristics, training models and recommendations for improving skills, and barriers. Barriers affecting HP-patient interaction include insufficient time spent as well as discordance factors of race, culture, attitude, age, gender, and language. These barriers have contributed to inequalities in healthcare and outcomes (Akgun, Kostak, Unsar, Kurt, & Erol, 2012; Durant, Bartman, Person, Collins, & Austin, 2009; Toporowski et al., 2012). Effective communication and patient-centered (PC) communication have also emerged as key concepts and strategies to improve the HP-patient relationship and health outcomes.

Effective communication with a strong focus on patient involvement is called patient-centered (PC) communication. PC care as defined by the Institute of Medicine (IOM), is care that is respectful and in which patient values guide clinical decision-making (National Research Council [NRC], 2001). PC research initiatives have been implemented to increase health quality outcomes. These require a PC approach, facilitating patient involvement in asking questions to influence decision-making and determine outcomes, with an "underlying imperative to improve patients' care experience, decision making, and health outcomes" (Selby, Beal, & Frank, 2012; Tinetti & Basch, 2013). Effective and PC communication are integral to a positive HP-patient relationship. They have been found to positively correlate to patient satisfaction and serve as a critical element in improving quality health care and short and long-term outcomes, addressing disparities, and decreasing costs (Blumenthal, 2012; National Priorities

Partnership [NPP], 2008). The importance of the emphasis placed on listening and involvement in PC decision making allows the different perspectives on what is most important to each individual patient to be heard rather than treating them the same as one of the other millions of people with the same chronic condition, e.g. DM (Tinetti & Basch, 2013).

To solve an individual's healthcare problem and improve outcomes, HPs must be effective in diagnosing the problem and communicating treatment recommendations to the patient. However, to improve outcomes, it is also important for patients to adhere to these recommendations for managing their self-care by modifying health behaviors. In the clinical setting, experienced HPs see the variety of patient responses to their own and their professional colleagues' recommendations for modification. Responses range from non-adherence or no changes in a patient's perception, understanding, attitude, or behavior regarding the diagnosis of a healthcare problem to that of a completely transformed lifestyle pattern including embracing and modifying every behavior to optimize sleep, diet, exercise, and therapy. In PC care, "what researchers and clinicians may consider non-adherence, patients may consider a reasoned decision within the context of their own priorities and preferences" (Tinetti & Basch, 2013). This presents a situation of health outcome goal incongruence. Non-adherence can be a patient choice but non-adherence in health behavior modification is also a significant variable leading to poorer outcomes. The two cannot co-exist as a solution for the same goal and this dilemma can add to an already challenging health environment.

Indisputably, research findings endorse the awareness, learning, and utilization of communication skills by HPs to explore the meaning of illness, to determine patient's

social and family context, and provide PC and culturally competent care. Despite the elimination of all barriers including communication issues, and the implementation of measures and interventions for increasing education and support for improved treatment adherence, a wide variation of patient responses still occurs. This calls the question as to whether PC care alone is enough to solve the poor health outcomes that result from patient non-adherence. The role of PC communication in assisting and motivating patients to make health behavior modifications has been explored and found to be effective, however the influence of or by HPs has not been studied. Effective and PC communication skills may contribute to only part of the process of how a HP can be influential in health behavior modification.

HPI: A New Framework for Exploring the Impact of HP-Patient Interaction on Outcomes

A review of the healthcare literature into the role and process by which HPs influence the health behavior modification and health outcomes of patients with acute or chronic health problems or diseases revealed a large gap. Many variables have been found that "influence" outcomes from an action and cause-effect inference but the process of influence that HPs have on patients' health behavior modification has not been described. Social or societal influence has been explored within contexts that have focused primarily on family, cultural, and colleague or peer influence. HP influence has not been yet explored as a distinct concept.

To explore the influence that HPs have on patient responses to treatment recommendations and modification of health behaviors, understand reasons for non-adherence, and contribute to the improvement of health outcomes, it was necessary to

name, define and develop a conceptual model to describe the concept. Termed "healthcare provider influence" (HPI), it is defined as a process wherein a purposeful interpersonal interactive, collaborative, and transformative relationship develops between a patient and a HP working toward a specific focus of health behavior modification (Fryzelka & Weiss, unpublished). HPI is defined, conceptualized and developed as a framework utilizing a PC approach involving effective communication and incorporating transformative leadership skills. Transformational leadership theory incorporates the use of social influence, a form of power that involves the movement of expert power from the HP to the patient via referent power to bring about behavior modification. A PC approach was utilized to better understand and explore the role of the HP and the process of how the HP impacts patient adherence to recommendations (Tinetti & Basch, 2013).

Population outcome disparities, discrepancy in adherence, screening, awareness, and follow-up, the resistance of some GDM diagnosed women to make health altering modifications even when barriers are eliminated, and recommendations provided, stimulated this researcher to pursue exploring the demographic and leadership characteristics of HPs and the overall influence that they have on the women they are caring for. The leap from diagnosis to treatment and prevention can at times be more than some individuals are able to or care to pursue and it is the notion of how HPs influence the ability or choice of patients to initiate or modify health behaviors necessary for self-care management that is of utmost interest to this researcher.

This research, utilizing the newly developed HPI conceptual model, was intended to provide insight on how HPs influence patients to make health behavior modifications resulting in improvement in their quality of health and overall health outcome indicators.

It is projected that the HPI conceptual model will be used in several additional research endeavors. The hope is it will generate opportunities to increase HPs awareness of patients' knowledge, attitudes, beliefs, biases, and behaviors that may influence their overall engagement in self-care management. Secondly, the HPI framework may be effective in assisting HPs to improve their approach in involving, inspiring, motivating, and altering patients' perspective, attitude, and approach to health behavior modification and thus increase the overall quality of care. Finally, it may be useful as a guide to focus on the process of HPI with several health problems, to increase health quality and outcomes and decrease disparities for vulnerable populations. Access, advocacy, support, education and provision of options by the HP to patients is important but the role and responsibility that come from the influence that a HP can have on a patient may be more powerful and has the potential for substantial transformation.

Purpose of the Study

The purpose of this research study was to explore the relationship of HPI and health behavior modification, specifically healthy eating (HE), physical activity (PA), and glucose monitoring (GM) in women with GDM, a disease where treatment, control, and prevention center on patient self-management through dietary modifications and increases in PA. Specific aims were: a) to determine if HPI was associated with patient engagement in health behavior modification of healthy eating, physical activity and glucose monitoring in women with GDM; b) to determine if patient characteristics moderated the relationship between HPI and patient engagement in health behavior modification of healthy eating, physical activity and glucose monitoring in women with GDM; c) to determine if healthcare provider characteristics moderated the relationship

between HPI and patient engagement in health behavior modification of healthy eating, physical activity and glucose monitoring in women with GDM; d) to determine if self-efficacy mediated the relationship between HPI and patient engagement in health behavior modification of HE, PA, and GM in women with GDM; and e) to determine if there were differences in the pattern of patient engagement in healthy eating and physical activity during pregnancy for women with and without a GDM diagnosis.

Relevance to Nursing Practice, Education, Policy, Research, and Vulnerable Populations

Nurses make up the largest group of HPs globally and spend the most time interacting and engaging with, caring for, and teaching patients. Exploring the correlations of HPI to health behavior modification is beneficial to the patient as well as to the HP. The patient benefits from improved individual health status and long-term outcomes by modifying health behaviors. The HPs benefit from an awareness and understanding of additional processes that can be employed to facilitate improved individual patient health status and the unique leadership role in which they are able to engage. Understanding HPI can be instrumental in improving patient relationships, behaviors, and outcomes for multiple diseases and populations. Understanding the conceptual model of HPI overall with specific exposure to PC principles fits with current national research initiatives of improving patient's experiences of care, improving health outcomes, and decreasing the cost of healthcare (Berwick et al., 2008).

HPs are taught how to communicate but there is no evidence in the research literature about understanding and teaching HPs how to influence. Learning to be influential requires intentional education and practice in transformational leadership

principles within the context of PC communication. This approach, once validated, could be incorporated into pre-licensure and HP educational preparation in new strategies for patient education and behavior modification. Early academic exposure should provide for more natural and progressive utilization throughout HP students' education and extend into their professional careers, setting the stage for the development of strong nursing and healthcare leaders who may pursue a variety of pathways in their professional careers, including education, politics and research. Nursing faculty, likewise, with an understanding of HPI, can adapt and transfer the same principles in the learning environment to potentiate the modification of student learning behaviors for improved student personal growth and achievement.

Exploring HPI is a beginning step to grooming nurses to strive to impact future health outcomes by actively combining the utilization of PC communication and transformative leadership skills to positively augment and influence the patient's self-efficacy, motivation, and engagement in health behavior modification. Understanding the conceptual model of HPI is essential to embrace, instruct, model and direct modifications in the process of HPI for positively impacting cost, quality, and outcomes of health for patients.

Finding new measures of incentive for improved health outcomes may affect insurance, governmental and legislative policy changes. Governmental assistance programs, such as Women Infants Children (WIC), can perhaps be convinced to modify the foods distributed and the dissemination of patient GDM-education to match the focus of dietary modification beneficial for GDM/DMs, including carbohydrate restriction, protein replacement, increased vegetable intake, and eating breakfast, to enhance the

process and educational component of HPI. Increased reimbursement to the HP could be argued because of the mutual HP-patient success of improved health status and outcomes. Similarly, albeit controversial, patient rewards in addition to the intrinsic value of improved health outcomes, could be implemented because of engagement in behavior modifications related to HE and PA. GDM was selected as a good case exemplar for the exploration of the relationship of HPI to health behavior modification outcomes. More women are likely to access care during a pregnancy than at any other time of their life. The diagnosis of GDM allows for measurement of the immediate and short-term health behavior modifications for proximal outcomes, which are the same ones intended to continue into the long-term for distal health outcome improvement. Women are more vulnerable during pregnancy and those with GDM are even more vulnerable due to potential health consequences to themselves and their fetuses/newborns. It is socially just and imperative to work toward improving the health status of all, every individual, in all countries regardless of economic status, racial or ethnic make-up, gender, education, or any other descriptor. It is even more important in the process to address the needs of those most affected and vulnerable, to decrease healthcare outcome disparities between populations. Research efforts utilizing the HPI model can be replicated for improvement of many other chronic conditions.

Chapter 2: Review of the Literature

A review of the healthcare literature was conducted to determine whether and how healthcare providers (HPs) influence the health behavior modification of patients diagnosed with Gestational Diabetes Mellitus (GDM). Initially, an integrative review of the literature related to health provider influence was conducted to understand the definition, concepts and process whereby HPs exert influence. To address the identified gap in the literature regarding this concept, a conceptual model of healthcare provider influence (HPI) was developed and serves as the conceptual framework for this study (Fryzelka & Weiss, 2013) (Appendix B). This integrative review of the literature includes a definition, description, and conceptual diagram representing the necessary components, conditions, and outcomes of healthcare provider influence and the theoretical basis for the model.

In this second chapter, the nursing and socio-psychological theories selected to provide the foundation and framework for the HPI conceptual model will be described. Following the development of the conceptual model for HPI, presented in manuscript format (Appendix B), a literature review was conducted to review and explicate the additional concepts included in this research proposal, including self-efficacy and health behavior modification. A review of these concepts in relation to GDM when appropriate was conducted as well and described in this chapter. Finally, the philosophical underpinnings, the assumptions for this proposal, and the Conceptual-Theoretical-Empirical structure (CTES) are also described.

Healthcare Provider Influence

HPI is defined as a process wherein a purposeful interpersonal interactive,

collaborative, and transformative relationship develops between a patient and a healthcare provider working together toward a specific focus of health behavior modification (Fryzelka & Weiss, unpublished). The development of the conceptual model of HPI is based on two theories, the Integrated Theory of Health Behavior Change (ITHBC) developed by P. Ryan (2009) and Transformational Leadership (TFL) by Bass (1985; Bass & Riggio, 2006). The concepts included in HPI conceptual model are divided into three sections: conditions, components, and outcomes. The condition and outcomes concepts are specific to the patient, as the primary focus of patient-centeredness is incorporated throughout the model and describe the salient elements necessary for the HPI to occur: mental/physical resources and the cognitive/psychological and behavioral/physical benefits of a positive influence. Included in the model are five components and three process descriptors. The five components are categorized as logistics, concordance factors, emotive, cognitive, and social/communication. The process descriptors are interaction, collaboration and transformation. These conditions, components, process descriptors, and outcomes are unique yet closely linked within the model.

A full description of the development of HPI is included in an Integrative Review of the Literature and Development of Conceptual Model of Healthcare Provider Influence (HPI) Manuscript form (Fryzelka & Weiss, 2013) (Appendix B) for review. A description and rationale for the selection of the theories are included in the manuscript; however, each will be more thoroughly described later, as they together provide explanatory strength to the model and subsequently, the research design.

Theoretical Framework/Conceptual Framework

There are several theories that provide the framework for this research project as well as for the development of a conceptual model. The central theory providing the foundation for this specific inquiry focus is ITHBC (P. Ryan, 2009). The secondary theory, TFL (Bass, 1985) is a theoretical model that provides the foundation for the development of the HPI model as well as provides the explanatory basis for the process of HPI.

Integrated Theory of Health Behavior Change

Following a review and synthesis of the healthcare literature, a lack of a comprehensive description regarding the process of influence by HPs was discovered. Reference to social influence, wherein professional influence is a component, however was found within the work of the ITHBC (P. Ryan, 2009).

The ITHBC was developed following a review of the literature and the resultant identification of a gap in the comprehensive understanding of health behavior change including prediction of long-term changes. The ITHBC integrated several theories and proposed to fill in that gap, explaining the variables involved in health behavior change or modification. The ITHBC includes theories of health behavior change, self-regulation, social support theory, and self-management of chronic illness (P. Ryan, 2009).

It was determined that ITHBC could serve as a central foundation for this research inquiry for several reasons. It provides the foundation and describes the linkage between health problem to health improvement including a central focus on the patient and his or her role in changing behaviors while accounting for the number of variables that also play a role in effecting these changes. It includes an undefined concept within one of its concepts theorized to play a role in health behavior change, that of social

facilitation via social influence by professionals or healthcare providers. A more robust development of the social professional influence component of the ITHBC is needed. The HPI conceptual model could explicate and complement this integrated theory quite well.

The ITHBC is described as a descriptive middle-range theory. Descriptive mid-range theories are "based on deductive and inductive processes and reveal the substance of a situation yet without structured linkages showing the specific nature of relationships among components (Rodgers, 2005). Over time, parts of the theories can be explored further to clarify vague aspects or to identify the scope of the contexts in which it is reasonable to apply the theory" (Rodgers, 2005). Thus, extracted from a position within this theory and providing direction, the HPI conceptual model (Fryzelka & Weiss, unpublished) was conceived and developed to better understand and explain the process by which the social influence by HPs within their clinical practice setting, in their professional relationship with patients, impacts the health behavior modification of individual patients and improves their health outcomes as a result.

The ITHBC is based on several assumptions: "behavior change is a dynamic, iterative process"; change and progress require desire, motivation and self-reflection; interventions that are person-centered rather than standardized are more effective; and social influences and relationships, which are positive, are beneficial in effecting immediate and sustained health behavior modification and improved health (P. Ryan, 2009). Outcomes are projected to be both proximal, to ensure engagement in self-management behaviors and that the behavior change has occurred, and distal, to ensure attainment of improved health status (P. Ryan, 2009).

ITHBC purports that several factors are helpful in and associated within the facilitation of successful changes in health behavior. Factors include interventions that address and foster specific knowledge and beliefs, increase self-regulation skills and abilities, and enhance social facilitation (P. Ryan, 2009). The constructs of the ITHBC theory include knowledge and health beliefs that are linked to engagement in self-regulation. Engagement in self-regulation behaviors increases skills and abilities, which enhances self-efficacy and leads to engagement in and enhancement of self-management behaviors and when enhanced by social facilitation has a direct and positive effect on health status (P. Ryan, 2009; P. Ryan & Sawin, 2009). The concepts of social facilitation, specifically social influence, self-efficacy, and health behavior modification from the ITHBC provide the focal interest of this study.

The concept of "social facilitation" includes the concepts of social influence, social support, and negotiated collaboration between individuals and families and healthcare professionals" (P. Ryan & Sawin, 2009). The component of social influence encompasses the potential influences and influencers of the individual patient's engagement in health behavior change. Influencers identified include parents, siblings, peers, and professionals. There are undoubtedly many variables and personal relationships that comprise influences on individual behavior, including but not limited to parents, siblings, peers, and professionals. People experience social influence when there is an attempt to alter, modify, or change their attitudes, reactions or behaviors by another (Gabel, 2012a). If this person is knowledgeable or in a position of perceived authority and they sway the thinking and motivation of another leading to engagement in behavior (P. Ryan, 2009), then this demonstrates social influence from a leadership perspective

(Gabel, 2012a). One of the potential sources of social influence is the healthcare provider (HP) who via means of emotional, instrumental, and informational social support facilitates engagement in health behavior (P. Ryan, 2009). Social influence and the recently developed conceptual model of Healthcare Provider Influence (HPI), self-efficacy, and health behavior modification are described later in greater detail.

As a middle- range theory, the ITHBC is meant to guide clinical practice (Higgins & Moore, 2000) and specifically, this theory was conceptualized to guide the facilitation of patient health behavior change for improved outcomes (P. Ryan, 2009). The ITHBC is applicable to individuals in the healthcare clinical practice setting. ITHBC is intended to describe the components involved in the facilitation of health behavior change related to management of chronic conditions and health promotions (P. Ryan, 2009). In addition, ITHBC explains how health behavior change is facilitated via the interrelatedness of these components. Despite the population to be studied having GDM, although not considered chronic, is highly correlated to increased future risk of a progression to its chronic form, Diabetes Mellitus (DM) (Tieu et al., 2013). The proximal outcomes of patient self-management of health behavior modification, specific to GDM, were healthy eating/diet per dietary recommendations, increased physical activity, and adherence to glucose monitoring.

A number of research studies have been conducted using the ITBHC framework as a guide. Weight retention and weight management have been studied in postpartum women using the ITHBC (Ohlendorf, 2014; Ohlendorf, Weiss, & Ryan, 2012; P. Ryan, Weiss, Traxel, & Brondino, 2011). The use of a cardio-metabolic health nurse to manage comorbid physical and mental health was evaluated (Happell, Stanton, & Scott, 2014). A

smoking cessation self-management intervention in construction workers was explored using ITHBC, as well (Bondy & Bercovitz, 2013). ITHBC guided the designing and testing of a computerized intervention for prevention of osteoporosis and self-management applications for intake of vitamin D and calcium (P. Ryan, Maierle, Csuka, Thomson, & Szabo, 2013; P. Ryan, Pumilia, Henak, & Chang, 2009).

For purposes of this research study and for the development of the HPI model, the ITHBC was selected as an appropriate framework because of its concentration on the individual and related health behavior change outcomes. An additional theory was chosen to provide an explanatory basis for the process of HPI.

Transformational Leadership

HPI, consistent with and situated within ITHBC, is centrally based on a leadership theory derived from work within the field of social psychology called Transformational Leadership (TFL) (Bass, 1985). A detailed description of TFL is warranted, as it provides a strong basis for the research inquiry and assumptions of this project.

Several leadership theories have emerged over the years describing and classifying leadership as a trait, a style, and a behavior (Northouse, 2007). Extensive research has been undertaken within many disciplines, including the following: healthcare, politics, education, military, business, and other realms, wherein leadership styles have been described and correlated to performance and behavior change (Bass & Riggio, 2006; Northouse, 2007). Different leadership styles have been found to correlate with various behaviors towards subordinates and colleagues. One of these leadership theories, called TFL, was first named by Downton in 1973, however did not emerge until the work of Burns approximately five years later in 1978 (Northouse, 2007). Shortly

thereafter, other social psychology researchers reintroduced TFL and have continued to explore, define, and refine TFL (Bass, 1985; Bass, 1998; Bass & Avolio, 1995; Bass & Riggio, 2006). This major work related to TFL was continued by Bass and several colleagues in their efforts to distinguish it from all other classifications of leadership, including transactional leadership. It has been described as similar to charismatic leadership but later described as encompassing charisma as one of its essential elements (Bass, 1998; Conger & Kanungo, 1988)

According to Burns (1978), leadership was well differentiated from power; however, those who continued the work of describing TFL could not do so without describing the concept of power as not only necessary but fundamental to leadership (Bass, 1998). French and Raven (1959) defined and described the many sources of power: legitimate, reward, coercive, expert, and referent. TFL is based on the two latter components of expert power and referent power (Bass, 1998). Expert power refers to having the expertise or knowledge in how to do your work. Referent power refers to the power that is referred from the expert and results in empowerment. Social influence requires referent power, the transfer from one to another. Power has been defined as social influence (Raven, 2008). Authentic TFL is also referred to as socialized leadership (Howell & Avolio, 1993). TFL characterizes leadership wherein a leader responds to the follower's needs, aligns goals and objectives, and though empowerment stimulates, inspires and moves followers to meet and exceed performance expectations as well as to strive for higher levels of potential (Bass & Riggio, 2006).

The current description and model of TFL, after several modifications over the past several decades, is currently described as consisting of four different components:

idealized influence and charisma, inspirational motivation, intellectual stimulation, and individual consideration (Bass & Riggio, 2006). Idealized influence or charisma describes leaders who act as strong role models for followers, are deeply respected and trusted by followers who want to emulate the leaders who provide them with a vision and mission (Bass & Riggio, 2006). Inspirational motivation or inspiration is descriptive of leaders who communicate high expectations to followers and inspire them through motivation to become committed, focusing their efforts to achieve more than they would if on their own (Northouse, 2007). Intellectual stimulation incites followers to be creative, innovative and to challenge their beliefs and values, as well as encourages them to think things out and engage in problem-solving (Northouse, 2007). Finally, individualized consideration provides a supportive environment in which the leader listens carefully to the need of the individual follower (as a coach and advisor), while assisting him or her in becoming fully actualized either with caring, strong affiliation, or specific directive (Northouse, 2007). TFL emphasizes these four components and requires leaders to be aware of how their own behaviors relate to the needs of their subordinates (Northouse, 2007). These are representative of a positive trajectory of TFL. When TFL is inauthentic, instead of positive characteristics it can have negative ones (Howell & Avolio, 1993).

Relevant to this research and to HPI, the HP is the expert, has expert power, is the social source of referent power, and is the socializing leader. The expert power results from the visibility of the HP's advanced education and knowledge of disease pathology and related prevention and treatment measures, as well as the quality, depth and demeanor of the HP's interaction with the patient. Due to having and utilizing TFL

skills, the HP can transfer or refer this expert power to the patient. This transfer of power from the expert to others can affect several potential variables that can improve one's health outcome and status, including knowledge, internal motivation, and self-efficacy (Gabel, 2012a). When this transfer of power results in an ability or increased ability to and engagement in healthy behavior modification, this is called referent power (Gabel, 2012a). TFL emphasizes internal motivation and follower development and implies that a process that changes and transforms people is concerned with emotions, values, ethics, standards, and long-term goals, includes followers' motives, satisfying their needs and treating them as full human beings (Northouse, 2007).

The Full Range of Leadership (FRL) Model was designed to include three types of leadership and presents them in a continuum to differentiate their characteristics and effectiveness (Antonakis, Avolio, & Sivasubramaniam, 2003). TFL, described as producing greater effects than the other two as well as more than is expected, sits on a continuum at one end with transactional leadership in the middle and laissez-faire leadership, essentially described as the absence of leadership or non-leadership on the other end (Bass, 1985; Bass & Avolio, 1990).

TFL styles have been found to correlate highly with positive individual and group behavior modification (Bass & Avolio, 1995). In management literature, results from outcome studies have found that different components of TFL predict or positively correlate to effectiveness or satisfaction between leaders and employees (Bass & Avolio, 1994; Bryman, 1992).

Substantial work evaluating the TFL qualities of HPs in healthcare settings in management roles and inter-professionally among colleagues in both nursing and

medicine has also been undertaken (Bycio, Hackett, & Allen, 1995; Gellis, 2001). Using the TFL model in the development of physician leadership has been recommended to improve health care quality and cost control (Xirasagar, Samuels, & Stoskopf, 2005). However, a gap was identified in the literature in regard to evaluating TFL and patients, and the relationship between HP's leadership style and patients, including their engagement in health behavior modification in response to either preventative or curative treatment recommendations. No research has been found in which patients were asked their perception or assessment of their HP's leadership characteristics. Gable (2012a, 2012b), recognizing the lack of leadership research in the healthcare setting involving patient and HPs, recommended exploring the use of Bass's TFL model in the medical arena. The incorporation of power and leadership study into medical education has been proposed, as well as, strategies recommended to achieve this (Gable, 2012a, 2012b). Use of TFL and evaluation of TFL in physicians for improvement in patient health outcomes have also been recommended (Gable, 2012a, 2012b).

Other transformational leadership perspectives have been presented in the literature (Northouse, 2007). Strategies used by leaders with followers in transforming organizations have been described (Bennis & Nanus, 1985). Practice guidelines for how to behave as an effective leader to accomplish extraordinary things using five fundamental practices include: model the way, inspire a shared vision, challenge the process, enable others to act, and encourage the heart (Kouzes & Posner, 1987, 2002) has also been described (Northouse, 2007). These were reviewed for appropriateness of fit for this research. However, they are not as relevant to the HP-patient relationship and personal or individual patient outcomes, nor as thorough and comprehensively used for

research as the theory selected, as they are more focused on organizational outcomes and more suitable and effective for training and development purposes (Northouse, 2007).

Self-Efficacy

Self-efficacy is a concept that was explored in this research. Although not explicitly included in the conceptual model of HPI, self-efficacy is encompassed within its emotive/cognitive component as well as a cognitive/psychological outcome. Self-efficacy is also a component of the ITBHC under the category of knowledge and beliefs (P. Ryan, 2009). It is described within that model as affected by knowledge, beliefs, and practice of skills, and augmented as a result of self-regulation (P. Ryan, 2009). It is purported to enhance engagement in health behavior modification (P. Ryan, 2009).

Self-efficacy theory, a form of social cognitive theory was developed and described by Bandura to describe the relationship between the necessary but insufficient components of how knowledge, transformational operations, and constituent skills progress into performance or action (Bandura, 1986). "Perceived self-efficacy is defined by people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances," and addresses the process of how personal judgments or sense of capability affect motivation and behavior to do what they need to do or can do to control whatever affects their lives with the skills they have (Bandura, 1986, p. 391). People tend to do those things they think they are capable of and avoid doing those things that they do not think they can do, or which will take significant effort. People must make decisions in many aspects of their lives, one of which involves their health. To do so, they must exercise efficacy, the belief in their capability to exercise control over their own motivation and behavior (Bandura, 1991). Beliefs are one

determinant for behavior, thoughts and reactions. Self-efficacy is one of the psychosocial determinants regulating psychosocial functioning and impacts health status by influencing biological functioning (Bandura, 1986). Competent functioning requires both skills, social, behavioral, and cognitive as well as the self-efficacy beliefs to use or organize them effectively to accomplish an outcome if the person judges that he or she can or wants to.

It is important to distinguish the difference between self-efficacy and outcome expectation. An outcome expectation is a judgment of the likely consequence the behavior will produce, therefore not the act but its consequence (Bandura, 1986). How one behaves largely determines the outcomes one experiences; however, it is not the performance that is generally measured or cared about, but rather the outcome. Since outcomes are contingent on performance, the perception of what one can do or whether he or she is able to achieve the outcome will likely determine what actions are taken.

Strategies or ways to alter a people's self-efficacy can occur because of cognitive processing when information is communicated actively, vicariously, physiologically or persuasively. These strategies are performance attainment/skills mastery, vicarious experience/modeling, physiological states/reinterpretations of symptoms and verbal/social persuasion (Bandura, 1986). Mastery experiences will instill a strong sense of efficacy; with each success a more robust sense is built. Modeling is when people judge their own capabilities by comparison with what others can do or the opinion of others. They increase their own beliefs and self-efficacy when they see or experience vicariously through others. The opposite is also possible in that a decrease in beliefs of capability can result if they see others fail. Reinterpretation of symptoms involves

providing people with the skills to reduce physiological reactions to modify how they interpret somatic information. Finally, social persuasion is used via influence to convince people they have the capability to achieve and succeed. When the objectives are realistic, the influence can lead to great success. The strength of belief in one's capacity to do a specific task is a good predictor of motivation and behavior. Enhanced perceived self-efficacy is the belief that the self has the capability to mobilize the motivation, cognitive resources, and course of action needed to meet situational demands and leads to improved behavior, motivation, thinking patterns, and emotional well-being (Bandura, 1986). Performance attainment or actual experience of the success of one's actions is the most influential source of self-efficacy beliefs because it is based on actual skill mastery.

Theory and research have linked self-efficacy and TFL. Self-efficacy has been suggested as a possible mediating mechanism through which transformational leadership affects followers' performance in the self-concept motivation theory of leadership work of Shamir, House, and Arthur (1993). Leaders with TFL are said to enhance a follower's perceived self-efficacy and role commitment by communicating high performance expectations and positive visions, providing training, coaching and opportunities for development, and expressing confidence in their abilities to contribute to the mission and goals of their organization (Shamir et al., 1993). Leaders with TFL were believed to increase self-efficacy, leading to higher team morale, which resulted in greater team innovation directly benefitting patients in a teaching hospital (Wilson-Evered, Hartel, & Neale, 2001). In a study of bankers, TFL was also found to positively and significantly relate to self-efficacy ($p \leq .05$) in regard to individual job performance (Walumbwa, Avolio, & Weichun, 2008). Increasing follower's self-efficacy, along with performance

goals, was found to mediate the relationship between leader TFL factors and increased performance in business students (*N*=282) (Kirkpatrick & Locke, 1996). When leaders understand how their followers view themselves and providing regular and adequate feedback, this can transform a follower's belief that they can be successful at more challenging tasks.

Self-efficacy has been explored in relation to self-management. It refers to the confidence and beliefs that contribute to self-management of behaviors, such as health behavior modification. Health behavior modification is a major outcome variable in self-efficacy research as well as the outcome for this research study. Bandura's self-efficacy theory provides the framework for much of the research regarding self-management interventions (Lorig et al., 1996). Multiple self-efficacy instruments for several chronic health conditions, as well as related health behavior measures have been developed and used in research demonstrating repeatedly the correlation between the two concepts of self-efficacy and self-management of health behavior modification (Lorig & Holman, 2003; Lorig, Ritter, & González, 2003). Health behavior modification, such as in diet management and physical activity is increased when self-efficacy is enhanced (Lorig, González, & Ritter, 1999; Lorig, Ritter, & Jacquez, 2005; Lorig, Ritter, Villa, & Armas, 2009).

Self-Management Health Behavior Modification

Self-management refers to the process of engaging in specific behaviors enhancing a person's ability to manage an illness, usually chronic in duration and nature, or risk behaviors. Self-management includes learning tasks such as medical or behavioral management, role management, and emotional management (Lorig &

Holman, 2003). Five core skills include problem-solving, decision-making, resource utilization, forming a patient-HP partnership, and taking action (Center for the Advancement of Health, 2002). The fourth skill is consistent with the interactive and social communication within the HP-patient relationship and the patient-centeredness of the HPI conceptual model. Health behavior modification is a central concept included as an outcome in the behavioral/physical component of the HPI model. Health behavior modification is used synonymously with health behavior change. Engagement in self-management behaviors is one of the proximal outcomes of the ITHBC (P. Ryan, 2009). Self-management for the individual is the primary focus in the work of Lorig, rather than family or community (P. Ryan & Sawin, 2009). Self-management tasks described as maintaining good nutrition and appropriate diet and maintaining adequate exercise and physical activity (PA) (Lorig et al., 1996) represent the outcome measures for health behavior modification in this proposal. For the purposes of this proposal, health behavior modification was defined as "the adaptation or changes made to current practices that affect one's health and overall outcomes, such as healthy eating and physical activity (PA)" (Fryzelka & Weiss, 2013).

Health behavior modification has been studied extensively throughout the healthcare professions in relation to many chronic diseases or preventative health promotion strategies. The predominant foci of self-management of health behavior modification research are correlation studies with health outcomes that usually involve chronic conditions or diseases, such as DM, arthritis, asthma, hypertension, and cancer (Heisler, Smith, Hayward, Krein, & Kerr, 2003; Lorig et al., 2003; Lorig et al., 2005; Lorig et al., 2009). In addition to the two most commonly identified areas of health

behavior change or modification, dietary or eating pattern changes and exercise or physical activity changes, others include smoking or drug and alcohol cessation, stress or pain management, and coping strategies. Health behavior modification among all of these, but especially smoking or drug and alcohol cessation has been increasingly shown to prevent or delay the onset of chronic health problem diagnoses as well as improve or slow deterioration once they occur (Lorig et al., 1996). Treatment and prevention programs usually aim at least some efforts toward health behavior modification (Lorig et al., 1996). Improving healthy behaviors can improve physical, mental and social health and functioning, while prolonging and prompting independence and autonomy (Lorig et al., 1996).

Several variables representing health behaviors that have been studied in correlation with self-efficacy including diet and exercise (Lorig et al., 1996) in people with DM (Kara, van der Bijl, Shortridge-Baggett, Asti, & Erguney, 2006; Leung Hui, Sevenhuysen, Harvey, & Salamon, 2014; Lorig & González, 2000; Rapley, Passmore, & Phillips, 2003). To engage in health behavior modification, individuals must perceive that they can do so, they need to perceive themselves at risk, and they need to see more benefits than costs in making the changes. HPs can enhance patient self-efficacy by providing information actively, vicariously, physiologically, and persuasively. This can lead to influencing and empowering them, increase their controllability along with their knowledge, beliefs, confidence and success regarding health behavior modification. This can in turn increase physical and emotional well-being and contribute to prevention of further sequelae or future disease.

Regarding GDM, it has been suggested that it is important to help patients increase their perception of their ability to deal with GDM before communicating risk information (Snoek & Rubin, 2005). Women with recent GDM diagnosis pass through a period of transition requiring knowledge about the disease and treatment, with the potential for conflicting self-perception about their capability to modify their behaviors and their body's response (Leung Hui et al., 2014; Parsons, Ismail, Amiel, & Forbes, 2014). To treat GDM or prevent future DM, the patients need to perceive that they can do what is needed regarding health behavior modification of diet and physical activity to achieve that outcome. In postpartum women with a recent diagnosis of GDM, engagement in healthy dietary behaviors were found to positively correlate with social support, and engagement in sufficient or increased physical activity levels were positively correlated with high self-efficacy and high social support, often reported to be verbal encouragement from family and friends or someone exercising with them (Kim, McEwen, Kieffer, Herman, & Piette, 2008; Smith, Cheung, Bauman, Zehle, & McLean, 2005). Decreased self-efficacy for PA related to time pressures and fatigue and barriers to PA reported were a lack of childcare and insufficient time (Smith et al., 2005). Women with GDM have experienced stress over losing control of GDM by not being able to follow recommendations or success in achieving glucose targets with dietary management (Leung Hui et al., 2014). Factors negatively affecting patient engagement self-management in DMs include inadequate self-efficacy, ineffective HP relationships, limited DM knowledge, inadequate family and community support among others (Rodriguez, 2013). These results support the notion of exploring measures to increase GDM/DM self-efficacy by developing a trusting HP relationship and consistent

information, support, knowledge, goals and use of verbal persuasion to build self-efficacy to promote healthy behaviors in this patient population (Rodriguez, 2013).

Physical activity has been found to be effective in preventing and managing GDM (Ruchat & Mottola, 2013). However, understanding women's beliefs about and behaviors related to exercise as well as barriers and sources of social influence were deemed important to develop interventions to increase exercise in GDMs (Symons Downs & Ulbrecht, 2006). A diabetes prevention program found that in cases of people diagnosed with impaired glucose tolerance and thus determined to be at high risk of developing DM, implementation of interventions that modify health behaviors and lifestyles have been shown to significantly reduce the incidence of DM and all the social and human costs (Snoek & Rubin, 2005). Patients with GDM who were expected to have had more difficulty in controlling their blood sugars because of physiological glucose impairment usually had better-controlled blood sugars with greater motivation (Snoek & Rubin, 2005). It also found that barriers to prevent onset or delay diagnosis of DM were attributed to a lack of knowledge among the public and physicians about the correlation between impaired glucose tolerance and previous GDM diagnosis and the risk of developing DM (Jones, Roche, & Appel, 2009; Snoek & Rubin, 2005). The perception of general risk versus personal risk of future DM in postpartum women varied in two studies (C. Kim et al., 2007; Zera, Nicklas, Levkoff, & Seely, 2013). Most postpartum women with recent GDM, 90-95%, were aware, that previous GDM was a risk for DM but only 16% that believed they were personally at risk for developing DM in the future.

Increased knowledge and motivation certainly play a role in health outcome improvement via health behavior modification. Motivational interviewing has been

highly efficacious for behavior changes in smoking cessation, alcoholism, and dietary adherence and physical activity for diabetics (Leyva-Mora, 2007). However, reported conclusions from self-management research findings indicate that knowledge alone is insufficient as a predictor of these changes; motivation is not always inherent in those diagnosed or at risk for acute or chronic illness and disease, and readiness or ability to make changes that are necessary to prevent or treat illness is not a given (Lorig et al., 1996).

A concept related to self-efficacy that is prevalent in health behavior modification research is patient activation, extensively studied by Hibbard and colleagues (Hibbard, Stockard, Mahoney, & Tusler, 2004; Lorig et al., 2009; Hibbard & Greene, 2013; Hibbard, Greene, & Overton, 2013). Patient activation is used to describe the skills and confidence that equip patients to become more actively engaged in their healthcare and is defined as "understanding one's own role in the care process and having the knowledge, skills, and confidence to take on that role" (Hibbard et al., 2004; Hibbard, Greene, & Overton, 2013). Patient activation, in multiple studies, has been found to lead to improved health outcomes, decreased healthcare costs, and increased patient care experiences (Hibbard & Greene, 2013). Patient activation has been studied in research involving healthy behaviors, DM and in multiple populations (Lorig et al., 2009; Rask et al., 2009; Hibbard & Greene, 2013).

Patient activation is measured by a 13-item tool called patient activation measure (PAM), developed to measure four domains: confidence, beliefs, knowledge, skills. Scores increase as levels of activation increase from least to most activated and testing reflects strong psychometric properties (Hibbard et al., 2004; Hibbard, Mahoney, Stock,

& Tusler, 2007). PAM was linked to health behavior activation and better health outcomes, including biometric measurements of hemoglobin A1c (Hibbard & Green, 2013). In one study, very low activation levels were significantly associated with higher health care costs and predictive of higher future costs. On the contrary, higher activation levels and more confidence, knowledge and skills in health self-management increased navigation of health care system and incurred less costs (Hibbard, Greene, & Overton, 2013). Higher PAM scores were significantly correlated with health and preventative behaviors in multiple studies including eating a healthy diet, increasing physical activity, and avoiding health-damaging behavior (Hibbard et al., 2004; Hibbard, Mahoney, Stockard, & Tusler, 2005).

Due to the proximity in conceptual construction and fair amount of overlap between patient activation and self-efficacy, it was necessary to determine which one would be a better fit for this study's conceptual design. Both include elements of knowledge, skills and confidence. Both have engagement in health behavior modification as their end. Both have been studied in patient populations similar to the sample of this study, as well as in patients with DM. The difference between the two at initial glance appears to be related to "perception of beliefs in one's capability" present in self-efficacy versus "understanding one's role" in patient activation. As a mediating variable in this study the self-efficacy appears to have a better fit with transformative leadership and patient activation with transactional leadership. This interpretation may result in part due to the different strategies recommended for increasing engagement suggested by Bandura for self-efficacy (performance mastery, modeling, re-interpretation of symptoms, and social persuasion), which are consistent with TFL, and by Hibbard for patient activation,

(interventions and system support). Self-efficacy represents a process of transforming the individual's cognitive-psychological perception of capability in psychosocial interaction with others, thus fits better with the social influence component of the ITHBC model, described "when a knowledgeable person in a position of perceived authority, such as a HP, sways their thinking and motivation leading to engagement in behavior" (P. Ryan, 2009). The focus of this research was on the influence of patient engagement in health behavior modification via a collaborative-psychosocial interaction involved in the HP-patient relationships leading to transformation in the patient's emotive-cognitive and physical-behavioral status. This focus encompassed the perception of capability that affects motivation and engagement in behavior modification, consistent with self-efficacy. The HPI conceptual model includes this strong link to self-efficacy as well as multiple other inter-related components that via utilization of transformational leadership skills by the HP may increase patient engagement. Differentially, patient activation relates more to cognitive-only and is focused more on the individual-institutional/organization interaction versus person-person with utilization of strategies of interventions and support to increase their understanding of their role. Patient activation has a better fit with the social support component of the social facilitation aspect of the ITHBC, consisting of "emotional, instrumental, or informational support, which facilitates engagement in a health behavior" (P. Ryan, 2009) rather than the inter-personal social influence aspect.

Despite the use of self-efficacy and patient activation with similar research objectives and goals, such as health care reform, the improvement of health outcomes, decreasing associated costs, and utilizing a patient-centered (PC) care focus, self-efficacy

is determined to be a better fit for this research purpose. In summary, patient self-efficacy, that is the self-perception of their capability, including knowledge, beliefs, and confidence, that can transform into skills and taking opportunities to engage in health behavior modification is a more suitable measure with this study than assessing their "understanding of their role in the process", consistent with patient activation.

The patient's perception of their HP's role and TFL characteristics were assessed and tested in association with outcomes of patient engagement, health behavior modification. Patient self-efficacy was also assessed for a mediating effect on the relationship between HPI and outcomes of patient engagement, health behavior modification. Measurements for self-efficacy specific to the context of the study, GDM, the Diabetes Self-Efficacy Scale (DSES), are readily available; however, there is no measure of PAM specific to diabetes or gestational diabetes.

Gaps

A gap identified in the research is the need for HPs to better understand how health behavior change is made and their role in facilitating and supporting change as well as understanding how to maintain these behavioral changes over time (P. Ryan, 2009). A similar recommendation from the patient activation research called for a focus on the HPs role for patient engagement in health behavior modification (Hibbard & Greene, 2013). This research was proposed to better understand the role and influence of HPs via the patients' perception of their HP's leadership characteristics and the association with their engagement in health behavior modification. As has been described, several studies have found a correlation between increased self-efficacy and increased engagement in health behavior modification. This proposed study incorporated

a measure of self-efficacy and addressed whether the degree of self-efficacy affected the relationship between HPI and patient engagement in health behavior modification. Additional research recommendations have been proposed due to the gaps related to TFL leadership research involving patients and HPs. The evaluation and development of TFL skills in HPs for use in their relationship with patients may have an impact on the improving health outcomes, containing/decreasing healthcare costs, and improving healthcare quality (Gabel, 2012a, 2012b; Xirasagar et al., 2005). These suggestions from individuals involved in health behavior modification research and P. Ryan's conceptualization of the ITHBC (2009) that provided the space for HPI to emerge and develop, all serve to confirm the gap in the literature about the process of HPI and its relationship to patient health behaviors and outcome.

This study intended to not only fill in some of those gaps, but also to provide an opportunity for initial testing of the newly-developed HPI conceptual model, a new structure and perspective from which to explore the range of factors that could contribute to improvement in patient health status and outcomes. This allowed for inquiry into the role and responsibility of the HP from a social leadership lens, which has not yet been described in the literature. Additionally, it provided a foundation for future research into how to augment engagement in the self-management of health behaviors, as well as perceived self-efficacy to drive self-directed modification of health-promoting behaviors. Furthermore, it had and still has the potential to guide curriculum and professional development and augments HP-patient communication in the clinical setting. Additionally, it contributed to increased increases in the efficiency and effectiveness of the HP-patient interaction.

Research Purpose/Aims

The purpose of this study was to explore the relationship of HPI and health behavior modification, specifically healthy eating, physical activity, and glucose monitoring in women with GDM, a disease where treatment, control, and prevention center on patient self-management through dietary modifications and increases in PA. The specific research aims were: a) to determine if HPI was associated with patient engagement in health behavior modification of healthy eating, physical activity, and glucose monitoring in women with GDM; b) to determine if patient characteristics moderated the relationship between HPI and patient engagement in health behavior modification of healthy eating, physical activity, and glucose monitoring in women with GDM; c) to determine if healthcare provider characteristics moderated the relationship between HPI and patient engagement in health behavior modification of healthy eating/diet, PA, and glucose monitoring in women with GDM; d) to determine if self-efficacy mediated the relationship between HPI and patient engagement in health behavior modification of healthy eating, physical activity and glucose monitoring in women with GDM; and e) to determine if there were differences in the pattern of patient engagement in healthy eating and physical activity during pregnancy for women with and without a GDM diagnosis.

Philosophical Underpinnings for the Study of Healthcare Provider Influence

Reflection on the philosophical paradigms underlying this research revealed that the overarching paradigm or worldview from which this research inquiry initially arose within the researcher was from critical social theory (CST). With a major focus on health outcome improvement from an individual concentration graduating to a community and

ultimately, a global one, the intent of the researcher is to address in the social setting and within social institutions, such as within health care, measures to improve or encourage opportunities for patient self-empowerment and self-actualization as a result of exploring and correcting power issues. In this inquiry, interest in how HPs influence patient engagement in healthcare behavior modification emerged from the desire to understand how HPs, those with expert power, using transformational leadership can or should transfer their power to the patient for improvement in healthcare status. Toward this end, a review of the literature and conceptualization of the HPI model ensued. Historically and socio-politically, CST sets the paradigm for a more negative and destructive form of power; however, the perspective in this case is to recognize that there exists a power differential and to effect movement of the power for positive and transformative purposes. These power concepts are included in the TFL theory that provided the foundation for the HPI conceptual model. CST is concerned with the study of social institutions, issues of power and alienation, and envisioning new opportunities (Gillis & Jackson, 2002). Personal meaning is shaped by societal structure of the healthcare setting and communication processes (Campbell & Bunting, 1991). Both the setting and the social-communication interaction between the HP and the patient are components of the HPI conceptual model. The empowerment of patients to increase their engagement in health behavior modification to improve health outcomes and the opportunity to experience transformation because of their experiences and interaction with expert leaders all appear to be a good fit for CST. The research inquiry, the intentions of the researcher, the ontology of critical realist, the outcomes related to the process of the inquiry and potential results, and finally, the future intervention studies all appear

consistent with the tenets of CST. However, despite all these considerations, the epistemology and methodology do not support this paradigm specific to this specific inquiry. The epistemology, the nature of how the knowledge is learned was not subjective and the researcher and participant were not engaging in a participatory manner. Nor was the methodology, how data was collected, analyzed, and selected for this research design, consistent with CST (Guba, 1990).

The paradigm that motivated this specific proposal, with consideration of the ontology, epistemology, and methodology aligned with post-positivism on all three of these levels. Post-positivism began emerging as a group of philosophers questioned and rejected the notion that acquisition of all knowledge be reduced or deduced, and derived by reasoning and strict objectivity alone, as is reflected rigidly with the positivist stance. Although initially accepted due to its philosophical foundation for much of medical research, positivism has historically been questioned from a global nursing perspective as to whether it was even an appropriate fit for this discipline. The major critique is due to the lack and devaluing of holism, patient-centeredness, and humanity, which are critical tenets of nursing (Guba, 1990).

The 'objectivist' epistemology of positivism was critiqued and a post-positivist "modified objectivist" epistemology proposed as an alternative. Regarding the modified objectivist, it is suggested that knowledge, while objectively acquired by sensory experience, is biased in that the researcher knows and believes also because of what they perceive or feel. "Perception is partly a function of prior knowledge" wherein presuppositions and theory play a role and result in the reality that observations become theory-laden (McErlean, 2000, p. 3). The researcher brings several assumptions or biases

that served a pivotal role in structuring the research conceptual-theoretical-empirical statement research structure (Fawcett, 1999). The major assumptions in this research proposal were that HPs play an expert role that via interaction with patients can refer that power or empower them, utilizing TFL skills to increase their engagement in health behavior modification. This assumption was based on the researcher's previous experience in both a HP and patient role. Additional assumptions will be detailed later.

Ontologically, positivism and post-positivism support realism, with the latter described as taking on a critical realist stance, similar to CST (Guba, 1990). Reality is derived from natural laws and is used to predict and control phenomena according to positivism; however, as a result the findings are not generalizable as reality is constantly changing (Guba, 1990; Monti & Tingen, 1999). Reality cannot be completely objective as many factors and dimensions affect reality from variations between person, time, environment, and context. The reality of every patient will be different based on the interplay between variables of influence and outcomes; however, a consensus will result, representing a modified objectivist view, from multiple perspectives, in this case by asking who is influential and what about them or their actions is influential. Both the HPI conceptual model and the ITHBC are patient-focused involving human behaviors, reactions, and perceptions, also with elements of patient-centered communication and care. In this case, the patient was not constructing or defining her own reality, which would be consistent with constructivism.

The post-positivist paradigm was also aligned with the methodology, the means used to gather and analyze data to create knowledge, selected for this research. The methodology is also consistent with positivism, but the interrelated theories are not

positivistic. This was a quantitative empirical study looking for observations and associations, between multiple variables, HP and patient characteristics, patient perceptions of HP influence and HP leadership characteristics, delivery and content of information, self-efficacy, and patient health behavior modification. Correlations were hypothesized to exist between the independent and dependent variables. The nature of psychosocial objective measurements of perceptions and behavioral outcomes was consistent with post-positivism. Theory testing and application of the ITHBC, and the use of valid and reliable measures to examine phenomena of HPI were representative of objectivity, present in the positivist and post-positivist paradigms. In this case, the objectivity was "modified", in that knowledge was acquired as objectively as possible and according to rules and guidelines for validity, reliability, and use for generalizability. Furthermore, the proposition was derived with bias and preconceived notions about the association between the variables. These factors all support post-positivism.

Assumptions of the study

Ideological

1. Persons with illness or disease are influenced in their decisions regarding health behavior modification by relationships with others, one of whom is their HP.
2. HPI describes a transformative process by which patients can engage in health behavior modification.
3. Self-efficacy can explain some of the effect of HPI on patient engagement in health behavior modification.

Procedural

1. HPI can be assessed by patient's completion of questionnaires and surveys

2. TFL characteristics of HP can be assessed by the patients for whom they provide care by completion of a survey.
3. Patient self-efficacy can be assessed by completion of a survey.
4. Social influence, measured as HPI, is a stable condition and only needs to be measured once (Champion, 1994).
5. Patients can recall and report their healthy eating/diet, PA and glucose monitoring behaviors accurately from the past week.

The assumptions are based on the review of the literature regarding patient-centered communication and results of TFL, primarily, in the organizational setting. One of the hypotheses for this research, that HPI augments the engagement of patients in health behaviors that are positive and beneficial to improve their health status when the HP has higher levels of TFL skills/characteristics is based largely on these assumptions.

Conceptual-Theoretical-Empirical Structure (CTES)

As soon as a research purpose was identified, and questions formulated, it was important to determine what the concepts were, how they were linked together, what they were based on, and how the concepts were to be measured (Fawcett, 1999). Concepts should be well described and transparency in how they are merged is deemed important for those researching and those who intend to understand the theory and findings. Each research proposal should be linked to an existing nursing theory to further explain, expound on, modify, or refute it (Fawcett, 1999). A means to facilitate this is by designing a conceptual-theoretical-empirical structure (CTES) (Figure 1) (Fawcett, 1992). Although there is a level of clarity intended by developing a CTES, due to the multiple descriptors, designations, and naming of conceptual models and theories, it is

not always necessary or possible to describe all the multiple levels of theories for each research proposal or determine just one theory that provides the foundation for the research.

Conceptual Framework

The conceptual framework used for the development of the HPI conceptual model and subsequently this research is based on two theories, the ITHBC and the TFL. The ITHBC has been described as a descriptive middle-range theory (P. Ryan, 2009). As a middle range theory, it is testable and is limited in scope and number of variables, in terms of not addressing the full scope of nursing's concerns; however, it does have a broad scope in relation to the types of clinical problems and patient types that could be considered, and therefore it is both sufficiently general yet specific enough to be used in research (Fawcett, 1999). In addition, it directs and is tested by practice (Fawcett, 1999). HPI represents an extraction from the social facilitation-social influence-professional influence component of the ITBHC.

The second theory contributing to the conceptual framework for HPI is TFL. The socializing aspect of TFL is conceptually aligned with the social facilitation-social influence component of the ITHBC. TFL serves as the process theory whereby the HP is an effective and positive social influencer. The emphasis on intrinsic motivation needed for behavior modification is consistent with the motivational aspects of TFL. The individualized consideration within TFL is consistent with the patient or person-centered approach of the ITHBC. The combination of the two theories of ITHBC and TFL provides a strong basis for the development and testing of the HPI model, with the

specific focus of exploring the correlation between HPI and health behavior modification engagement in this and future research.

Theoretical Framework

Theories are interrelated concepts and statements that are testable, described as less abstract, often in the form of middle- range, micro-range, and situation-specific theories, and contribute to the intermediate level of the CTES (Fawcett, 1999; Hardy, 1978; Higgins & Moore, 2000). The HPI conceptual model represents the theoretical level as a practice theory, focusing on a specific population or situation, in this case GDMs (Walker & Avant, 2005). A conceptual model contains a set of relatively abstract and general concepts, as well as the propositions that link or describe those concepts and is intended to provide the context for theory testing (Fawcett, 1989, 1999). It can be used to represent ideas relevant for all healthcare professionals, especially their largest group, nursing, HPI describes the components and process of influence involving HPs and patients in regard to improved health outcomes via engagement in health behavior modification, which was tested for the first time. HPI is a construct of several concepts that are operationally defined and represented by several independent variables that were tested to verify the correlation between concepts within the model and the links within the integrated theory (Walker & Avant, 2005) to determine if the proposed relationship among concepts could be validated. While the construct is relatively abstract, selected components are being drawn on as they relate to concepts from the two conceptual level theories, ITHBC and TFL. Testing these concepts also works simultaneously to test and validate the shared components of these theories (Walker & Avant, 2005).

Empirical Level

Empirics describe the methods used to collect and analyze the data and represent the most concrete level of the statement (Fawcett, 1999). The empirical level represents the most concrete level of the structure and contains the measurements of the variables representing or providing the operational definition of the concepts interlinked in the research statement. A total of nine measures contributed to this empirical level which were linked to the theoretical and conceptual levels in the discussion to follow.

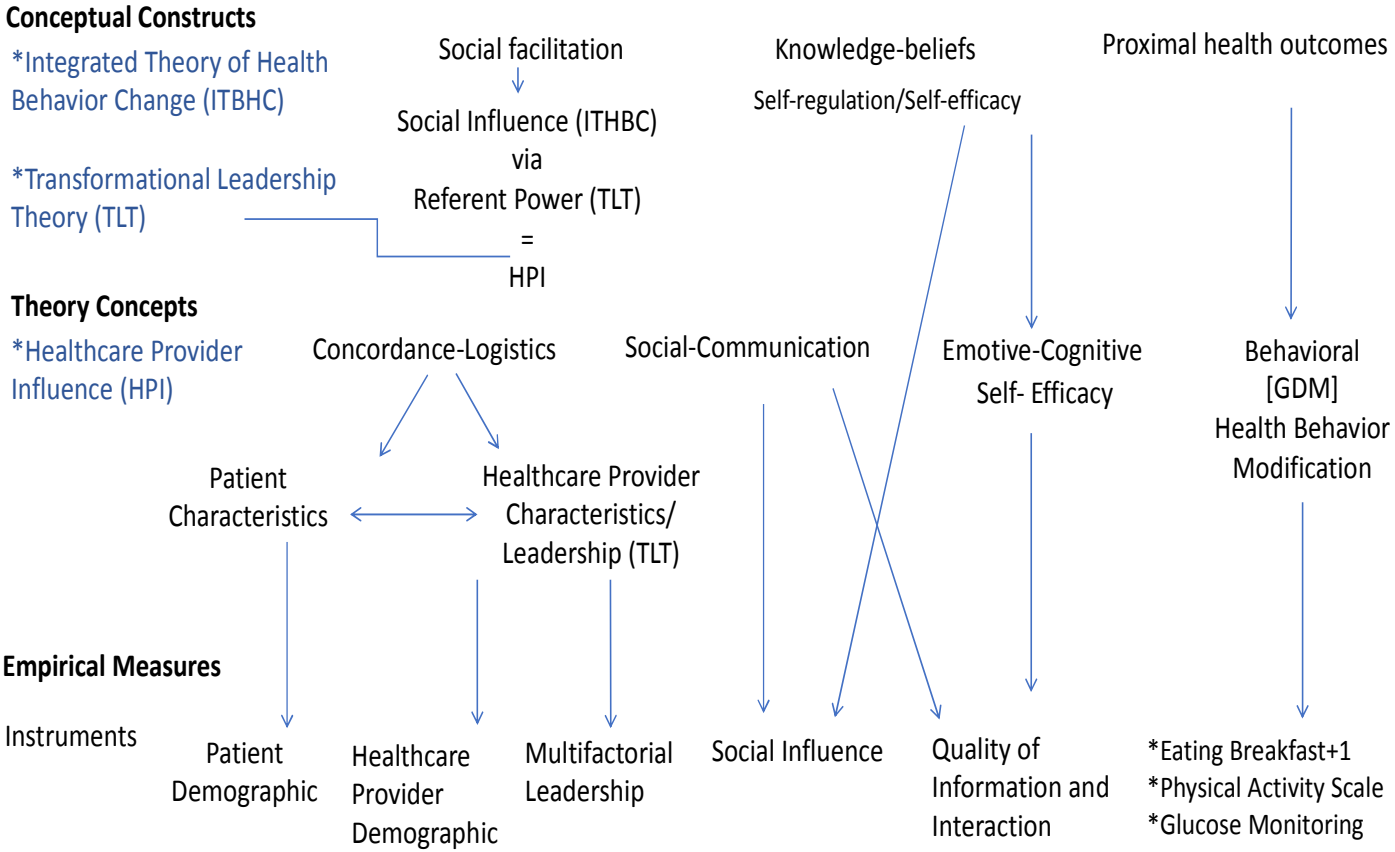

Figure 1: Conceptual-Theoretical-Empirical Structure

The HPI model was pulled from and essentially explicates the social influence concept, a component of social facilitation from the ITHBC. Social influence is also represented from the TFL theory. In this study, social influence was represented by two concepts from the HPI model: concordance-logistics and social-communication. Concordance-logistics was operationalized as patient and HP characteristics, including HP leadership and measured using the Patient Demographic Questionnaire (PDQ), the HP Demographic Questionnaire (HPDQ) and the Multifactor Leadership Questionnaire-5X (MLQ). Social-communication was operationalized as HP social influence measured by the Social Influence Questionnaire-GDM (SIQ) and the quality of interaction and the informational content received-delivered measured by the Quality of Information-Interaction-GDM (QOII). Other ITHBC components were linked to the HPI concepts. Self-efficacy is a component of knowledge-beliefs, a process construct of the ITHBC as well as the primary operational definition of the emotive-cognitive concept of HPI. It was measured by the Diabetes Self-Efficacy Scale (DSES). The SIQ and the QOII are also linked to the knowledge-beliefs concept on the conceptual level and the emotive-cognitive concept on the theoretical level. Finally, proximal health outcomes, a component of the ITHBC was represented by the behavioral-health behavior modification HPI concept and measured by the Eating Breakfast Questionnaire (EBQ) +1, the Physical Activity Scale (PAS) and the Glucose Monitoring Questionnaire (GMQ).

Summary

A summary of the review of the literature related to the concepts included in the research proposal has been presented, as well as a description of theories that provided a foundation for the development of a conceptual model, HPI and testing of the proposition

based on assumptions that HPI increases patient engagement in health behavior modification. A gap in the healthcare literature was identified necessitating the need for the model due to a lack of an existent one. The post-positivist philosophical paradigm that underlies these theories and research and as well as the conceptual-theoretical-empirical statement has been described including the theories, ITHBC and TFL, and a description of the characteristics of the instruments selected for the study variables. Assumptions related to the research study have also been reported. The following chapter addresses the design, aims, related hypotheses and research questions, methodology, recruitment, and implementation of the study.

Chapter 3: Research Design and Methods

Research Purpose

The goal of the research was to explore the relationship of healthcare provider influence (HPI) and health behavior modification, specifically healthy eating (HE), physical activity (PA), and glucose monitoring (GM) in women with GDM. This research project was designed and structured as a primary means of testing the relationship between components of a newly developed conceptual model for HPI. The overarching research question is "What is the relationship of HPI to health behavior modification of healthy eating, physical activity and glucose monitoring behaviors in women with GDM?"

Research Aims, Hypotheses (H) and Questions (RQ)

The specific research aims with their corresponding hypotheses (H) and a question (RQ) were:

Aim 1) to determine if HPI was associated with patient engagement in health behavior modification of HE, PA, and GM in women with GDM.

H1) HPI, specifically, SIQ and QOII will be positively correlated with an improvement in HE, an increase in PA and adherence to GM recommendation behaviors in women with GDM.

Aim 2) to determine if patient characteristics moderated the relationship between HPI and patient engagement in health behavior modification of HE, PA, and GM in women with GDM.

H2) Patient factors, specifically, race/ethnicity, primary language, and personal/family history GDM/DM, will have a moderating effect on the relationship

between HPI, specifically, SIQ and QOII and HE, PA, and GM behaviors in women with GDM; the relationship will be stronger with race concordance, primary language concordance, and a positive personal/family history of GDM/DM (GDMPFH)

Aim 3) to determine if healthcare provider characteristics moderated the relationship between HPI and patient engagement in health behavior modification of HE, PA, and GM in women with GDM.

H3) HP factors, specifically, gender, HP specialty, HP leadership style (MLQ) will have a moderating effect on the relationship between HPI, specifically, SIQ and QOII, and HE, PA, GM behaviors in women with GDM; the relationship will be stronger with gender concordance, HP transformational leadership style (MLQ) but not differ based on HP specialty.

Aim 4) to determine if self-efficacy mediated the relationship between HPI and patient engagement in health behavior modification of HE, PA, and GM in women with GDM.

H4) Patient self-efficacy will have a mediating effect on the relationship between HPI specifically, SIQ and QOII and HE, PA, and GM behaviors in women with GDM.

Aim 5) to determine if there were differences in the pattern of patient engagement in HE, PA during pregnancy for women with and without a GDM diagnosis.

RQ1) Were there differences in patient engagement in health behavior modification of HE and PA as a result of time (Phase 1, during high-risk screening and Phase 2, near the end of pregnancy) or diagnosis of GDM (control group: non-GDMs and GDMs)? and b) were there differences in patient engagement in health behavior modification of HE and PA as a result of time (Phase 1, during screening and Phase 2,

between 34-36 weeks gestational age) or diagnosis of GDM (control group: non-GDMs and study group: GDMs) when adjusting for three covariates: race/ethnicity, primarily language and personal/family history of GDM/DM?

Research Design and Method

In planning a study to answer the proposed research question and validate the HPI conceptual model, it was necessary to select a design, determine sample selection including inclusion and exclusion criteria, estimate a sample size, develop a research procedure and protocol, including consideration of human subjects protection, select and test instruments used to measure variables within the study, and address threats to internal and external validity. Additionally, consideration and relevance to the theoretical and philosophical underpinnings was important.

The primary research design selected was an observational, prospective, longitudinal, correlational exploratory design. A correlational design was determined appropriate for inquiry investigating the association between two or more variables (Hulley, 2007). This type of design explains if there is and what the association is and how strong the relationship is between predictor or independent variables (IVs) and the outcome or dependent variables (DVs). In this research, components of HPI, specifically HP leadership characteristics, HP specialty, gender, race/ethnicity, and language used and patient characteristics, specifically race/ethnicity, primary language, and personal/family medical history were explored for their association with patient health behavior modification of healthy eating, physical activity and glucose monitoring in women with GDM. The association was explored within the natural setting and occurrences without an attempt to control, modify, or affect the situation, thus was observational and

exploratory (Hulley, 2007). Elements of timing contributed to the prospective and longitudinal nature of the design. Participants were followed from enrollment during early to mid- pregnancy through near the end of pregnancy, at approximately 34-36 weeks gestational age, thus observed prospectively (Hulley, 2007). Longitudinally, an effect or change in the outcome variables of HA and PA was assessed over time, at two different time frames, with the same sample (Mertler & Vannatta, 2001). This research design was a fitting selection, as it was consistent with theory testing of the proposed relationships in the HPI framework and addresses research aims 1 through 4 involving the components of cognitive, behavioral and social factors of participants and HPs, as well as the outcomes of health behavior modification embedded within the HPI conceptual model (Hulley, 2007).

In addition to the correlational design, a quasi-experimental comparative design was used for Aim 5, to explore differences in health behavior modification of HA and PA in pregnancy for women at high risk for GDM but were not diagnosed with GDM (non-GDMs) and those who were diagnosed with GDM (GDMs). A repeated measures approach was used to compare changes in HE and PA behaviors during pregnancy at two times (Phase 1 occurring at the time of initial high-risk GDM screening test, and Phase 2, near the end of pregnancy at approximately 34-36 weeks gestational age) in women with GDM and high risk non-GDMs.

Quantitative methodology is an appropriate fit for this observational, prospective, longitudinal, correlational, and explanatory design that proposes to explain phenomena and associations, test hypotheses, and explain, in measurable increments, the change in outcomes between time periods (Mujis, 2010). The process involved data collection using

instruments/ questionnaires and statistical analyses utilizing correlation and regression coefficients to test the recently designed HPI conceptual model and associations between variables. This research method was suitable for the post-positivist philosophical underpinnings of this research purpose and inquiry as it was intended not only to construct knowledge but also to increase the meaning and deepen the understanding regarding the process of HPI and its association with patient health behavior modification. Analyses included multiple IVs and several DVs, denoting the consideration of the complexity of associations influencing multiple outcomes, rather than just one, as the population and representative sample participants were likely to be affected in more than one way (Guba, 1990). This allowed for a more comprehensive inquiry, analyses and interpretation of findings (Stevens, 1992). Quantitative methods are commonly used in social science research focusing on findings related to specific health behavior outcomes, and used to explain and affect future social change, as future research was projected following this discovery (Mujis, 2010; A. B. Ryan, 2006). All these factors are consistent with post-positivist philosophy (A. B. Ryan, 2006; Mujis, 2010).

Population Sample

The population for this study was pregnant women identified as at high-risk for GDM. Sample inclusion criteria for participation were pregnant women, 18 years and older, who underwent diagnostic testing for GDM, either in early pregnancy as a result of meeting a criterion for higher risk, or as a result of routine mid-pregnancy screening, prior to receiving a diagnosis of or counseling for GDM from any type of HP during the current pregnancy. All races and ethnicities were included and encouraged for purposes of evaluating diverse patient characteristics as moderating variables. The sample included

both English and Spanish speakers, with sufficient literacy levels to comprehend and complete instruments.

Participants who meet these criteria and were diagnosed with GDM were included in the GDM group. Participants who were determined to be at high-risk in early pregnancy or had an initial elevated routine mid-pregnancy screening result but were subsequently not diagnosed with GDM following diagnostic testing made up the control group (non-GDMs) for Aim 5. Participants were excluded if they had a diagnosis of DM prior to pregnancy.

Setting and Selection of Sample Participants

Much consideration was given as to the optimal location for study implementation, including clinical setting and site, feasibility for quantity and diversity of participant recruitment, and timing related to data collection. The sample was obtained using a convenience sampling approach from various maternity prenatal clinic settings in a Midwestern US city. Seven clinic practice settings were utilized for recruitment of participants and data collection, including federally qualified health centers, large university hospital-based teaching clinics, and private practice clinics. There are a variety of healthcare providers (HPs) that provide maternity care for these patient participants, including advanced practice nurses, such as nurse practitioners (NPs) and Certified Nurse-Midwives (CNMs), and physicians, such as osteopathic/medical doctors (MDs), specializing in Family Practice or Obstetrics/Gynecology. The desire was to have as diverse as possible a sample in regard to maternity care provision based on HP specialty as one of the major foci of the research. A major consideration for this was that different

HP specialties may have or use different leadership skills, affecting HPI and its association with patient health behavior modification.

Sample size estimation

Accurate sample size estimates were needed to plan for adequate power to obtain statistically significant and meaningful results. Factors such as disease prevalence, lack of access, and feasibility issues may ultimately affect the sample size to be recruited for the study (Munro, 2001). The sample size estimate is affected by selection of the desired power, the effect size, the statistical significance level and the number of IVs tested. A power of 0.80 is generally accepted as sufficient and reasonable in behavioral science research (Cohen, 1987; Ferguson, 2009; Munro, 2001). A moderate effect size of 0.15 is generally desired for correlational research designs (Munro, 2001). The significance level (α) expressed as the probability (*p*) value ranges from 0.00 to 1.0; the generally accepted standard for statistical significance has been a *p*-value of 0.05. It is important to note that the statistical significance level is however not equal to the clinical or practical significance level especially regarding behavioral research (Thompson, 2002). In cases of preliminary research, therefore, when there is no specific recommendation for a desired *p*-value, the *p*-value should be based on the feasibility of obtaining an adequate sample size, which may be restricted when the prevalence rate of disease in the population is low, and on the consideration of error type and risk. In these cases, a larger *p*-value for significance may be chosen (Munro, 2001). Regarding this study, GDM occurs in approximately 9.2% of pregnancies in the US (DeSisto et al., 2014; Hartling et al., 2012), limiting the accessible patient population. Because the risk of Type 1 error holds less risk of harm to patients involved in social cognitive behavioral research than in medical

intervention research (Hulley, 2007) and because the sample is somewhat difficult to access, a *p*-value of .10 was selected for this exploratory, observational study. Nonetheless, increasing the error and risk margins of a Type 1 error can pose limitations by increasing the threats to validity. Measures to address limitations and threats including the selection of analyses were considered. For example, rather than large multivariate analytic model, multiple analyses were conducted to explore each hypothesized relationship separately with fewer variables to address the limitation of a smaller accessible sample that can limit power when large numbers of variables are entered (Munro, 2001).

A power analysis for this research project was conducted using Gpower statistical program (Faul, Erdfelder, Lang, & Buchner, 2007, 2009), for a desired power of 0.80, moderate effect size f^2 of 0.15, and a significance level, *p*-value of .10. A power analysis for each of the four hypotheses was conducted separately (Table 2). Hypothesis 1 had a total of two predictor variables (SIQ composite score, QOII total score) for a multiple linear regression analysis. Hypothesis 2 has two predictor variables (SIQ composite score, and QOII total score and three dichotomous moderating variables (race concordance, primary language concordance, and personal or family history of GDM/DM). The two predictor variables, one of the three moderating variables, and the interaction between the predictors and the moderating variable will be analyzed for each of the moderating variables separately with each of the eight dependent variables lending to a total of five tested variables, e.g. SIQ composite score, the QOII total score, race concordance, the SIQ composite score X race concordance, and finally, the QOII total score X race concordance. Primary language concordance and personal or family history

of GDM/DM will be analyzed in the same manner described above for this multiple linear regression analysis. Hypothesis 3 had two predictor variables (SIQ composite score, and QOII total score and three dichotomous moderating variables (gender concordance, HP specialty, and HP leadership style). The two predictor variables, one of the three moderating variables, and the interaction between the predictors and the moderating variable will be analyzed for each of the moderating variables separately with each of the eight dependent variables lending to a total of five tested variables, e.g. SIQ composite score, the QOII score, gender concordance, the SIQ score X gender concordance, and finally, the QOII score X gender concordance. HP specialty, and HP leadership style (MLQ) were analyzed in the same manner as described above for this multiple linear regression analysis. Hypothesis 4 contains two predictor variables (SIQ composite score and QOII total score), which will be combined separately and together with one mediating variable (DSES) for a total of three tested variables for this multiple linear regression analyses. The power analysis was based on the selected method of analyses that contained the largest number of tested variables, equaling five.

Based on the results of the power analyses with predetermined power, effect, and significance level and the largest number of tested predictor and total tested variables; a sample size of 75 participants was estimated to be adequate for the study group: GDMs Phase 2 completers and data analyses. Recruitment continued until fulfilling the predetermined sample size, using face-to face data collection and verification of data completeness for the Phase 2 data collection and initial analysis has been accomplished. This resolved any concerns or threat of insufficient sample size that could have resulted from participant discontinued involvement due to preterm delivery or other reason for

withdrawal prior to or during Phase 2, incomplete data collection, and elimination of outliers.

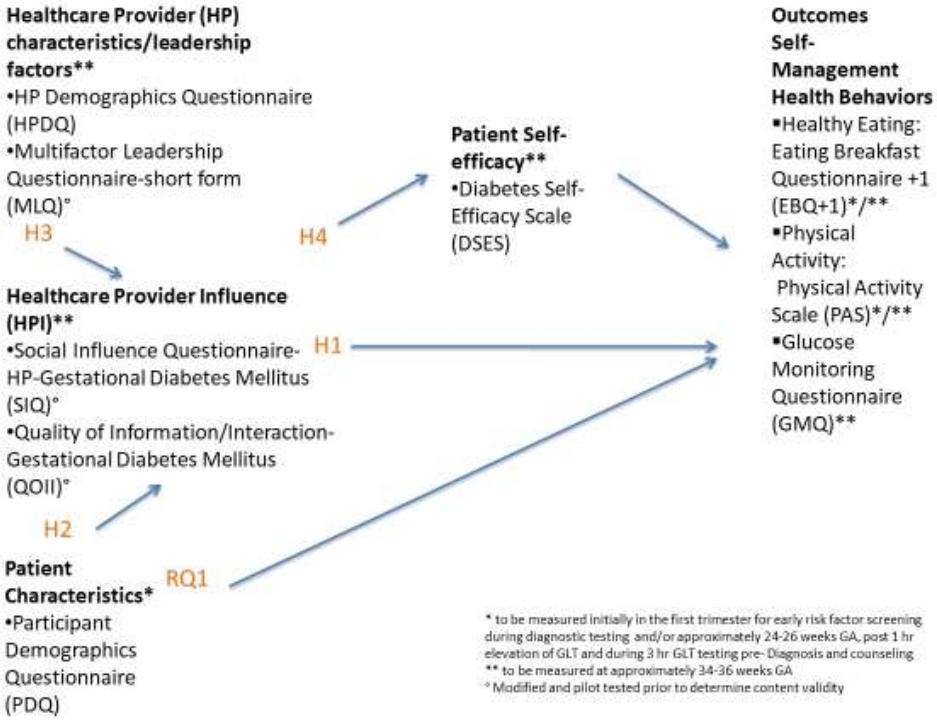

Figure 2. Research Hypotheses and Measures

Measures

A total of nine instruments and questionnaires (Appendix D) were selected or developed to empirically measure research concepts and for data collection (Table 1). Figure 2 depicts the hypothesized relationships between study variables and measures. Measures include: the Multifactor Leadership Questionnaire-5X-Short Form (MLQ); the Social Influence Questionnaire-HP-GDM (SIQ), Quality of Information/Interaction-Gestational Diabetes Mellitus (QOII); Diabetes Self-efficacy Scale (DSES); the Eating

Breakfast Questionnaire (EBQ) +1, the Physical Activity Scale (PAS), the Glucose Monitoring Questionnaire (GMQ), the Participant Demographic Questionnaire (PDQ), and finally, the HP Demographic Questionnaire (HPDQ). The PDQ and the HPDQ were developed for this study to collect pertinent patient and HP demographics and descriptors. Modifications were made to the MLQ, the SIQ, QOII, the DSES and the GMQ to address content specific to patients, HPs and GDM, which will be described individually in detail below.

All the instruments are currently available in both English and Spanish language following translation for this study or previously translated and used in Spanish speaking populations for other research purposes. Those previously translated include the MLQ, the PAS, the EBQ, and the DSES. Translations for the other five instruments were conducted by certified medical interpreters and underwent both forward and back translations methods prior to testing for validity and for use in the pilot and main study.

Table 1: Instrument Matrix

Instrument (reference)	**Reliability and Validity**	**Scoring / Level of Measurement**
Multifactor Leadership Questionnaire-5X (short form) (MLQ) (Antonakis et al., 2003; Avolio & Bass, 2004; Bass & Avolio, 1997; Bass & Riggio, 2006)	Original MLQ: Test-retest (n=193).52-.82 MLQ-5X: $\alpha > 0.80$ for all scales External validity: Tested and used in research across large samples internationally over > 15 years, with many cultures, populations, languages ($N >$ 15,000) Construct validity- Factor analyses supports full nine-factor structure FRL CFA goodness of fit= .93 Predictive validity- meta-analyses: multiple- support TFL model Multiple meta-analyses with strong positive correlations with objective and subjective measures of performance.	45 items Rated on 0-4 Likert scale Initial analysis: 1 final leadership style score: 3 categories, 2 variables **Categorical**

	Modified for patient GDM population	
Quality of Information-Interaction-GDM (QOII) (Weiss et al., 2008; Weiss & Lokken, 2009; Weiss et al., 2007)	Original QDTS tested in multiple populations including medical surgical (MS) (*N*=147) postpartum (PP) parents of hospital children (PHC) (*N*=135) Reliability coefficient: α > .80 for all scales and subscales Total content (content received + delivery) scale: α = .87 (PP), .89 -.90 (combined samples); .92 (MS).88 (PHC) Validity established with large study sample EFA: 2 factor structure (content and delivery) account for 54. 2% of scale variance Modified for GDM population	17 items: 6 paired (content received and needed) and 11 for delivery Rated on 0-10 Likert scale 1 total score (content + delivery) **Interval**
Social Influence Questionnaire-GDM (SIQ) (Champion, 1994; Ohlendorf, 2014)	Original (social influence scale): tested in middle aged women (n=301); α =.83 Goodness of Fit chi-square *p*<=.78 Model chi-square *p*≤.01 Modified instrument used in postpartum mothers (n=124): α =.84 Content validity testing Modified for GDM population	3 items Item 1: categorical Items 2 and 3 rated on 1-5 Likert scale Analysis:1 final score: total HP social influence score **Categorical/ Interval**
Diabetes Self-Efficacy Scale (DSES) (Lorig & González, 2000 ; Lorig et al., 2003 ; Lorig et al., 2005 ; Lorig et al., 2009)	Internal consistency, α =.83 (English) (N=109, 186)-.85 (Spanish) (*N* =147) DMs Test-retest validity, r = .80 (*n*=20 Spanish) Face and content validity with multiple focus groups (DMs, Diabetic Educators/nutritionists) Reported item convergent and discriminant validity testing but not described Forward/back translation for the Spanish measures	8 items Range of 1-10 Likert scale Analysis: 1 total mean score, 8 items **Interval**
Eating Breakfast Questionnaire + Portion of vegetables (EBQ+1) (Lorig & González, 2000; Lorig et al., 2005)	EBQ: Used with English (n=123) and Spanish (*N*= 315; 317; 109) DMs Portion of vegetables (*N*=109) Single items internal consistency and test-retest were not reported/not applicable Face and content validity with multiple focus groups (DMs, DEs) Forward/back translation for the Spanish measures	3 items Analysis: 3 scores Item 1: range 0-7 Item 2: 0 (no) -1 or more (yes) item 3: 0-no upper limit **Interval**

Physical Activity Scale (PAS) (González, Stewart, Ritter, & Lorig, 1995; Lorig et al., 2003; Lorig et al., 2005; Lorig et al., 1996; Ohlendorf, 2014)	Used with chronic disease, including DM, English and Spanish speaking, and postpartum women (PP) (*N*=124) Tested in English (*N* =1127-1130) Spanish (*N* =270) - retested in English (*n*=51) and Spanish (*n*=25) for strengthening/stretching, *r* =.56 (English) -.91 (Spanish) and aerobic exercise, *r* =. 72 (English) -.89 (Spanish) Face Validity: items address components of physical activity/exercise Construct validity testing: test-retest .86; correlation of .29 was found between Item 1 and Items 2-6. Translation/back translation for the Spanish measures	6 items Analysis: 2 scores Item 1: range 0-180 Item 2-6: range 0-900 **Interval**
GMQ (Lorig & González, 2000 ; Lorig et al., 2003 Lorig et al., 2005 ; Lorig et al., 2009)	Item 1: English (*N*=62) and Spanish (*N*=109; 142-speaking DMs Psychometric testing reports single-items internal consistency reliability; test-retest reliability not reported/ not applicable Face and content validity with multiple focus groups (DMs and Des) Forward/back translation for the Spanish measures	4 items Analysis: 3 scores +1 Items 1-2: Range 0-7 Item 3: Range 0-28 Item 4: open-ended **Interval/Narrative**

Instruments Description

Multifactor Leadership Questionnaire-5X

The Multifactor Leadership Questionnaire-Short form-5X (MLQ) was used to measure the patient's perception of the leadership characteristics or qualities of their HP that could affect self-efficacy and patient engagement in health behavior modifications. The MLQ was selected as the measure for Transformational Leadership (TFL) due to its strong foundational basis within TFL theory, consistent with one of the central tenets of the HPI conceptual model.

The MLQ was developed to measure the concept of TFL (Bass, 1985; Bass, 1998). TFL "is the process in which leaders change their associate's awareness of what is important and move them to see themselves and the opportunities and challenges of the environment in a new way" (Avolio & Bass, 1995). TFL characterizes leadership wherein a leader responds to the follower's needs, aligns goals and objectives, and though empowerment stimulates, inspires and moves followers to meet and exceed performance expectations as well as to strive for higher levels of potential (Bass & Riggio, 2006). The original MLQ, a 73-item instrument measuring five factors was constructed by Bass following a series of interviews with over 70 senior professional and business executives. The MLQ has undergone many revisions over the past several decades and has been modified following multiple content and factor analyses. It has been tested in many settings and with many international populations, numbering well over 15,000 subjects in different countries as well as has been translated into several languages (Antonakis et al., 2003; Bass & Riggio, 2006). The MLQ has been used in multiple industries including education, military, healthcare, and politics and "the most widely accepted instrument to measure to TFL" (Bass & Riggio, 2006). The most current revision is a reduced version named the MLQ-5X (Avolio & Bass, 1995) which will be used for this research. There are two forms of the MLQ, the Leader and Rater Forms. For the purposes of this research, the Rater form will be utilized and described.

The MLQ is a 45-item questionnaire, written at a 9th grade level, although used previously in less educated populations, and takes approximately 15 minutes to complete (Bass & Riggio, 2006). The Rater Form is most commonly used in research to measure a follower's perception of a leader's behaviors in nine leadership domains representing the

nine factors in the Full Range of Leadership (FRL) model (Bass & Avolio, 1994). The FRL model includes characteristics of TFL as well as transactional leadership (TAL) and laissez-faire non-leadership (LFNL). TFL is represented and measured by five factors: idealized influence/charisma, which divides into two subcategories idealized attributes and idealized behaviors; inspirational motivation; intellectual stimulation; and individualized consideration. Transactional leadership characterizes leadership through social exchange wherein the leader rewards or disciplines based on performance (Bass & Riggio, 2006). The two factors that represent transactional leadership are contingent reward and management-by-exception-active. Laissez-faire leadership or non-leadership is "the avoidance or absence of leadership" (Bass & Riggio, 2006). The two factors that represent laissez-faire are passive/avoidant behavior and management-by-exception-passive. The nine factors are each represented by four items, amounting to 36 items. Incorporated into the MLQ are three leadership outcomes: extra effort; effectiveness; and satisfaction, represented by nine items amounting to a total of 45 items (Bass & Riggio, 2006). These outcomes have been found to positively correlate to the five TFL factors and contingent reward (Bass & Riggio, 2006). Outcome item data will be collected but not used for hypotheses testing in this study. The items are scored on a 5-point Likert scale ranging from "not at all" to "frequently, if not always". Each of the nine factor subscale scores are computed as the mean score of the four item scales. If an item is left blank, the mean score is calculated from the answered items. Three leadership composite scores are computed as the sum the related factor subscales pertaining to each leadership type, divided by the number of factors. The highest of the composite scores, an interval level score, is used to categorize the type of leadership as transformational, transactional,

or laissez-faire. The three levels of leadership were examined using two variables or vectors. Transformational and transactional categories were coded as dichotomous variables as the third type, laissez-faire was not determined to be sufficient to analyze (n=1) in the regression analysis.

The MLQ has been widely used in research over a 15-year period and earlier versions expand over 25 years. Reliability and validity testing were conducted in earlier versions of the MLQ as well as the MLQ-5X. The test-retest reliability of the earliest version of the MLQ Rater Form (*N*=193 ranged from .52-.82 after six months), as reported in the unpublished work of Pile (Bass & Riggio, 2006). The MLQ-5X has demonstrated high reliability and validity across large samples (Avolio & Bass, 1995). Good to excellent internal consistency with α coefficients > 0.80 resulted for all nine MLQ-5X factor scales and leadership composite scores (Avolio & Bass, 2004; Bass & Avolio, 1997; Bass & Riggio, 2006). The MLQ-5X has undergone numerous validity testing including convergent and divergent validity testing and construct validity, determined with multi-dimensional confirmatory factor analyses (CFA) of the FRL theory and found to support the full nine-factor structure of the MLQ-5X (Antonakis et al., 2003; Bass & Avolio, 1997). CFA goodness of fit = .93 (Avolio & Bass, 2004; Bass & Riggio, 2006). The average variance extracted from each factor was > .50 and factor loadings were found to be satisfactory (Avolio, Bass, & Jung, 1995).

Predictive validity was determined by multiple meta-analyses using leadership type composite scores and found to have strong positive correlations with objective and subjective measures of performance to support the TFL model (Bass & Riggio, 2006). Substantial evidence has been reported that TFL is positively correlated with measures of

leadership effectiveness (Bass & Riggio, 2006). A meta-analysis including 20 studies separated TFL and transactional leadership into two composites and found that with corrected means TFL was correlated at *r*=.76, .71, and .88 with effectiveness, satisfaction and extra effort while transactional leadership correlated at *r*= .27, .22, and .32 with the same three outcomes, respectively in followers (Gasper, 1992). Permission was obtained for the use, modification and reproduction of the MLQ-5x following purchase of license (Appendix D). The MLQ-5X was minimally altered, not for domain or content, but for eight minor stem changes to pertain to patient's perceptions of HPs rather than use by colleagues or subordinates. The results of content validity testing indicated a content validity index (CVI) of .67 with 30 of the 45 items deemed relevant. Eight of the 15 items determined to be non-relevant items were related to laissez-faire/non-leadership, two related to transactional leadership and five to transformational leadership. However, as this instrument is intended to assess a continuum of leadership and non-leadership characteristics, all items will be retained for use in this research proposal.

Social Influence Questionnaire-GDM (SIQ)

The Social Influence Questionnaire-GDM (SIQ) was selected to measure social influence of healthcare providers (HPs) from the GDM patient participant perspective. This measure addresses the concept of social influence from professionals, in this case HPs. The SIQ is a modified version of the Social Influence Questionnaire (Ohlendorf, 2014) which in turn was adapted from an original social influence scale designed to increase mammography utilization (Champion, 1994).

The social influence measure developed by Champion (1994) is a two part 20-item scale determined to have a Fleisch-Kincaid reading level of 12th grade (Champion,

1994). Six social contacts of the participants which shall be called social influencers were specified, two of whom are physicians and nurses. The first part of the scale measures the participant's perceived beliefs of each social influencer about mammography. The second part of the scale measures the participant's perception of the influence that each social influencer has on the participant's behavior (Champion, 1994). One social influence scale score was calculated by summing the computed scored for the two factors of beliefs and influence multiplied for each social influencer. A higher social influence score indicated greater social influence on the patient's health behavior modification. Internal consistency reliability for the total social influence score was a Cronbach's α of 0.83 (Champion, 1994). Validity was tested through factor analysis with other covariates wherein social influence was positively correlated to mammogram screening (p=.07) with a Goodness of Fit chi-square, $p \leq .78$, model chi-square, $p \leq .01$ (Champion, 1994).

A recent modification and utilization of this social influence scale, called the Social Influence Questionnaire (SIQ), was adapted to assess social influence regarding weight loss in postpartum women (Ohlendorf, 2014). The SIQ included eight social influencers and five beliefs statements. Two of the social influencers are physicians/nurse-midwives and hospital nurses. Testing of the SIQ resulted in a Cronbach's α of 0.84 (Ohlendorf, 2014). Content validity of the SIQ was conducted with content analysis experts prior to use (Ohlendorf, 2014). Permission was received for modification and use of the SIQ.

The SIQ is a 3-item version, newly modified for use in this study that focuses only on healthcare providers (HPs) as sources of social influence and GDM-related health beliefs. In contrast to the original social influence scale (Champion, 1994) and the SIQ

(Ohlendorf, 2014), which include a variety of different social influencers including family, friends or partners, in addition to HPs, the SIQ only includes different HPs. It has been shortened in this publication to SIQ. The HPs that are included are three categories that care for women diagnosed with GDM, nurses, nurse-midwives/physicians/nurse practitioners, and Diabetic nurse-educators/Registered Dietitians. The first item asked which HPs counseled the patient regarding GDM. The first item is categorical level measurement that will be used for descriptive purposes only. The second and third items inquired about the participant's perception of the strength of the influence that each of the three-social influencer-HP categories have on the patient's health management behavior and the participant's perception of the strength of nine beliefs that the social influencer-HP has that the patient can make health behavior modifications. Response options and interval level scoring for these items are the same used in the SIQ. Response options for the influence factor are on a 5-point Likert scale and ranges from "strongly influences" to "no influence". Response options for the beliefs factor are on a 5-point Likert scale and a range from "strongly agrees" to "strongly disagrees". Individual social influencer scores are computed by multiplying their social influence score by their belief in patient behavior score. Scores for each individual social influencer range from 0-225. Based on feedback and to prevent confusion, the research analyses did not proceed with analyses involving nurses as their role was too general to assess for professional influence in this context. A total social influence score, the sum of all the individual social influencer's score, range from 0-675. This latter score was the one that used for hypothesis testing. Content validity was conducted with content experts in a pilot study prior to use in the main study. The CVI of the entire instrument was .90 with 28 of the 31 items deemed

valid. Due to the overall validity of the instrument, although the three items not found to be sufficiently relevant they were nonetheless retained as they reflected one belief pertaining to three different HP specialties.

Quality of Information-Interaction-GDM Scale (QOII)

The Quality of Information-Interaction-Gestational Diabetes Mellitus (QOII) was selected and modified to measure the HPI components of GDM-relevant information provision, as well as, the interaction and delivery process by pertinent HPs. The QOII is adapted from the Quality of Discharge Teaching Scale (QDTS)-New Mother form, which is a modification of the original Quality of Discharge Teaching Scale (QDTS) (Weiss & Lokken, 2009; Weiss et al., 2007). The QDTS was developed and tested in several studies to measure the patient's perception of the quality of discharge teaching in adult medical-surgical patients (*N*=147), parents of hospitalized children (*N* =135) and postpartum mothers (*N* =141) (Weiss et al., 2008; Weiss & Lokken, 2009; Weiss et al., 2007). The QTDS-New Mother form for postpartum mothers is a 19-item scale measuring the quality of hospital discharge teaching for postpartum mothers. There are seven paired "content received and needed" items and 12 "delivery of information" items (Weiss & Lokken, 2009). Permission was obtained from the author for the use and modification of the QTDS-New Mother to adapt it for the purposes this study, the counseling and delivery of GDM related information to pregnant women diagnosed with GDM, thus named QOII-GDM and shortened to QOII for future description herein. Although not pertinent to hospital discharge teaching, it is intended to measure content and delivery of information for a new diagnosis requiring modification of health behaviors for optimal self-management in the home environment.

The QOII- is a 17-item scale modified to include six "content received" items and 11 "delivery of information-interaction" items. The "content received" domains are related to the patients' perceptions of the amount of informational "content received" regarding GDM-related treatment and recommendations for self-management health behavior modifications of healthy drinking and eating, PA, and glucose monitoring, practice with glucose monitoring, and who and when to call with problems. These items are subdivided into content received from two categories of HPs, usually responsible for providing this education: a) nurse-midwife/doctor/nurse practitioner and b) diabetic nurse-educator/Registered Dietitian. The delivery domains correspond to the interaction and approach used by HPs for information delivery and include listening, answering specific concerns, showing sensitivity to personal values and beliefs, teaching in understandable manner with consistent information and at times that were good for the patient and family, evaluating patient understanding, promoting confidence in ability to care for self, and decreasing anxiety. One domain eliminated in the QOII-GDM version from the original QTDS is "knowing what to do in an emergency," as GDM is not a condition that generally requires hospitalization. The items are scored on an 11-point Likert scale, ranging from 0-10, indicating "none" or "not at all" to "always" or "a great deal". The interval level score that will be used for analyses is the total score, equal to the sum of two subscales scores, "content received" score, the sum of the "content received" items, and delivery score, the sum of the delivery items (Weiss et al., 2007). Higher total scores indicate a greater amount of information received ("content received" subscale) and the increased quality of the information-interaction (delivery subscale). Following secondary analyses including the two "content received" and "delivery"

subscale scores, based on previous research and per the recommendation of the author, that the outcome variables can perform differently when the two separate subscale scores are used instead of the total score (Weiss et al., 2008; Weiss & Lokken, 2009; Weiss, et al., 2007), the decision was to retain the total score instead as the sub-scores did not contribute to the analyses, presented multicollinearity concerns and added an additional tested predictor variable which would normally require a larger sample size.

Reliability testing for total and all subscales of the QDTS resulted in a Cronbach's $\alpha > .80$. Total content scale $\alpha = .87\text{-}.92$ for postpartum mothers, parents of hospitalized children and adult medical-surgical patients (Weiss et al., 2008; Weiss & Lokken, 2009; Weiss et al., 2007). Validity has been established with an exploratory factor analysis found to support a 2-factor structure (content and delivery), which explained 54.2% of scale variance (Weiss et al., 2007). Content validity was conducted with content experts in a pilot study prior to use in the main study. Results for the QOII found the instrument to be valid at .95 with 35 of the 37 items relevant at .83-1.00. Two items that were not sufficiently relevant related to contacting HP following diagnosis or counseling if needed. These were retained as they involved two different HP specialties had the potential to provide insight on expectations for content/delivery of information for different HP specialties.

Diabetes Self-Efficacy Scale (DSES)

The Diabetes Self-Efficacy (DSE) scale (DSES) measures confidence levels in beliefs related to DM and self-management health behaviors, including glucose monitoring, healthy eating, and PA (Lorig et al., 2003; Lorig et al., 2009). The DSES was developed for use in self-management research with DM patients (Lorig & González,

2000; Lorig et al., 2003; Lorig et al., 2009), thus content is appropriate and specific for a population with GDM. In addition to this, the DSES is a succinct instrument available in English and Spanish making it a practical choice for this research. It is an eight-item instrument available in Spanish and English that uses a 10-point Likert scale (1-10) format indicating "not at all confident" to "totally confident". The score is reported as the mean of the eight item scores with a range of 0-10. The scale was modified for the study by adding the word "gestational" prior to diabetes in two items. Focus groups including patients and their family members, educators and HPs were involved in the design of the DSES and the instrument has undergone standard psychometric testing for internal consistency, test-retest reliability if indicated, item convergent and discriminate validity as well as translation/back translation for the Spanish measures (Lorig & González, 2000; Lorig et al., 2005). These results are reported below if provided. The DSES was tested with samples of both English (*N*=186) and Spanish (*N*=189) speaking DMs resulting in findings of strong reliability with internal consistency, $\alpha = .83$ (English) and $\alpha = .85$ (Spanish) and test-retest validity, .80 (Lorig et al., 2003; Lorig et al., 2009). A pre-test/6 week/3-month post-test study of a community-based, peer-led diabetes self-management program resulted in increased self-efficacy for managing diabetes measured by the DSES at 6 weeks and 3 months increasing the mean (*SD*) 1.6 (2.6) at 3 months over the baseline of 6 (2.2) ($p<0.0001$) in a Spanish-speaking DM sample (*N*=109) (Lorig & González, 2000). A chronic disease self-management program was evaluated with a longitudinal research design in Spanish (*N*=322) and English (*N*=123) speaking DMs. Increases occurred in self-efficacy, measured by the DSES, from baseline to 4 months/1year in Spanish-speakers ($p <.0001$) and at 4 months in English-speakers ($p=.017$) (Lorig et al.,

2005). Baseline and change in baseline to 4 months self-efficacy was significantly associated with improvement in eating breakfast, and aerobic exercise (p <.001 (Lorig et al., 2005) measured with the PAS and items in the EBQ+1.

Eating Breakfast Questionnaire (SEBQ) +1

The Eating Breakfast Questionnaire (EBQ) +1 was selected to measure the healthy behavior of healthy eating/diet. The EBQ+1 includes three items that were developed and tested, as was the DSES, for self-management health behavior modification research interventions in DMs (Lorig & González, 2000). Two items relate to breakfast and a third item to vegetable portion intake, thus naming it the EBQ+1. The EBQ+1 assesses the frequency of eating breakfast weekly, the type and number of protein foods including the option of adding any not included on the list consumed for breakfast that morning, and the number of portions of vegetables consumed daily. Three interval level scores result. The response range for the first item is 0-7 while the second and third items are open-ended values. This measure will be used in at two different times, Phase 1 and 2 and compared for differences.

The search for a healthy eating measure was quite arduous due to the exhaustive list available, however many were found to be irrelevant, not disease specific or having limitations for research purposes. Counseling related to DM/GDM involves carbohydrate reduction and replacement with or increasing protein intake. A strong emphasis is placed on the intake of adequate, but not excessive carbohydrates, low glycemic versus high glycemic index carbohydrates, and those containing high versus low fiber. The learning curve regarding these characteristics of carbohydrates is difficult for most patients to achieve within a limited number of counseling sessions, thus obtaining accurate and

reliable data in asking about these dietary patterns would be cumbersome. Research has found that healthy eating behaviors conducive for DM/GDM include eating breakfast following the self-evaluation of fasting blood sugar, eating frequent meals starting with breakfast, increasing overall protein intake which increases insulin sensitivity, and increasing fiber intake by way of increased vegetable intake (Mekary, Giovannucci, Willett, van Dam, & Hu, 2012). Eating breakfast has also been found to decrease the risk of DM by 30% (Mekary et al., 2012). Insulin resistance is greatest in the morning for most women with GDM and therefore fewer carbohydrates should be eaten in the morning (Gutierrez & Reader, 2005). There are associations between excessive dietary fat intake and increased insulin resistance and elevated risk of GDM and DM (Hernandez, Anderson, Charter-Logan, Friedman, & Barbour, 2013).

Several factors contributed to the selection of the EBQ+1. GDM/DM related counseling and research evidence supports the relevance of the three items. The measure is easy to use and score, thus increasing accuracy in completion and analysis, and is brief, thus decreasing participant burden. Additionally, it addresses HP recommended GDM treatment/prevention strategies of nutritional counseling and health behaviors involving the timing and type of food intake, thus supporting the positive rather than the negative aspects of dietary carbohydrate and high fat restriction. Multiple focus groups with content experts, specifically diabetic nurse-educators, nutritionists, and persons with DM, met to discuss necessary content for inclusion in DM self-management health behavior modification peer education intervention studies and participated in the development of the EBQ+1 item (Lorig & González, 2000). As the healthy eating recommendations are the same for GDM as for DM, this is an appropriate measure. This measure has been used

in research, along with the DSES, with English and Spanish speakers (Lorig & González, 2000; Lorig et al., 2005).

Development and content validity testing of the items included in the EBQ+1 was conducted with multiple focus groups and content experts, Diabetic Educators, nutritionists, and persons with DM and their family members (Lorig & González, 2000). Translation, back translation, and translator consensus agreement for the Spanish measures was undertaken (Lorig et al., 2005). Standard psychometric testing of the items in the EBQ+1 for reliability and validity was reported as having been undertaken with internal consistency and test-retest reliability and item convergent and discriminant validity in English (*N*=123) and Spanish- (*N*=315/317; 109) speakers but limited description was provided (Lorig & González, 2000; Lorig et al., 2005). Repeated measures testing in a pre-test/6 week/3-month post-test study of a community-based, peer-led diabetes self-management program in a Spanish-speaking DM sample (*N*=109) measured by the items included in the EBQ+1 found improvement at 6 weeks in eating breakfast, eating protein at breakfast, and number of portions of vegetables eaten daily ($p<.05$) (Lorig & González, 2000). In the same study at 3 months, improvement in eating breakfast, the mean (SD) increased .24 (2.4) over the 5.9 (2.1) baseline ($p = .31$), eating protein at breakfast increased 12% over baseline 79% ($p \leq .01$), and number of portions of vegetables eaten daily increased .31 (1.3) over 1.3 (1.0) ($p \leq .01$) (Lorig & González, 2000). Validity testing of self-efficacy and the EBQ items was conducted in a longitudinal study of a chronic disease self-management program with repeated measures at pre-test, 4-months and 1 year in Spanish (*N*=322) and English (*N*=123) speaking DMs. Increases in eating breakfast, measured by the EBQ were found at 4 months/1 year in

Spanish-speakers (p<.001) and 4 months in English speakers (p=.006) (Lorig et al., 2005).

Physical Activity Scale (PAS)

The Physical Activity Scale (PAS) was selected to measure the health behavior of physical activity (PA). This measure will be used at two different times, Phase 1 and Phase 2, and compared for within GDM group and between control and GDM group differences. As with the previous outcome measure, a number of other instruments and applications used to measure exercise and PA were evaluated for use in this study; however the major impetus for selecting this measure was due to its development for and use in prior research focused on health behavior self-management modification in chronic illness including DMs (González et al., 1995; Lorig & González, 2000; Lorig et al., 2003; Lorig et al., 2005; Lorig et al., 1996) and in research involving postpartum women (N =124) (Ohlendorf, 2014). An additional benefit of the PAS is that it has been tested and re-tested in Spanish and English-speaking populations and is thus available in Spanish language. It is a six-item instrument addressing the total minutes of stretching/strengthening (Item 1) and aerobic exercise (Items 2-6) weekly, resulting in two scores. Each item receives a self-reported 5 point ordinal level scale response. These five options range from "none" to "greater than three hours per week". Each option assigns a value from 0 to 180 representing "minutes spent". One score is derived from item 1 with a possible range of 0-180. The second score is the sum of items 2-6, with a possible range of 0-900. The authors described this selection of an ordinal to interval conversion approach to prevent data skewing on both ends of reporting, to correspond to meaningful category reporting, to achieve equivalent proportions of individuals in the

non-zero categories, to lead to scoring rules, and for correlation analyses (Lorig et al., 1996).

Focus groups led to the development of the measure items prior to reliability and validity testing. Test-retest reliability estimates have been reported as r = .56 for item 1 and .72 for items 2-6 in studies of English-speakers (test, N =1127, 1130; retest, n=51) (Lorig et al., 1996), and r =.91 for item 1 and .89 for items 2-6 in Spanish-speakers (test, N =270; retest, n=25) (González et al., 1995). Construct validity and item-convergent and discriminant validity testing was conducted (Lorig et al., 1996). A correlation, r = .29 was found between Item 1 and Items 2-6, thus considered independent of one another. Internal consistency was found to be .83; test-retest .86 and range of item-scale correlations .68-.71. Item-convergent and discriminant validity testing were conducted as part of the multi-trait scaling analyses to evaluate the correlation of self-efficacy to perform self-management exercise to PAS. Correlations between self-efficacy exercise scale and PAS Item 1 was .26 and Items 2-6, .37 indicating greater convergence with aerobic exercise than with stretching/strengthening (Lorig et al., 1996).

Several longitudinal studies evaluating community-based, peer-led DM self-management program with repeated measures were conducted (Lorig & González, 2000; Lorig et al., 2003; Lorig et al., 2005). Based on pre-test/6-week/3-month post-test, improvement in exercise (p <0.05) at 6 weeks and at 3 months with an increase in mean (SD) of 50 (121) minutes/week over a baseline of 88 (103), $p \leq .0001$) was found in a Spanish-speaking DM sample (n=109) (Lorig & González, 2000). In a randomized control study, Spanish-speaking participants (N=327) involved in a 6-week program demonstrated improvements in exercise, measured by the PAS, and self-efficacy at 4

months (n=224) and 1 year (n=271) ($p \leq .0001$) (Lorig et al., 2003). Interventions resulted in improvements in aerobic exercise, measured by the PAS at 4 months/ 1 year ($p<.001/p<.001$) in Spanish (n=322) and 4 months ($p=.005$) in English (n=123) speaking DMs (Lorig et al., 2005).

Glucose Monitoring Questionnaire (GMQ)

The Glucose Monitoring Questionnaire (GMQ) is a 4-item measure developed for this research. The Glucose Testing Questionnaire (GTQ), a 2-item questionnaire provided the basis for the development of the GMQ as well as one of its four items. The GTQ was developed for and used in self-management health behaviors modification and self-efficacy research with DMs (Lorig & González, 2000; Lorig et al., 2003; Lorig et al., 2005; Lorig et al., 2009). Other glucose monitoring measures including daily logs have been utilized with DM/GDM, but these are not practical and feasible for outcome measurement. Item 1 of the GTQ was not included in the GMQ because it was inquired as to the availability of monitoring equipment which is generally provided to GDMs at the first counselling session for the short-term duration of the pregnancy, whereas those with long-term DM have life-long requirements for access to equipment and supplies. Item 2 of the GTQ is the first item of the GMQ, as it is pertinent to GDM and assesses the frequency of glucose monitoring behaviors weekly. The following items (Items 2 and 3) of the GMQ relate to GDM counseling recommendations and use the format of the GTQ to inquire as to: Item 2) the frequency of glucose monitoring behaviors four times daily and Item 3) a weekly recall regarding number of abnormal glucose results above the recommendations. Items 1, 2, and 3 of the GMQ are interval level scores that range from 0 to 7, for the first two items and 0-28, for Item 3. Item 4 inquires as to the patient's

perception of causes of glucose elevations if occurred and results in an open-ended response that may be used for narrative purposes only. This item is intended to prompt participant's thinking regarding elevations for their own self-awareness.

A general statement about reliability and validity testing using standard psychometric studies was reported for all measures. Testing relevant to Item 1 of the GMQ, adopted from the GTQ was conducted with English-speaking (*N*=62), mean (*SD*) of 4.85 (2.57) and Spanish-speaking (*N*=142), mean (*SD*) 4.23 (2.73) participants (Lorig et al., 2003; Lorig et al., 2005). A pre-test/6-week/3-month post-test study of a community-based, peer-led diabetes self-management program in Spanish-speaking (*N*=109) found improvement in frequency of glucose monitoring at 6 weeks ($p < 0.05$) and an increase in mean (*SD*) days of monitoring of .67 (2.34) over baseline 4.4 (2.7) ($p \leq .05$) (Lorig & González, 2000).

The DSES and the PAS, as well as items included in the EBQ +1 and the GMQ are all instruments that has been used in chronic illnesses self-management health behavior modification and self-efficacy research. These have been described in the theory development of the Integrated Theory of Health Behavior Change (ITHBC) and the Individual and Family Self-management Theory (IFSMT) (P. Ryan, 2009; P. Ryan & Sawin, 2009).

Participant Demographic Questionnaire (PDQ) and the HP Demographic Questionnaire (HPDQ)

The participant demographic questionnaire (PDQ) and the HP demographic questionnaire (HPDQ) collected patient and their maternity HP characteristics, to evaluate the effect of concordance factors, consistent within the HPI conceptual model.

These two questionnaires were completed, primarily by the patient participant, and finalized by the researcher or assistants.

The PDQ is an 11-item instrument that includes three categorical study variables used for analysis: race/ethnicity, previous or family history of GDM/DM, and primary language. Race/ethnicity and primary language were selected as they have been found to correlate with health behavior modification in previous studies (Anderson, 1999; Street, 2003; Verlinde, De Laender, De Maesschalck, Deveugele, & Willems, 2012). The additional categorical and interval level items were used for descriptive purposes only. These include the language that the teaching was conducted in, inquiry into whether the patient's HP is one they preferred for care, age, completed years of education, years in the United States, parity, pre-pregnancy and Phase 2 body mass index (BMI), and number of HP clinic visits since screening and/or diagnosis.

The HPDQ, a 9-item questionnaire includes three categorical level items that used for correlational analyses and six items that will be used for descriptive purposes. Race/ethnicity, gender, and professional specialty were three variables selected for analyses. These have been studied previously in health behavior correlational research (Anderson, 1999; Street, 2003) as well as have been found to mediate and moderate the effects of TFL (Bass & Riggio, 2006). The remaining items include the name of clinic and the HP, the language used in conversation/counseling with the patient participant, including the use of interpreter services for the interaction, years in practice, and age.

Pilot Study

A pilot study was conducted following the approval of Marquette University's Institutional Review Board (IRB) to establish and ensure the content validity of the three

instruments modified for use in the study: the MLQ-5X; the SIQ-HP-GDM; and the QOII-GDM, in both English and Spanish languages, prior to use in the research project. As mentioned previously, the MLQ was modified for use with patients to elicit their perception of their HP's leadership characteristics. The SIQ was modified to eliminate all categories of influencers except HPs and to increase the number of subcategories to include relevant HP types as well as adapting the perceived beliefs to relate to GDM. The QOII was modified to include item language relevant to GDM counseling and HP types.

Content validity refers to the extent to which an instrument measures what it was developed to measure (Lynn, 1986). Content validity for the modified instruments was used to assess the relevance and adequacy of the content area sampled (Lynn, 1986), ensure appropriateness of use, feasibility, and language proficiency. A pilot study sample of five content experts was determined appropriate for establishing content validity (Lynn, 1986). A convenience sample of six patient participants were recruited as content experts from the primary researcher's clinical setting. Inclusion criteria were English and/or Spanish speaking and literate, and a current or recent diagnosis of GDM within the past 12 months. Recruitment of Spanish speakers in addition to English was intended to gain insight and establish validity from and for use in populations more vulnerable to GDM, such as Latina populations. Participants were approached following a prenatal or postpartum clinic appointment. They were informed of the purpose of the pilot study and assured that participation was voluntary. If interested, participants were given a written description of the pilot study that included instructions about how to complete the forms and language that stated that completion of them, implies consent. Participants were asked to review and critique the newly modified instruments: the MLQ-5X, the SIQ-HP-

GDM, and the QOII-GDM by completing a content validity questionnaire. Their suggestions for item modification were also solicited. The content validity questionnaire was developed, based on guidelines for the validation of new or modified instruments, as described by Lynn (1986). The foci of the content validity questionnaire were on the clarity and importance of the instrument items and the appropriateness of content regarding GDM counseling and leadership characteristics of their HPs. Content validity was conducted and results of the CVI for the MLQ = .67, the SIQ = .90, and the QOII = .95.

Protection of Human Subjects

Prior to initiating the study, the research proposal detailing procedure from recruitment to consenting, to data collection through analyses, was sent to the Institutional Review Board (IRB) at Marquette University. Approval was sought subsequently from each clinic and participating hospital IRB. For clinic settings that do not have a specific IRB committee or process, the University IRB process and approval was reviewed, and permission secured prior to recruiting eligible participants at those sites. The University IRB served as the IRB of record for all of the clinic sites. Recruitment and data collection were initiated only after permission was granted to proceed and IRB approval had been obtained.

After receiving IRB approval or administrative permission as appropriate to the setting, a meeting was arranged with a designated contact person at each site to describe the research project purpose and process, including voluntary consent, data collection and handling, and the importance of maintaining confidentiality throughout all the stages of the research. Contact information for the principal investigator (PI) was provided to the

clinic staff and participants to answer any questions, concerns, or to report any adverse risks or effects of recruitment, participation, and involvement.

As potential participants were identified in the various clinic settings as meeting inclusion criteria by clinic staff, their permission to be approached to elicit interest and permission to participate in the research study by research staff was solicited. The clinic staff notified the research staff of the potential participant's name and the research staff then proceeded with recruitment at the appointment time designated for laboratory testing. The recruitment occurred predominantly with permission in an examination room or in the laboratory setting prior to or following specimen collection. Introductions were made between potential participants and the PI or trained research assistants. The recruitment process then involved providing a description of the study and provision of consent forms. Health Insurance Portability and Accountability Act (HIPAA) authorization for use and disclosure of Personal Health Information was obtained as part of the consent process. No data were collected prior to recruitment and consenting.

Timing and Procedure of Participant Recruitment

Each potential participant was approached individually by the PI or trained research assistants regarding participation in the study when identified as meeting the inclusion criteria by clinic staff. The two times that recruitment occurred predominantly were correlated to routine GDM screening times during routine prenatal visits based on recommendations of the NIH Consensus Guidelines (Vandorsten et al., 2013) and generally accepted by ACOG (2013) and the ADA (2014) and which were consistent in across the sites. The first time, early gestational GDM testing usually occurs in the first trimester or early second trimester prior to 14 weeks gestational weeks at the initial

prenatal intake appointment, at which time screening for GDM is based on high risk indicators for pre-existing DM or early GDM. These factors include obesity with Body Mass Index (BMI) > 30, patient personal history of GDM or first degree relative family history of DM, or other factors such as BMI > 25 coexistent with other risk factors such as history of infant birth weight greater than nine pounds, history of unexplained stillbirth, high-risk ethnicity (African-American, Asian-American, Hispanic/Latina, Native American, East Indian), history of polycystic ovarian syndrome (PCOS) or medical comorbidities, such as hypertension or heart disease. This initial screening occurred via laboratory testing of patient blood samples for either a fasting blood sugar, a hemoglobin A1c, or a one-hour glucose challenge test (GCT) otherwise called glucose load test (GLT) or a glucose tolerance test (GTT) of 50 grams of carbohydrates. Elevated results indicating early GDM (often referred to as pre-diabetes) include a fasting blood serum level greater than 95 mg/dl, a hemoglobin A1c of greater than or equal to 5.7 or a one-hour GLT greater than 200 mg/ dl. Results from a one-hour GLT greater than or equal to 140 mg/ dl, but below 200 mg/ dl, lend to a follow-up diagnostic testing recommendation of a series of four blood specimens tested for glucose levels, fasting, and in one-hour intervals for three hours following a 100-gm carbohydrate GLT. If two of the four results are elevated, the patient is diagnosed as having GDM. Results of a fasting blood serum greater than 125 mg/ dl or hemoglobin A1c greater than 6.4 is diagnostic for DM. The second time for routine screening for those pregnant women who have not been previously screened nor determined to have high risk factors indicating need for earlier screening occurred usually between 24- and 28-weeks gestational age. At that time, it is recommended that all pregnant women be screened

with a one hour 50 gm GLT and adhere to the same laboratory result recommendations previously mentioned. With the diagnosis of GDM or DM, appropriate counseling, treatment recommendations, and/or blood sugar monitoring should be discussed either by the obstetrical HP and/or the Diabetic Educator/Registered Dietitian team.

Consent

All participants were informed of the study verbally and were then given a written informed consent form (Appendix C) to read and sign. The written consent form was given in Phase 1 and was intended to cover two phases of data collection, Phase 1 and 2. Consent included permission for the researcher or trained research assistants to retrieve a minimal amount of information from the patient or staff to complete the PDQ and HPDQ only. Verbal confirmation of intention and willingness to participate in Phase 2 and agreement to be contacted or to coordinate contact with the clinic staff for Phase 2 participation during a clinic appointment time was solicited during Phase 1. Prior to Phase 2 data collection, verbal confirmation in-person was again solicited and obtained. Assurance of the voluntary nature of consent was provided at both times of participation, as well as permission to withdraw if at any time a participant expressed a desire to do so. The patient would have been assured that, whether consenting to or declining to participate, there would have been no effect or impact on the patient's care or relationship with the HP or clinic and also reassured that any future involvement was voluntary and that if she does not desire to be further involved, there will be no penalty or repercussions related to clinic care or otherwise. Appreciation will be expressed for their involvement, and confidentiality reassured. Contact information for the PI was provided to the participants to address any follow-up concerns, questions or adverse effects that might

occur due to being involved in the study. There were no participants who desired to stop the study for any reason

Data Collection Procedure

The initial period of recruitment occurred at the time the participant was identified as high-risk for GDM, either early gestational age, or at the routine gestational age, but prior to receiving diagnosis and counseling by any HP regarding GDM and potential health outcomes. The timing of early or routine screening coincided as intended with the potential participant presenting to the clinic for lab work, which takes from several minutes to over three hours to complete. For many potential participants requiring extensive laboratory testing time, this was determined and found to be an ideal and appropriate time to recruit participants. The study was described to the potential participant. If expressing interest in participating, the participant was asked to sign a written consent form. The study data was collected in the prenatal clinic during the office visit or laboratory testing appointment for Phase1. Following the consenting process, the PDQ, the EBQ+1 and the PAS were given to the participant to complete. These documents were available in English and Spanish. The coded instruments and questionnaires were assigned a study ID number (coded). A separate document is being kept by the PI that links the study ID number to identifying information, specifically name, date of birth and phone number. Once the instruments were completed by the participant, they were placed in a sealed envelope with the matching study ID number on the outside. The participants were notified that would be contacted for a second round of data collection, Phase 2, in the third trimester of pregnancy and asked their preferred means of contact. Those who screened high-risk but were not diagnosed with GDM were

assigned to a control group (non-GDMs) while those who are diagnosed with GDM will be assigned to the study group (GDMs). This diagnosis was determined by the HP based on the blood glucose results. Blood glucose results were obtained from clinic staff responsible for laboratory result follow-up as well confirmation of diagnosis, who then contacted and relayed the information to the PI for control versus study group assignment.

Phase 2 data collection occurred at approximately 34-36 weeks gestational age. For the GDM group, this occurred minimally, 8-10 weeks following GDM diagnosis, counseling, and a series of repeated visits with maternity HP and/or diabetic nurse-educator/Registered Dietitian team. The participant preferred contact information was be used to schedule Phase 2 data collection. Data collection for Phase 2 for the GDM group occurred in-person at the prenatal clinic during the routine office visit that takes place at that time. Contact with the participant or permission to contact the clinic staff to determine appointment time was obtained. Control group (non-GDMs) participants were given the option of being contacted for Phase 2 data collection by phone or completing in the clinic at a routinely schedule prenatal appointment. The majority completed during their routinely schedule appointment.

During Phase 2, the GDM group participants completed the HPDQ, the MLQ the SIQ, the QOII, the DSES, the GMQ as well as repeated the EBQ+1, and the PAS (Figure 1). Appreciation was expressed and at the conclusion of this second phase, participants received a compensation gift in the form of a gift card to area department or grocery store in the amount of $10.00. Following completion of the participant portion of the PDQ and

the HPDQ, the PI or trained research assistants collected the additional information from the medical staff, thus completing the data collection.

Data Protection and Anonymity

Vigilance to data protection and maintaining confidentiality was initiated at recruitment and throughout data collection and analysis. Consent forms and completed data collection forms were sealed immediately in an envelope coded with a study identification (ID) number and transferred to the PI by trained research assistants as soon as possible. The Study ID code was linked to each participant's contact information, name, and date of birth using a master file, both in the form of a secured password-protected flash drive and a hardcopy spreadsheet. The Study ID code was placed on all data collection forms needing completion for Phase 2. As was the case for Phase 1, once the data forms have been completed by the participant, verified for thoroughness by the research assistant or PI and additional data recorded, the forms were placed in a coded envelope and transferred to the PI. All data entry occurred in a private office at the PI's home. The data is stored on a password-protected flash drive, along with the hard-copy master file and all forms are kept in a locked file cabinet in a locked office in the PI's home at all times except during data entry. Data is retained in a de-identified format after the completion of the study. All identifiers on hard copy and electronic files were destroyed or erased.

Data Analyses

Data Preparation

Data was entered, and analyses conducted using Statistical Package for Social Sciences (SPSS) 24.0. In preparing for analyses, several steps were conducted. Data was

evaluated for missing or incomplete values as well as for distributions and outliers. Plans were in place to replace with substitution of means of scale items if there was less than 20% of the responses missing on an individual questionnaire which had responses and if greater to use listwise deletion, however there were no cases of data missing on any questionnaire except for the MLQ and not greater than 20%.

Data Analyses

Due to the purpose and correlational exploratory design of this research, the overall focus of analyses was to explore for relationships among the study variables using correlation models. In addition to correlations models, comparative difference models of analysis between GDM and non-GDM over two time periods during the pregnancy addressed whether health behavior modification of healthy eating and PA occurred in pregnancy with and without a GDM diagnosis. It is important to note that because of the exploratory nature of the analysis and the small sample size, several considerations were necessary. Multiple analyses were conducted with limited number of variables per analytic model as the sample size would not support larger more complex multivariate modeling such as structural equation modeling. The level of significance criterion was relaxed to $p \leq .10$ to preserve analytic power and to provide the opportunity for relationships to emerge as significant, that could be studied and with larger samples in the future. The limitations of this approach are discussed in the "strengths and limitations" section.

Descriptive and inferential statistics were used for analytic purposes to address the aims of this research project. As an initial step, descriptive statistics, primarily frequency and percentages, were used for categorical variables and measures of central

tendency, such as means and standard deviations, were used for interval variables to describe the sample demographic characteristics of the participant such as race/ethnicity, primary language, age, history of GDM/DM as well as the HP characteristics such as gender, race/ethnicity, age, and HP specialty.

The methods used for inferential analyses for each of the study aims included include both univariate and multivariate analyses using multiple linear regression and analyses of covariance (ANCOVA) to analyze paths identified in Figure 2 and listed in Table 2. Multiple regression analyses are useful to explain the interrelationships among multiple variables, to examine the contribution of each independent variable (IV to the dependent outcome variable (DV) (Mertler & Vannatta, 2002; Munro, 2001). The purpose of ANCOVA was to determine group differences while controlling for the effect of one or more variables (Mertler & Vannatta, 2002). Repeated measures were integrated into the ANCOVA analyses to measure group mean differences over time (Munro, 2001).

The first step following data collection and prior to analyses was to employ data screening methods to detect potential data problems, such as data entry errors, missing values, possible outliers, and non-normal distributions (Odom & Henson, 2002). Depending on the type of analysis, assumptions were examined to ensure there were no violations of linearity, normality, homogeneity of variance, homoscedasticity, and multicollinearity (Mertler & Vannatta, 2002; Munro, 2001). Examination of residential scatterplots, correlation coefficients among IVs, or variance inflation factor (VIF) were conducted for multiple linear regressions (Tabachnick & Fidell, 1996; Mertler & Vannatta, 2002). For repeated measures ANCOVAs, this can be accomplished with boxplots or histograms, the Shapiro-Wilk test of normality, Mauchly's test of sphericity,

and the Levene's test for homogeneity of variances (Mertler & Vannatta, 2002; Munro, 2001). The variables and predetermined analysis are described for each hypothesis to be tested or question to be answered below.

Table 2: Research Analyses			
Hypothesis (H)/ Research Question (RQ)	**Level of Measure**	**Method of Analyses**	**Gpower Sample Size Estimate**
H1) HPI, specifically, SIQ and QOII will be positively correlated with an improvement in HE, an increase in PA, and adherence to GM recommendation behaviors in women with GDM.	Interval (IV; DV)	**Multiple Linear Regressions:** 8 separate regression models for each of the 8 DVs: health behaviors (3 HE, 2 PA, and 3 GM) 2 IVs: HPI (SIQ composite score, QOII total score)	***F* tests** – Linear multiple regression: Fixed model, R^2 deviation from zero **Analysis:** A priori: Compute required sample size **Input:** Effect size $f^2 = 0.15$ α err prob = 0.1 Power (1-β err prob) = 0.8 Tested predictors = 2 **Output:** Noncentrality parameter λ = 8.1000000 Critical $F = 2.4097449$ Numerator $df = 2$ Denominator $df = 51$ Total sample size = 54 Actual power = 0.8014124
H2) Patient factors, specifically, race and language concordance and a personal/family history GDM/DM (GDMPFH) will have a moderating effect on the relationship between HPI, specifically, SIQ and QOII, and HE, PA, and GM monitoring behaviors in women with GDM; the relationship will	Interval (IV) Categorical (Moderating Variable) Interval (DV)	**Multiple Linear Regressions** In each step: Separate regressions for each of the 8 DVs: health behaviors (3 HE, 2 PA, and 3 GM) Step 1: on 2 IVs: HPI (SIQ composite score, QOII total score) Step 2: separately on each of 3 Moderating Variables: patient factors (race concordance,	***F* tests** – Linear multiple regression: Fixed model, R^2 deviation from zero **Analysis:** A priori: Compute required sample size **Input:** Effect size $f^2 = 0.15$ α err prob = 0.1 Power (1-β err prob) = 0.8 Tested predictors = 5 **Output:** Noncentrality parameter λ= 11.2500000

be stronger with race concordance, primary language concordance and with a positive GDMPFH		language concordance, and GDMPFH) Step 3: separately on the interaction term between each of the 3 Moderating Variables: patient factors (race concordance, language concordance and GDMPFH) and the 2 IVs: HPI (SIQ composite score, QOII total score)	Critical *F* =1.9325887 Numerator *df* =5 Denominator *df* = 69 Total sample size=75 Actual power = 0.8031994
H3) HP factors, specifically, gender concordance, HP specialty and HP leadership style (MLQ) will have a moderating effect on the relationship between HPI, specifically, SIQ and QOII, and HE, PA, and GM behaviors in women with GDM; the relationship will be stronger with gender concordance, and HP transformational leadership style (MLQ) but not differ based on HP specialty.	Interval (IV) Categorical (Moderating Variable) Interval (DV)	**Multiple Linear Regressions** In each step: Separate regression for each of the 8 DVs: health behaviors (3 HE, 2 PA, and 3 GM) Step 1: on 2 IVs: HPI (SIQ composite score, QOII total score) Step 2: Separately on each of the 3 Moderating Variables: HP factors (gender concordance, HP specialty; HP leadership style (MLQ) Step 3: separately on the interaction term between each of the 3 Moderating Variables: HP factors (gender concordance, HP specialty; MLQ) and the 2 IVs: HPI (SIQ composite score, QOII total score)	***F* tests** – Linear multiple regression: Fixed model, R^2 deviation from zero **Analysis:** A priori: Compute required sample size **Input:** Effect size f^2 = 0.15 α err prob = 0.1 Power (1-β err prob) = 0.8 Tested predictors = 5 **Output:** Noncentrality parameter λ= 11.2500000 Critical *F* =1.9325887 Numerator *df* =5 Denominator *df* = 69 Total sample size=75 Actual power = 0.8031994

H4) Patient self-efficacy will have a mediating effect on the relationship between HPI specifically, SIQ and QOII) and HE, PA, and GM behaviors in women with GDM.	Interval (Mediating Variable; IV; DV)	**Multiple Linear Regressions** **Primary analysis** (Baron & Kenny, 1986) 1. Regressing the Mediating Variable: DSES on each of the 2 IVs: HPI (SIQ composite score and QOII total score 2. Separately regressing the 8 DVs: health behaviors (3HE, 2 PA, and 3 GM) on 2 IVs: HPI (SIQ composite score and QOII total score 3. Separately regressing 8 DVs: health behaviors (3 HE, 2 PA, and 3 GM) on 2 IVs: HPI (SIQ composite score and QOII total score **and** the Mediating Variable: DSES **Secondary analysis**: (Preacher & Hayes, 2008) Estimate the relative total and indirect effects of IV: HPI (SIQ and QOII total score) in separate equations on 8 DVs (health behaviors: 3 HE, 2 PA, and 3 GM) through the Mediating Variable: DSES Generates bootstrap percentile or Monte Carlo confidence intervals for indirect effects	***F* tests** – Linear multiple regression: Fixed model, R^2 deviation from zero **Analysis:** A priori: Compute required sample size **Input:** Effect size $f^2 = 0.15$ α err prob = 0.1 Power (1-β err prob) = 0.8 Tested predictors =3 **Output:** Noncentrality parameter λ=9.3000000 Critical *F*=2.1807273 Numerator *df* =*3* Denominator *df* = 58 Total sample size= 62 Actual power = 0.8006314

		MEDIATE Y= health behavior/X=HPI (SIQ composite score and QOII/M=DSES	
RQ1a) Were there differences in patient engagement in health behavior modification of HE and PA as a result of time (Phase 1, during screening and Phase 2, near the end of pregnancy) or diagnosis of GDM: control group: non-GDMs and study group: GDMs? RQ1b) Were there differences in patient engagement in health behavior modification of HE and PA as a result of time (Phase 1, during screening and Phase 2, near the end of pregnancy) or diagnosis of GDM: control group: non-GDMs and study group: GDMs when adjusting for race/ethnicity, primary language,	Categorical (IV; Covariates) Interval (DV)	**Comparative Model:** **One-way repeated measures ANCOVA** Separate analyses for each of 5 DVs: health behaviors (3 HE and 2 PA) Two different times (Phase 1 and 2) IV: 2 Groups: study: GDMs and control group: Non-GDMs Covariates: patient factors (race/ethnicity, primary language, personal/family history of GDM/DM)	***F* tests** – ANOVA: Repeated measures, within-between interaction **Analysis:** A priori: Compute required sample size **Input:** Effect size f^2 = 0.25 α err prob = 0.1 Power (1-β err prob) = 0.8 Number of groups = 2 Number of measurements = 2 Correlations among rep measures = 0.5 Nonsphericity correction = 1 **Output:** Noncentrality parameter λ=7.0000000 Critical *F*=2.9091325 Numerator *df* =1.0000000 Denominator *df* = 26.0000000 Total sample size= 28 Actual power = 0.8240978

personal/family history of GDM/DM)?			

Research Aim 1/Hypothesis 1

Research aim 1 was to determine if HPI was associated with patient engagement in health behavior modification of HE, PA and GM monitoring in women with GDM. To test the hypothesis that HPI will be positively correlated with an improvement in HE, an increased in PA, and adherence to GM recommendation behaviors in women with GDM, a multiple linear regression model was selected (Mertler & Vannatta, 2002). All measures were interval level. A separate multiple linear regression equation was analyzed for each of the eight DVs, health behaviors. Three DVs relate to HE measured by the EBQ+1. Two related to PA, measured by the PAS. Three related to GM, measured by the GMQ. The IVs, HPI, measured by the SIQ composite score and the QOII total score were entered simultaneously into the analysis for each of eight DVs. A secondary analysis followed the same steps with three IVs, including the SIQ composite score and a two QOII-GDM "content received" and "delivery" subscale scores instead of the one QOII total score. The decision was made to retain analyses with the QOII total score as there were some concerns including multicollinearity issues with the subscale scores.

Research Aim 2/Hypothesis 2

Research aim 2 was is to determine if patient characteristics moderated the relationship between HPI and patient engagement in health behavior modification of HE, PA, and GM in women with GDM. The hypothesis states that patient factors, specifically, race concordance, primarily language concordance and a personal/family history GDM/DM (GDMPFH) will have a moderating effect on the relationship between HPI, specifically, SIQ and QOII, and HE, PA, and GM behaviors in women with GDM; the relationship will be stronger with race concordance, primarily language concordance

and with a positive personal/family history of GDM/DM (GDMPFH). A moderating variable is generally accepted to be a descriptive characteristic that can affect the strength or direction of the relationship between the IV and the DV (Baron & Kenny, 1986). For this analysis, the IV, HPI was measured by the SIQ composite score and the QOII total score, both, interval level. The moderating variables include three patient factors (race concordance, language concordance and GDMPFH) contained in the PDQ and are all categorical level. The eight DV health behaviors (three relate to HE, two related to PA and three relate to GM) measured by the EBQ+1, the PAS, and the GMQ, respectively, are all interval level.

Using a multiple regression model, separate regressions were run on each step of the three-step process for each of the eight DVs. In the first two steps, the eight DV health behaviors were regressed separately on the two IVs of HPI and on the three moderating variables, patient factors for a total of 40 regressions equations. Each of the patient factors are categorical level dichotomous variables: race concordance (Concordance/Discordant), primary language concordance (Concordance/Discordant), and personal/family history of GDM/DM (Yes/No). In the third step, the eight DVs, health behaviors were separately regressed on an interaction term between each patient factors and each of the two IVs of HPI to determine if there is a moderating effect, for a total of 48 additional regressions. In this latter step, if the regression results were significant, the moderating hypothesis would be supported. A secondary analysis using the same steps above included all the same variables listed however, using three IVs, the SIQ score and two QOII "content received" and "delivery" subscales instead of the QOII-GDM total score. Interactions were tested on simple slopes with the use of Preacher's

website (Preacher, Curran, & Bauer, 2006). The decision was made to retain analyses with the QOII total score only as there were some concerns including multicollinearity issues with the subscale scores.

Research Aim 3/Hypothesis 3

Research aim three was to determine if healthcare provider characteristics moderate the relationship between HPI and patient engagement in health behavior modification of HE, PA, and GM in women with GDM. The hypothesis states that HP factors will have a moderating effect on the relationship between HPI and HE, PA, and GM behaviors in women with GDM; the relationship will be stronger with gender concordance and HP transformational leadership style (MLQ) but not differ based on HP specialty. The IV, HPI, measured by the SIQ composite score and the QOII total score, were both at interval level. The moderating variables include three HP factors (gender concordance, HP specialty) measured by the HPQ and the leadership characteristic measured by the MLQ, all categorical levels. The eight DV health behaviors (three relate to HE, two relate to PA, and three relate to GM) are measured by the EBQ+1, the PAS, and the GMQ, respectively and all are interval levels.

Using a multiple regression model, separate regressions were run in each step of the three-step process for each of the eight DVs. In the first two steps, calculating main effects, each of the eight DVs, health behaviors were regressed separately on the two IVs of HPI and on each of the three moderating variables, HP factors for a total of 48 regressions. Each of the HP factors are categorical dichotomous variables: gender concordance (Yes/No), HP specialty (nurse-midwife/physician) and leadership characteristic (transformational/transactional). In the third step, calculating an interaction

effect, the eight DV health behaviors were separately regressed on an interaction term between each of the four HP factors and each of the IVs of HPI to determine if there is a moderating effect for an additional 48 regressions. If in this latter step, the regression results were significant, the moderating hypothesis would be supported. A secondary analysis using the same steps includes all the same variables but with three IVs, the SIQ score and two QOII "content received" and "delivery" subscales instead of the QOII score. To explore interaction patterns, simple slope tests were conducted with the use of Preacher's website (Preacher, Curran, & Bauer, 2006). The decision was made to retain analyses with the QOII total score only as there were some concerns including multicollinearity issues with the subscale scores.

Research Aim 4/Hypothesis 4

In addition to the exploration of the moderating effects of patient and HP factors on the relationship between HPI and health behavior modification, it was important to explore the mediating effect of patient self-efficacy on that same relationship as well. The fourth research aim was to determine if self-efficacy mediated the relationship between HPI and patient engagement in health behavior modification of HE, PA, and GM in women with GDM. This addressed whether the degree of self-efficacy (either higher or lower) affects the relationship between HPI and health behavior modification differently.

In general, a mediating variable reflects a transformative process within a participant that intervenes between the IV and the DVs and is said to account for the relation between the IV and the DVs (Baron & Kenny, 1986). To test the hypothesis that there will be a mediating effect of patient self-efficacy on the relationship between HPI and HE, PA, and GM behaviors in women with GDM, it was necessary to evaluate the

level of measurement and address several conditions to conduct multiple linear regressions. All the levels of measurement were interval for this analysis. Assumptions when doing multiple regressions with mediating variables are that there is no measurement error in the mediator, although this is virtually impossible as mediators are often, as in this case, an internal psychological variable, likely to be measured with error (Baron & Kenny, 1986). Another assumption is that the DVs do not cause the mediator (Baron & Kenny, 1986). Conditions that must be met are that variations in HPI significantly account for variations in self-efficacy, variations in self-efficacy significantly account for variations in health behavior modifications and when variations in HPI on self-efficacy and variation in self-efficacy on health behavior modifications are controlled, a previously significant relation between HPI and health behavior modification is no longer significant (Baron & Kenny, 1986).

This multiple regression model involved a three-step process testing separate coefficients for each regression equation. The first step involved regressing the mediating variable, self-efficacy, measured by DSES on the IVs, HPI, measured by the SIQ and the QOII total score, entered separately. For self-efficacy to function as a mediator, HPI must be shown to correlate with self-efficacy. The second step involves eight separate regressions equations for each of the eight DV health behaviors, three HE, two PA, and three GM, measured by the EBQ+1, the PAS, and the GMQ on HPI. A prerequisite to mediation by self-efficacy was that HPI must affect the health behaviors. The third step involves regressing each of the eight DV health behaviors on the combined IVs, HPI and the mediating variable, self-efficacy, wherein self-efficacy must affect the health behaviors (Baron & Kenny, 1986). A secondary analysis was conducted using the same

steps and include all the same variables but with three IVs, the SIQ score, and two QOII "content received" and "delivery" subscales instead of the QOII-GDM total score. The decision was made to retain analyses with the QOII total score only as there were some concerns including multicollinearity issues with the subscale scores as well as increased risk for error with an added variable.

A further analysis was conducted to estimate the relative total and indirect effects of the IVs: HPI (SIQ and QOII total score) in separate equations on 8 DVs (health behaviors: 3 HE, 2 PA, and 3 GM) through the mediating variable: self-efficacy (DSES). This analysis generated bootstrap percentile or Monte Carlo confidence intervals for indirect effects using the equation: MEDIATE Y= health behavior/X=HPI (SIQ-HP-GDM composite score and QOII-GDM)/M=DSES (Preacher & Hayes, 2008).

Research Aim 5/Research Questions 1a/1b

The fifth aim was to determine if there were differences in the pattern of patient engagement in HE and PA during pregnancy for women with and without a GDM diagnosis.

To address this aim, the research question asks, "were there differences in patient engagement in health behavior modification of HE and PA over time (Phase 1, during screening and Phase 2, near the end of pregnancy) or diagnosis of GDM (control group: non-GDMs and GDMs)?" A mixed design, repeated measures ANCOVA addressed this two-part question inquiring into the between two groups and within each group differences at two times in the pregnancy. ANCOVA combines analysis of variance (ANOVA) with regression to measure differences among group means (Munro, 2001). Following pre-analysis assumption testing, this analysis input included the IV, two

groups, the control group (non-GDMs) and the GDM group, five DV health behaviors (three HE and two PA), measured by the EBQ+1 and the PAS, all interval level, and three covariates, patient factors (race/ethnicity, primary language, personal/family history of GDM/DM), measured by the PDQ, all categorical level. Separate equations were run for each of the five DVs, and include the IV and the three covariates, for mean differences between the GDM and non-GDM groups over time (Phase 1 and Phase 1). The third health behavior outcome, glucose monitoring was only measured in Phase 2 as it is not relevant to Phase 1 and thus was not be included in this analysis.

Methodological Rigor

To strive for methodological rigor, it was imperative to carefully design and describe a research protocol and policies that addressed the many elements of a research project with integrity, legitimacy, soundness, validity and feasibility. To confirm methodological rigor, it was imperative to evaluate the appropriateness of the research design and selection of method in answering the research question, address internal and external validity threats, and provide an overall assessment of the strengths and limitations of the research design and methods, instruments, and analyses.

The research design was appropriate for research inquiries involving cognitive, behavioral and social factors of participants and HPs and the outcomes of health behavior modification. The correlational design has been used in similar research inquiries involving one or multiple concepts of social influence, self-efficacy, and health behavior modification. It was designed as an initial exploration into the concept of HPI, testing of a recently developed conceptual model, and the association of HPI with patient health behavior modification, thus addressing an identified gap in the healthcare literature and

legitimizing the need for the inquiry. The design provided a solid approach to initiating the understanding of how HPs influence patient health behavior modification and thus how to increase this process toward overall improved health status. Quantitative methodology supported this research designed to describe associations between HPI and health behavior modification as well as exploring additional potential patient and HP factors that modifying that relationship. A non-experimental correlational design is appropriate for the exploration of associations, prior to implementation of any future intervention studies. However, this design also carried with it, potential threats to internal and external validity.

Strengths and Limitations of the Research Design, Methods, and Measures

Several measures were taken to increase the strength and reduce threats to external and internal validity. External validity relates to the how well the research design reflects the research question whereby research findings can be generalized to the populations and settings (Hulley, 2007; Polit & Beck, 2008). Internal validity is related to how well the implementation of the study reflects the research plan and whether the results are attributable to the IVs or other unrelated factors (Polit & Beck, 2008).

Design

This correlational exploratory research design was appropriate to conduct initial validity testing of the newly developed HPI conceptual model. It was a first step in a process to collect data and information to contribute to the understanding of the process wherein HPs influence patient health behavior modification, describe more fully the HP as social influence situated within the ITHBC model, and provide guidance for the

eventual development of future exploratory and intervention studies. The sample, measures and analyses are described separately following the discussion of the design.

Using a control group provided strength to the design, as it allowed for the comparison between those who were diagnosed versus those who were not diagnosed with GDM. It considered that health behavior modification might occur because of pregnancy alone. There are several possible design limitations. The first was the use of quantitative methods as the sole methodology. Although this method is pertinent to post-positivist philosophy, the use of qualitative methods could enrich the values-component included in this paradigm. Following initial exploration of the relationships among variables in this quantitative study, future studies should include a more robust mixed methods approach to increase the depth and richness of data that leads to a better understanding of the association between the concept of HPI and health behavior modification. Another possible limitation impacting the results and reflecting a threat to internal validity come from a threat of maturation, the effect that the naturally occurring process of time has on participants and outcomes (Polit & Beck, 2008). There is some concern that time, or time-related factors present a threat to validity. The longer a participant is enrolled in the study, such as in the case of early pregnancy versus mid-pregnancy diagnosis of GDM, the more it could impact health behavior modification. In addition, greater time could have allowed influences for behavior modification, apart from HPI. However, it is important to remark that time, including the duration and frequency of contact with the HP, is contributory to the relationship and included in the process and conceptual model of HPI, although not directly tested in this study.

Sample

There are several strengths related to the sample. Participants were recruited based on predetermined inclusion and exclusion criteria. They were recruited from various healthcare clinical settings and institutions, with various types and specialties of HPs and includes both English and Spanish-speakers. This was intended to provide for a clinically and demographically diverse participant sample, to represent the target population well (Hulley, 2007), and to explore diverse HP-patient relationships with different HP specialties. The intentions with these sample considerations were to increase accuracy of estimations, decrease bias and homogeneity, and thus add to the design strength. A limitation related to sample selection includes the use of convenience sampling. This could also contribute to the opposite effect listed previously, wherein the sample was not representative of the population demographics.

Adequacy of sample size estimation is an important criterion for internal validity. Power analysis was used to determine a samples size a priori. An acceptable power criterion of .80 was selected. A moderate effect size was predetermined, which is one of the most important elements of the power analysis and may contribute more to the clinical and practical significance of the results than could be achieved by the statistical significance. Additionally, adding to the precision of the estimate was the decision to recruit and collect and review data until it is determined that the sample size estimate was achieved for analyses purposes, even if data collection resulted in greater than the sample size calculation (Hulley, 2007), albeit overall recognizably small in relation to the number of variables to be explored.

A limitation that could result in an increased risk of type 1 error related to the sample size estimation is the relaxing of the selected significance level to $p<.10$ as well as

a family wise error rate resulting from conducting multiple linear regressions for several hypotheses. Statistical significance alone is insufficient as a criterion for behavioral research and was selected based on the feasibility of recruiting participants in a timely manner, albeit a lower level which inherently may limit the findings (Thompson, 2002). This decision was based on the relatively infrequent occurrence of GDM among pregnancy women and this study serving as an initial exploration and testing of the HPI conceptual model.

Data Collection

Measures to ensure validity included standardized and consistent training of research assistants in recruitment criteria and procedures, consenting, and procedures for data collection and ensuring quality and completeness of data based on the understanding that the results of the analyses are only as good as the reported data (Hulley, 2007; Mertler & Vannatta, 2002). The decision to thoroughly train research assistants in recruitment as well as in consistent face-to-face data collection methods while providing continuous access to the PI occurred and contributed to design strength on several levels as well as decreasing random measurement or systemic error. These include an increase in the accuracy, thoroughness, and usefulness of the data responses for analyses both by decreasing potential response bias in the event the PI is the exclusive recruiter and data collector but also by increasing the ability to review forms following completion, return immediately for missing data or to assist with instruction or clarification (Hulley, 2007). These measures simultaneously decreased the threat to measurement error, prevented

missing data, increased adherence to maintaining confidentiality, and provided for assurance to participants and subsequently retention and participation in Phase 2 of the study. Missing data and retention did not present as concerns. There was an overall lost to follow-up in both the control and the study group of 7%. Involving clinic staff in identifying potential participants was beneficial as it increased staff interested and their willingness to recommend participants. Likewise, it did appear to increase the trust of the participants and increase their willingness to participate, while preventing attrition and loss to follow-up, which often present as threats in longitudinal studies. Additional strengths relate to the timing of data collection which eliminated any inconvenience related to financial or transportation burden was facilitating recruitment and participation at times the participant participated in routine receiving prenatal care. Burdens and possible limitations related to data collection involving multiple clinic settings did require an increased need for organization, training, and persistence on the part of the PI for adequate and appropriate participant recruitment and reimbursement however it also increased the diversity of the sample. An additional limitation is possible due to the option of a different data collection method, via phone, for Phase 2 for the control group participants. This was a seldom selected option.

Measures

To increase precision and accuracy of findings and to reduce measurement systematic error, several factors to strengthen the design were considered. Each instrument was scrutinized prior to selection for relevance to content, fit with study purposes, prior use in similar research projects, level of measurement, and strong reliability and validity. The outcome and mediating variables have all been used jointly in

previous self-management health behavior modification research with DMs. All the variables are measured with interval level of measurement except the moderating variables. Reliability and validity have been reported for the instruments overall and many have been tested and used with similar and diverse populations, except for those modified for this research. However, the three instruments that were modified underwent a pilot study testing for content validity prior to implementation in the study to determine relevance, clarity and comprehensiveness by content experts. Content validity was evaluated by both English and Spanish speakers to gain insight and establish validity for the study population. All the instruments are available in English and Spanish, including those that were translated and back translated by certified medical interpreters for the purposes of this study. Competent translation reduces random measurement and systemic error that occurs with response variation and results in accurate results when item confusion or lack of clarity in wording or content is addressed (Hulley, 2007).

Most of the instruments impose little participant burden as they were brief and easy to understand. Instrument options that were disregarded included multiple day food diaries or logs that would have been relevant but bear the risk of reporting errors or recall regarding portion sizes, types of foods, forgotten foods or beverages which could be significant, and thus deemed unsuitable. In addition to potential inaccuracies, they are cumbersome for the participant and time-consuming for analyses for the researcher. Those types of instruments might be better used in the clinic setting for counseling purposes rather than research purposes for longitudinal behavior modification comparisons.

Several possible limitations are measure-related. Most of the instruments are completed by the participants, and all the health behavior modification outcomes measures are self-reported. While there are limitations to using self-report measures, they can also be the useful and provide an insight to the self-perception of a participant's behaviors, which is an overall facet to this research (P. Ryan, 2009). Habitual responding might also occur wherein the participant may get into a pattern of responding without considering the questions, especially when they are somewhat repetitive. One instrument, the MLQ did lacks brevity, although it is shorter that previous versions, and has been used reliably with large samples, in multiple languages and cultures and with populations having literacy levels below its designated level. Regarding instrument modifications, the MLQ, it had never been used in the clinical setting for patient evaluation of HP characteristics. As a result, it may not be the most appropriate instrument for this purpose. However, a review of the literature fails to result in any other option for this specific purpose of patient evaluation of HP influence. Future replication and uses with this modified instrument will be necessary to establish reliability and validity.

Analyses

There are several strengths of the selected analyses. One is the use of repeated measures ANCOVA which removes added sources of variance before comparing group means, thus decreasing error, increasing power, and requiring a smaller sample (Munro, 2001). Multivariate analysis in final regression pathways adds strength to the analyses. Multiple variables increase the amount of variance accounted for in the DV, which will increase the accuracy of a prediction (Munro, 2001). Multiple regression is described as most flexible and appropriate technique to analyze both categorical and continuous

variables, as well as numerous independent and dependent variables simultaneously (Munro, 2001). This allows for a more holistic and comprehensive understanding, and possible identification of interconnected relationships between variables. The exploration into the relationships between variables may result in findings that reflect the complexity of the human mind or a set of behaviors that often do not exist in isolation but rather may affect or be affected by several variables that even with the increased potential for errors might not have been considered prior to analyses (Mertler & Vannatta, 2002). Secondary analyses are planned to test several of the hypotheses using additional IVs, which may provide relevant information for future research.

Due to the limited availability of participants and feasibility for this study, the sample size was small overall. One of the major limitations of analyses with a smaller sample is the need to run multiple linear regression models for several of the hypotheses, one for each of the moderating variables and for each of the DVs for each research hypotheses instead of an alternative, for example, structural equation modeling. These multiple analyses of the same sample data increase the risk of Type 1 error, with possibility for a robust family size error, thus finding a significant effect in one or more of the multiple analyses that can be in fact a spurious finding. In this exploratory study, no correction for multiple comparisons is included. Another limitation involves categorical levels of measurement when conducting multiple regression models. As much as was possible, instruments with higher level interval measurement were selected for analyses purposes as well as to increase precision, accuracy and resultant generalizability of inferences (Hulley, 2007). Another possible limitation is that the p value criterion is relaxed to $p<.10$. However, the rationale for this choice has been described previously

and additionally, this is intended to allow for possible associations to emerge for future more in-depth analyses with larger samples.

Summary

Identifying gaps in the healthcare research literature regarding the process of how HPs influence patient self-management of health behavior modification in women diagnosed with GDM resulted in formulating a research purpose and proposal to begin addressing this health promotion concern. The research purpose, five aims and related hypotheses or question were all described. The predictor and outcome variables were delineated as well as the instruments used to measure the variables and their levels of measurement. The instruments were described in detail, including the rationale for the selection of these instruments and reported reliability and validity. Modifications made to the original instruments for use in this study were pilot tested to establish content validity to determine if the modified content was appropriate for the study population. The plan and process for implementing the research project including estimating the sample size, recruitment of the sample, protection of the participants and data, seeking IRB approval, participant consenting, and procedure for data collection were detailed. Data analyses, including the selection of the appropriate test, adherence to methodological rigor and minimizing error or bias were described. The research design and methodology were thoroughly planned to address the study aims with the intention of understanding the process and components of how HPs influence patient health behavior modification in women diagnosed with GDM.

Chapter 4: Results

The majority of the results of this research study is presented in a manuscript titled "Healthcare Provider Influence on Health Behavior Modification in Gestational Diabetics ("Appendix E). The manuscript includes the details of the descriptive statistics and characteristics for the research study participants as well as the psychometric properties of the study instruments used. Additionally, a description and discussion of the analyses of four research aims including Hypotheses 1-3 and an additional research question are reported, clinical practice implications, future research recommendations, and a conclusion. One hypothesis and two research questions not reported in the manuscript are presented in this chapter.

Hypothesis 4 and Research Questions

1) Hypothesis 4 states that patient self-efficacy will have a mediating effect on the relationship between HPI specifically, SIQ and QOII and healthy eating, physical activity and glucose monitoring behaviors in women with GDM.

2) The research questions were: a) Are there differences in patient engagement in health behavior modification of healthy eating and physical activity as a result of time (Phase 1, during screening and Phase 2, between 34-36 weeks gestational age) or diagnosis of GDM (control group: non-GDMs and study group: GDMs) and b) are there differences in patient engagement in health behavior modification of healthy eating and physical activity as a result of time (Phase 1, during screening and Phase 2, between 34-36 weeks gestational age) or diagnosis of GDM (control group: non-GDMs and study group: GDMs)when adjusting for three covariates: race/ethnicity, primarily language and personal/family history of GDM/DM?

Data Analyses

Following data collection and prior to analyses, data cleaning was conducted to detect and resolve data problems, such as data entry errors, missing values, possible outliers, and non-normal distributions (Odom & Henson, 2002). Correlation analyses were computed using Pearson's *r* for interval level data, point biserial for categorical to interval level and chi-square for categorical to categorical level data.

To address Hypothesis 4, regression analyses were conducted separately for two healthcare provider types: the maternity healthcare provider (HP) and the diabetic nurse-educator (DE). Separately, each of the eight health behavior outcomes: three healthy eating (HE1, HE2, and HE3), two physical activity (PA1 and PA2 and three glucose monitoring (GM1, GM2, and GM3) were regressed onto the HPI measures, SIQ and QOII for the HP. Second, self-efficacy (DSES) score was regressed onto the same HPI measures. The eight health behavior outcomes were regressed onto DSES score and lastly, the eight health behavior outcome scores were regressed onto the HPI measures and DSES score. This process was repeated for the HPI measures for the DE.

Paired t-tests were used to measure the within group differences at two different times, Phase 1 to Phase 2 for control (non-GDM) and the study (GDM) group. One-way repeated measure analysis of variance (ANOVAs) compared the control and the study groups outcome change scores for the three HE and two PA outcomes at Phase 1 and Phase 2 for group differences. Analysis of covariance (ANCOVAs) analyzed the variance of group differences from three covariates: (race/ethnicity, referred to as race, primary

language, referred to as language, and personal/family history of GDM/DM, referred to as GDMPFH) in the outcome scores for the same five outcomes.

Prior to regressions and ANCOVA analyses, violations of the assumptions of linearity, normality, homogeneity of variance, homoscedasticity, and multicollinearity via scatterplots, histograms, correlation coefficients, Variance Inflation Factor, Kolmogorov-Smirov test of normality, F tests for independent and covariate interactions, Box's and Levene's tests were examined. (Tabachnick & Fidell, 1996; Munro, 2001; Mertler & Vannatta, 2002).

Instrument Description and Psychometrics

Instrument description and psychometric test results for all measures except the DSES are described in the manuscript in Appendix E.

The Diabetes Self-Efficacy Scale (DSES), modified to add "gestational" is an 8-item instrument which is scored from 0-10 and results in one mean score. Self-efficacy has been studied often in patients with DM (Lorig & González, 2000; Lorig, Ritter, & Jacquez, 2005; Lorig, Ritter, Villa, & Armas, 2009). The DSES measures confidence levels in beliefs related to DM and self-management health behaviors, including healthy eating, physical activity and glucose monitoring. Prior reliability testing found internal consistency, $\alpha = .83$ (Lorig et al., 2009), similar to this study's results, $\alpha = .86$. The inter-item mean correlations = .44 with the actual range from 2.13-10 with a mean (SD) of 7.9(1.56).

Results

Descriptive Statistics

The description of the total sample is presented in Table 1. The total sample recruited (n=210) for this study were divided into a control group (n=126) and a study group (n=84). At Phase 2, 93% from each group, 117 of 126 (control group) and 78 of 84 (study group), completed the study. Statistically significant differences between the Phase 1, control (n=126) and study group (n=84) participants included age, primary language, GDM screening, early versus routine (all $p \leq .01$), personal history of GDM ($p \leq .01$), and personal/family history of GDM/DM (GDMPFH) ($p \leq .05$). Early screening for GDM based on risk factors versus routine screening at approximately 24 weeks GA occurred 75.4% in the control versus 51.2% in the study groups. The control group reported a 12.7% personal history of GDM and a 63.5% GDMPFH versus a 28.6% personal history of GDM and a 77.4% GDMPFH in the study group.

Correlations

Correlations for all the study variables were analyzed to determine associations and to assess for multicollinearity concerns among the variables. Table 2 reports correlation results between study variables. Significant correlations were found between ΔHE1 and ΔHE2 ($r = .38$) and glucose monitoring days/weekly (GM1) and 4 times/daily (GM2), ($r = .63$), both $p \leq .001$ and GM1 and abnormal glucose results/weekly (GM3) ($r = .25$) and ΔPA1 and GM2 ($r = .27$), both $p \leq .05$.

Among the HPI conceptual model measures, both professional influence scores (SIQHP and SIQDE) were significantly associated ($p \leq .001$), both quality of information and interaction (QOII) scores (QOIIHP and QOIIDE) were significantly associated ($p \leq .001$) and each professional influence score for the HP and DE were associated with its related quality of information and interaction score (SIQHP: QOIIHP and SIQDE:

QOIIDE) ($p \leq .001$). Point serial and chi-square correlations were used for the following analyses. Race and language concordance were negatively correlated with QOIIHP, QOIIDE, and only the former with self-efficacy. Transformational leadership style was associated with glucose monitoring daily, race and language concordance and SIQHP and SIQDE.

Hypothesis 4: Self-efficacy as a mediator of HPI and health behavior outcomes

As previously described (Appendix E), models including HPI measures for the HP, with SIQHP and QOIIHP as independent predictors and the DE, with QOIIDE as an independent predictor were predictive of one healthy eating outcome, breakfast frequency/weekly (HE1). HPI measures for the HP further explained 10% of the total variance, $F(1,77) = 4.153$, $p = .02$ with QOIIHP as the only independent predictor (ß=.31, p=.01) for self-efficacy. Similarly, HPI measures for the DE explained 8% of the total variance, $F(1,77) = 3.162$, $p = .05$ with QOIIDE as the only independent predictor (ß=.33, p=.02) for self-efficacy. Self-efficacy was found to be a significant positive independent predictor for eating protein for breakfast (HE2) (ß = .22, $p \leq .05$) and a significant negative predictor for increased abnormal glucose results (GM3) (ß = -.22, $p \leq .05$) but was not a mediator for HPI measures on HE1, nor predictive of any other outcomes.

Research Questions: Comparison of non-GDM and GDM health behavior change

Tables 3 and 4 presents the descriptive frequencies and results of paired t-tests for outcome changes for the control (non-GDM) and the study (GDM) group. Over time (Phase 1 to 2) significant increases in HE1 was found for both groups, control ($p = .003$) and study ($p = .03$). While approximately 56-58% in each group made no changes, 23-29% increased and 12.8-15.4% decreased their breakfast frequency in both groups. Significant increases in HE2 occurred in the control group ($p < .001$) with 23.1 % more and 3.4% less eating protein for breakfast and in the study group 15.4 % more 9 % less eating protein and 74-76% in both groups not changing their behavior either way. In the study group, significant increases were evident for HE3, 51.3% increased vegetable portions and PA1, 50% increased stretching/strengthening exercise duration ($p < .001$)

Table 5 presents the one-way repeated ANOVA results for within and between group differences over time in healthy eating and physical activity. Over time, there were significant improvements in HE1, HE2, HE3 ($p \leq .001$) and PA1 ($p = .02$) for the total group. Between group significant differences over time were HE2 ($p = .06$) with more improvements in the control and in HE3 ($p < .003$) and PA1 ($p < .01$) more improvements in the study groups. Significant between group differences were found in vegetable portions/daily HE3 ($p \leq .01$) improvement in the study group and aerobic exercise duration (PA2) ($p \leq .1$) improvement in the control group.

Table 6 present the ANCOVA results for within and between group differences over time in healthy eating and physical activity while controlling for race (white), language (English-speaking), and personal/family history of GDM/DM (GDMPFH) (positive history). Kolmogorov-Smirov testing for ANCOVA covariates were significant ($p \leq .001$).

The increase in breakfast frequency (HE1) over time was accounted for by white race (p=.04) and for vegetables portions/daily (HE3) by positive GDMPFH (p=.06). The difference over time between groups for eating protein for breakfast (HE2), vegetables portions/daily (HE3) and for stretching and strengthening exercise (PA1) were all accounted for by white race, English language and positive GDMPFH. For HE2: race (p=.06), language (p=.06) and GDMPFH (p=.04); for HE3, race (p=.003), language (p=.004) and GDMPFH (p=.01); and for PA1: race and language (p= .01) and GDMPFH (p=.02).

The difference between the groups in HE1 were explained by white race (p=.003), English language (=.07) and positive GDMPFH (p=.02). The difference between the groups in HE2 were explained by white race (p=.06). The difference between the groups in HE3 were explained by white race and English language ($p \leq .001$). All the significant effect sizes reported from the ANCOVA analyses were small ranging from 2-9%.

Chapter 5: Discussion

Discussion, Implications, and Conclusions

The manuscript titled "Healthcare Provider Influence on Health Behavior Modification in Gestational Diabetics" (Appendix E) includes a discussion of the study results as well as limitations, implications for practice and a conclusion.

This chapter includes additional discussion regarding the findings related to the comparison of a control: non-GDM and a study: GDM group, as well as additional discussion of threats to validity, limitations and strengths, and implications for vulnerable populations and nursing education, research, and policy.

Discussion of Findings

In consideration of the hypotheses and findings reported here and, in the manuscript, (Appendix E), HPI measures (patients' perception of their healthcare providers' influence, quality of information and interaction in teaching encounters), leadership style, and patient-healthcare provider concordance factors influence GDM patients' engagement in health behavior modifications of healthy eating, physical activity and glucose monitoring outcomes. Self-efficacy was not a mediator but an independent predictor of one healthy eating and one glucose monitoring outcomes, findings consistent with previous studies (Lorig & González, 2000; Lorig, Ritter, & Jacquez, 2005; Lorig, Ritter, Villa, & Armas, 2009). Although social influence was not predictive of self-efficacy, quality of information and interaction from HPs and DEs was. Self-efficacy appears to play a role in influencing and has a place in the HPI conceptual model.

Significant improvements in three healthy eating (HE1, HE2, HE3) and one physical activity (PA1) outcomes occurred in the group over time providing evidence that

that pregnant women make positive changes whether or not they have GDM and receive counseling. While both groups increased breakfast frequency (HE1), an important dietary modification for GDM, the control group as well increased consumption of protein for breakfast (HE2) more than the study group and the study group increased vegetable portions/daily and stretching and strengthening exercise minutes/weekly (PA1) resulting in between group differences over time.

Emphasis should be placed on counseling GDM patients of the benefits of eating fewer carbohydrates at the first meal in the morning due to increased insulin resistance and instead adding or increasing protein which increases insulin sensitivity.(Gutierrez & Reader, 2005, Mekary, Giobannucci, Willett, van Dam, & Hu, 2012) It is important to consider whether the control group, although at high risk for GDM was able to maintain stable glucose results, in part related to this change. The study group did however increase their vegetable portions/daily significantly whereas the control group did not. While in pregnancy, vegetables would benefit both groups with increased vitamin and mineral content to counter the loss to fetal development needs and the benefits of increased fiber to counter gastrointestinal slowing in pregnancy, they are also the optimal choice for acquiring this carbohydrate sourced nutrient without increasing the risk for higher glucose results from other less optimal and higher glycemic index carbohydrate-fiber sources, such as grains (Mekary, et al, 2012).

The benefits of stretching/strengthening exercises, found to be increased in the study group, should be consistently a focus of GDM counseling. Strengthening exercises potentially increase muscle mass which increased insulin sensitivity and decreases need by increasing the absorption of glucose for energy (ADA, 2017), thus supporting more

stable glucose levels and, in the study group, 77% of participants reported achieving recommended normal levels of ≤ 2 abnormal results/weekly. The are other pregnancy-related benefits of stretching and strengthening, such as treating advancing gestational age aches and discomforts that both groups would have benefitted from. Although aerobic exercise change was not found to be significant, 44-48% of participants in both groups did increase their duration weekly, a commendable change in pregnancy when considering the increasing physical discomforts and fatigue that can occur as the gestational age increases which may have thus led to 29-33% decreasing aerobic exercise duration in both groups. There is some evidence that GDM counseling may be was effective in influencing the study group engagement in more healthy eating and physical activity behavior conducive to achieving glycemic control.

In considering variables accounting for differences in outcomes, all three covariates: white race, English language, and positive GDMPFH played small significant effects on change over time and between the control and the study groups. English-speaking, white women, and those with a previous experience or exposure to GDM or DM and the study group improved breakfast frequency, vegetable portion intake and increased stretching and strengthening exercises, more than those in the control group. Although the effects were small, a focus on understanding how women of different races, languages and health history modify their behaviors more or less than others and may respond to professional influence differently is an area worthy of further exploration. In the context of influencing health behavior modification, patient and HP characteristics should remain an area of focus and may help to redirect counseling content, delivery, and interaction with HPs and how these contribute to HPI.

The increase in breakfast frequency (HE1) over time was accounted for by race (p=.04) and for vegetables portions/daily (HE3) by GDMPFH (p=.06). The difference over time between groups for eating protein for breakfast (HE2), vegetable portions/daily (HE3) and for stretching and strengthening exercise (PA1) were all accounted for by race, language and GDMPFH. For HE2: race (p=.06), language (p=.06) and GDMPFH (p=.04); for HE3, race (p=.003), language (p=.004) and GDMPFH (p=.01); and for PA1: race and language (p= .01) and GDMPFH (p=.02).

Threats to Internal and External Validity

Threats to validity of results were considered. There were time variations between Phase 1 and Phase 2 depending on whether involvement in the control or study group began at early versus routine screening time. This time variation may have affected the ability and amount of behavior change that could occur an thus affect the between group difference results.

During the data collection process, feedback was received from one Asian participant that providing perceptions related to someone in a position of power, such as HPs, (referring to completion of the MLQ) especially if it contained any negative content, or was not culturally appropriate; however she understood the confidential nature of the responses and did not feel this would change her answers but felt it was important to bring light to this issue for the researchers in case other participants were impeded in responding accurately. As this study is based on patient perceptions of their HPs influence, interaction, and leadership style, objective measures would arguably diminish the intention, purpose and value of including the patient view.

Limitations and Strengths

Limitations regarding instruments were considered. Although the QOII and the DSES address glucose monitoring, the SIQ did not specifically inquire as to HP influence and beliefs of patient ability and barriers for engagement in glucose monitoring for GDM control and prevention of DM.

Strengths incorporated into the research design include counseling regarding and use of anonymous reporting, use of trained research assistants (RAs) to collect data, and the longitudinal nature of the design using the change score for five of the health behaviors as the outcome measure decreased concern for inflating responses. Outcome measure surveys are easy to complete with very few questions, which decrease participant burden. Additional strengths included the certified medical translators completed two-way forward-backward translation for Spanish language forms. Not only did this increase the accuracy but also allowed for the recruitment and inclusion of a more diverse sample which represents a vulnerable population at higher risk for GDM and DM. All revised and translated forms were able to be pilot testing for content validity prior to their use in this study.

Unanticipated benefits included the opportunity for multiple participants to express their positive and negative feedback, although unsolicited, by verbalizing to researcher or RAs or written expressions of gratitude or frustrations regarding counseling experiences or content, pertinence to their individual needs and healthcare system concerns in regard to approaching management for GDM. One participant requested to be contacted and participate in public presentations where the research results might be presented as well as reported her personal motivation to become a DE because of what she described as missing from her counseling experience.

Implications for Vulnerable Populations

Ethnic minority populations have the greatest prevalence and are at greatest risk for GDM/DM and, if current trends continue, the latter is projected to affect 50% of minority versus 33% of all U.S. children born after 2000 (DeSisto, Kim, & Sharma, 2014; Fujimoto, Samoa, & Wotring, 2013; Guariguata, Linnenkamp, Beagley, Whiting, & Cho, 2014; Narayan, Boyle, Thompson, Sorensen, & Williamson, 2003). Barriers that pose increased risks to developing GDM/DM and the inability to modify diet/eating and increase physical activity health behaviors recommended for the prevention and treatment of GDM/DM are the lack of awareness prevention knowledge and awareness as well as decreased access to quality healthy and sufficient foods and safe communities (Gucciardi, Vahabi, Norris, Del Monte, & Farnum, 2014; Hasan-Ghomi, Ejtahed, Mirmiran, Hosseini-Esfahani, Sarbazi, Azizi, et al., 2015; Laraia, Siega-Riz, Gundersen, 2010; López, & Seligman, 2012). Recognizing the increased prevalence and seriousness of DM, the diagnosis, prevention and formal DM education became a major focus of the Healthy People 2020 objectives on (DHHS, 2013). Extending this objective to include formal education with GDM management during pregnancy could address the more remote goal for prevention, delay of onset or earlier treatment of DM in females. Multiple approaches are necessary that are tailored to the specific target population group and its environment. Healthcare providers should assess the knowledge, awareness, and vulnerabilities of their individual patients in relation to GDM/DM treatment knowledge and their community and environmental resources to determine actions that can help to improve knowledge and eliminate health disparities within these and other vulnerable populations (Gonzalez, 2012). Screening for food insecurity, finding means to access quality foods, increasing

awareness of cultural differences in staple foods, attitudes to physical activity, and access to safe areas, while eliciting family support when often there are few or few willing to help can be difficult (Laraia, Siega-Riz, Gundersen, 2010; López, & Seligman, 2012).

A specific focus on GDM/DM involves not only providing correct, consistent, culturally and linguistically appropriate counseling but also trialing different strategies to interact, communicate, and even solicit information that can lead to more confidence and subsequently more influencing potential. In collaboration with patients and families, finding out what is available, appetizing, adequate, and quality resources that would additionally meet optimal health eating recommendations is important. HPs who take responsibility to be as educated and informed regarding their resources on every level of their patients can increase their potential to best influence health behavior modification and improve outcomes.

Education Implications

While the counseling and education of patients specific to the treatment and prevention of health problems and diseases is imperative, the initial education and training of HPs on how to counsel, interview, motivate, and interact with patients is equally important. In addition to encouraging self-reflective clinical practice and stimulating individual or group change to approaching patient health behavior modification, these research findings can be used to contribute to strategies and models of learning in education programs for all, including new and experienced, clinical, academic, and research focused HPs. Professional influence from HPs can positively impact all areas of practice which can stimulate a trickle-down effect of improved health outcomes at the least and the potential of many more benefits. Understanding how

perceptions of influence, information, interaction, leadership styles, and concordance factors affect the overall influencing capacity and potential of a HP can be not only individually transformative but also organizationally and nationally. Using different leadership skills can potentially affect both short and long-term outcomes. While transactional skills may focus on behavior modification for obvious proximal benefits, transformational skills involve exploring individual's values, goals, experiences, and vision, and uses these to impact longer term behavior change.

Policy Implications

To address the rapidly increasing rise in GDM and the number of potential deleterious effects to the mother and fetus, a bill was passed in 2012 mandating screening for GDM in order to lead to earlier diagnosis and treatment with the objective to reverse or prevent these complications. While screening is critical to identify those at risk, the follow-up diagnostic testing and management of GDM is even more vital. First line treatment considerations for GDM include optimal eating/drinking, physical activity and glucose monitoring. Health behavior modification minimally requires access to appropriate counseling and support from trained, culturally sensitive, and language concordant HPs and DEs via medical interpreters, if indicated, as well as, access to appropriate foods and safe places for physical activity. Treating GDM appropriately is one early and direct pathway to DM prevention, delay and treatment (Ruchat & Mottola, 2013). These considerations as well as the national objective calling for formal DM counseling (DHHS, 2013) are beginning steps to awareness for future policy changes.

Legislative initiatives and policy modifications are essential and must continuously evolve to address changing health care access, coverage and access to

appropriate foods, resolve food resource and scarcity concerns, ensure safe places for physical activity, and access to glucose monitoring supplies for those with GDM/DM (Gonzalez, 2012). A current focus could include government assistant programs, such as the Supplemental Nutrition Program for Women Infants and Children Program (WIC) which currently addresses food scarcity concerns and already focuses on anemia as one area of eating related malnutrition. Expanding the scope of nutrition awareness and resources for GDM treatment is a potential objective for this program. Providing diligent and accurate education and awareness regarding dietary and healthy eating GDM recommendations from this program is a first step. Additionally, reviewing foods that are approved, recommended and available for those with GDM, such as increased promotion of proteins and vegetables/vegetable juices and fewer but higher fiber carbohydrates, decreased fruit juices and other high carbohydrate nutrient poor processed foods/drinks could be effective. This is only one of many potential areas to focus efforts for change.

Research Implications and Future Directions

Addressing a gap in the research literature by conducting this pilot study has provided an initial understanding of the process of HPI and an additional layer of comprehension regarding patient-centered healthcare communication and counseling. In addition, it has stimulated the emergence of many new questions and served to guide education efforts for HPs in addressing GDM in order to prevent DM. Replicating testing of the current and additional testing of new components of the HPI conceptual model is highly recommended in order to lend a more comprehensive understanding and trajectory into utilizing this patient-centered model to improve influencing HBM, potentially benefitting other major acute or chronic illnesses such as hypertension, obesity, and

cardiovascular diseases. A specific direction using this model in the context of prevention/treatment of DM is measuring continued health behavior modification with a more distal focus in the postpartum period, such as at the 6-week routine and annually when glucose tolerance screening is recommended. A greater understanding how HP use of leadership styles is associated with short and long-term health behavior modification outcomes could lead to new approaches for health promotion and disease prevention. An awareness of how transformational leadership skills consider, inspire, motivate and transform individual patient's decision-making/goal setting and behavior modification should be sought after. This process of social/professional influence should be compared to the use of specific protocol reinforced recommendations for health outcome achievement in terms of satisfaction, quality of life and other variables.

Additional considerations for future research include the following: 1) adding research variables from the HPI conceptual model such as time, number and duration of visits by HP/DE, previously established personal or family relationship and interaction with HP prior to this pregnancy, and additional concordance factors, such as personal similarity and HP communication/patient learning styles; 2) further inquiry into how quality of information and interaction but not social influence was associated with self-efficacy, while both predicted different outcomes, 3) other factors of HPI that could increase self-efficacy and further exploration of its role as a mediator and moderator in outcome behavior modification; 4) deepening the inquiry into the leadership style of DEs may provide additional information and guidance for their improved influencing.; and 5) inclusion of other sources of social facilitation-support and influence to augment the

professional influence via family, community, peer, media or technological sources is another area of future research.

Finally, more comprehensive outcome measures for healthy eating, physical activity, and glucose monitoring behaviors and modifications to the SIQ would increase the strength of this design. Minor changes include modifying the HE2, protein for breakfast measure to include the number of protein portions at breakfast daily or weekly or overall daily portions. Another direction would be the development and use of an application that would assemble, analyze and report out what is entered into them including timing of meals, amount, type and nutrient-content of foods, such as protein, carbohydrates, fats, total calories in and used, BMI, physical activity tracker for time spent in exercise, and glucose results would provide invaluable information, but of course is sensitive to accurate input. The modification of the SIQ measure would include glucose monitoring items with a focus on inclusion of transformative leadership language throughout the instrument.

Summary

This chapter provides additional discussion regarding results for research findings not previously discussed in the manuscript, "Healthcare Provider Influence on Health Behavior Modification in Gestational Diabetics (Appendix E). It adds policy and educational implications and additional future research recommendations for consideration.

Conclusion

This pilot study's exploratory findings provide initial glimpses into the association between professional influence variables on health behavior modification.

Patients' perception of their healthcare providers' influence, the quality of information and interaction in teaching encounters, their leadership style, their specialty, and patient-healthcare provider concordance factors provide initial insight and awareness of what and how influence works for improving GDM patients' engagement in health behavior modifications. Healthcare provider self-reflection on practice, communication, interaction and leadership style could motivate the desire for professional transformation and play a role in influencing increased patient engagement in health behaviors. Every healthcare provider and every patient have the potential to become or do more. While some factors such as race, language, personal or family history, and concordance factors may increase or decrease this influencing potential, an awareness of these relationships can guide personal or organizations strategies for growth and improvement. There are numerous future directions for professional influence research.

Results Tables and Figures

Table 1: Total Sample Demographics and Descriptors				
	Range Mean (SD)			
Variable	**Control P1 (n=126)**	**Control P2 (n=117)**	**Study P1 (n=84)**	**Study P2 (n=78)**
Gender	Female 100%	Female 100%	Female 100%	Female 100%
Age****	18-39; 29.35(5.1)	18-39; 29.41(5.13)	18-41; 31.98(5.44)	18-41; 32.06(5.14)
Race/Ethnicity				
White	50.8%	48.7%	42.9%	44.9%
Black	12.7%	12.8%	15.5%	14.4%
Asian	3.2%	3.4%	13.1%	11.5%
Latina	31.7%	34.2%	27.4%	28.2%
Other	1.6%	0.9%	1.2%	1.3%
Primary Language****				
English	69.8%	67.5%	60.7%	61.5%

Spanish	28.6%	30.8%	23.8%	24.4%
Other	1.6%	1.7%	15.5%	14.1%
Years in US	0.1-39; 23.59(11.04)	0.1-39; 23.21(11.29)	0.3-41; 21.95(11.86)	0.3-41; 22.3(12.05)
Education	3-25; 13.96(4.31)	3-25; 13.79(4.3)	3-23; 14.66(4.46)	3-23; 14.75(4.48)
Insurance				
Medicaid	54%	55.6%	46.4%	43.6%
Private	46%	44.4%	53.6%	56.4%
Nulliparity				
Yes	27%	27.4%	33.3%	33.3%
Intended pregnancy				
Yes	63.5%	64.1%	71.4%	71.8%
Desired HP				
Yes	97.6%	97.4%	97.6%	98.7%
GDM screening****				
Early	75.4%	73.5%	51.2%	48.7%
Routine	24.6%	26.5%	48.8%	51.3%
GDMPFH**	63.5%	63.2%	77.4%	75.6%
GDMPH***	12.7%	12%	28.6%	25.6%
FH DM 1st degree	36.5%	36.8%	47.6%	47.4%
FHDM	57.9%	58.1%	70.2%	70.5%
1st degree	62.2%	62.3%	67.8%	67.3%
Grandparent	31.1%	30.4%	28.8%	29.1%
Other	6.8%	7.2%	3.4%	3.6%

(Notes: Chi-square difference in P1 control and study groups: [*p ≤.1, **p ≤.05, ***p≤.01, ****p≤.001; DM: Diabetes Mellitus; GDM: Gestational Diabetes Mellitus; GDMPFH: personal/family history of GDM/DM.; HP: Healthcare Provider

Table 2 Correlation Matrix																			
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**
ΔHE1 (1)		**.38******	15	02	14	-.06	-.03	05	05	06	**.2***	**.27****	17	**-.24****	005	07	04	-.25	**-.23****
ΔHE2 (2)			-.01	07	-.001	-.08	-.04	1	-.06	-.06	1	08	**.22****	-.11	04	09	**.2***	06	02
ΔHE3 (3)				04	09	-.08	-.05	-.02	07	06	12	05	-.05	09	02	09	**.21***	06	-.04
ΔPA1 (4)					21*	-.01	**.28****	-.04	-.1	-.17	-.13	-.15	07	-.07	06	14	11	-.09	-.003
ΔPA2 (5)						-.04	.18	-.17	04	01	-.002	01	17	-.11	-.14	13	-.08	-.13	-.16
GM1 (6)							**.63******	**.25****	-.14	09	-.09	-.01	-.13	14	11	-.15	-.05	07	**.19***
GM2 (7)								05	-.17	07	-.04	-.06	07	01	05	-.06	-.02	-.02	05
GM3 (8)									-.08	01	-.03	-.03	**-.22****	-.17	-.06	**-.25****	11	-.09	-.12
SIQHP (9)										**.59******	**.38******	**.27****	06	02	-.05	11	09	-.01	**.26****
SIQDE (10)											**.45******	**.55******	06	06	-.06	-.02	04	-.07	**.2***
QOIIHP (11)												**.79******	**.31*****	**-.19***	**-.27****	15	06	14	01
QOIIDE (12)													**.26****	**-.2***	**-.3*****	11	-.08	-.02	.1
DSES (13)														**-.32*****	-.02	14	05	11	-.02
RC (14)															**.46******	.1	-.13	14	**.21***
LC (15)																02	07	1	**.27****
GC (16)																	-.18	**.53******	03
GDMPFH (17)																		-.04	06
HP Spec (18)																			06
MLQ (19)																			

(Notes: Significant findings bolded [*p ≤.1, **p ≤.05, ***p≤.01, ****p≤.001,), ΔHE1: Healthy Eating 1 Change Score, ΔHE2: Healthy Eating 2 Change Score, ΔHE3: Healthy Eating 3 Change Score, ΔPA1: Physical Activity 1 Change Score; ΔPA2: Physical Activity 2 Change Score. RC: race concordance. LC: language concordance, GC: gender concordance, GDMPFH: personal/family history of GDM/DM. HP SPec: Healthcare provider specialty, MLQ: Leadership style, DSES: Self-efficacy

Table 3: Outcome Changes Over Time (Phase 1 to Phase 2)		
	Control (N=117) N (%)	Study (N=78) N (%)
HE1		
No change	65 (55.6)	45 (57.7)
Increase	34 (29.1)	23 (23.1)
Decrease	18 (15.4)	10 (12.8)
HE2		
No change	86 (73.5)	59 (75.6)
Increase	27 (23.1)	12 (15.4)
Decrease	4 (3.4)	7 (9)
HE3		
No change	44 (37.6)	22 (28.2)
Increase	41 (35)	40 (51.3)
Decrease	32 (27.4)	16 (20.5)
PA1		
No change	53 (45.3)	31 (39.7)
Increase	34 (29.1)	39 (50)
Decrease	30 (25.6)	6 (8)
PA2		
No change	26 (22.2)	18 (23.2)
Increase	56 (47.9)	34 (43.6)
Decrease	34 (29.1)	26 (33.3)
GM1 (7 days/week)		61 (78.2)
GM2 4 times/day)		41 (52.6)
GM3 (≤ 2 abnormal results week)		60 (76.9)

Notes: HE1: Healthy Eating 1, HE2: Healthy Eating, HE3: Healthy Eating 3, PA1: Physical Activity 1, PA2: Physical Activity 2; GM1: Glucose monitoring 1, GM2: Glucose monitoring 2, GM3: Glucose Monitoring 3

Table 4: Paired t-tests				
DV Control P1P2(n=117) Study P1P2(n=78) P2-P1 Diff Δ	Range	M(SD) M(SD) W/I Grp Diff P2-P2	Std Error Mean (Diff)	Within group Mean diff Sig(p) t (df) Control (116) Study (77)
HE1				
Control				
P1		5.39(2.22)	.21	
P2	-5-+7	5.91(1.95)	.18	
Diff (P2-P1)		.52(1.87)	.17	3.01 (.003)
Study				
P1		5.43(2.23)	.25	
P2	-7-+6	5.94(1.78)	.2	
Diff (P2-P1)		.51(2.03)	.23	2.23 (.03)
HE2				
Control				
P1	-1-+1	.72 (.45)	.04	
P2		.91(.28)	.03	
Diff (P2-P1)		.2(.48)	.04	4.45 (.000)
Study				
P1	-1-+1	.82(.39)	.04	
P2		.88(.32)	.04	
Diff (P2-P1		.06(.49)	.06	1.15 (.25)
HE3				
Control				
P1	-3-+3	2.08(1.16)	.11	
P2		2.13(1.14)	.11	
Diff (P2-P1)		.05(.89)	.08	.63 (.53)
Study				
P1	-3.5-+4.5	2.3(1.51)	.17	
P2		2.78(1.34)	.15	
Diff (P2-P1)		.48(1.12)	.13	3.79 (.000)
PA1				
Control				
P1	-180-+165	31.92(52.13)	4.9	
P2		31.41(47.68)	4.41	
Diff (P2-P1)		-.51(55.22)	5.11	-.1 (.92)
Study	-165-+180			
P1		25.58(44.98)	5.09	
P2		44.62(53.24)	6.03	
Diff (P2-P1)		19.04(47.91)	5.43	3.51 (.001)
PA2				
Control				
P1	-450-+255	98.46(95.26)	8.81	
P2		106.54(89.42)	8.28	
Diff (P2-P1)		8.08(103.52)	9.57	.84 (.4)
Study	-420-+360			
P1		124.42(134.95)	15.28	
P2		125(119.01)	13.48	
Diff (P2-P1)		.58(119.45)	13.53	.04 (.97)

Notes: HE1: Healthy Eating 1, HE2: Healthy Eating 2, HE3: Healthy Eating 3, PA1: Physical Activity 1, PA2: Physical Activity

Table 5: One-way repeated measures ANOVA within and between groups		
	Within Group (1,191) ANOVA F, p, partial η^2 within/ *group F between group diff	**Between group**
HE1	**F=13.317, p ≤.001, η^2 = .07** *Grp F = .000, p =.99, η^2 =.00	F = .016, p =.9, η^2 =.00
HE2	**F=13.592, p ≤.001, η^2 =.07** ***Grp F= 3.51, p =.06, η^2 =.02**	F = .802, p =.37, η^2 = .004
HE3	**F = 13.61, p ≤.001, η^2 =.07** ***Grp F=8.837 p =.003, η^2 =.04**	**F = 6.443, p = .01, η^2 = .03**
PA1	**F=.5845, p =.02, η^2 = .03** *** Grp F= 6.51, p ≤.01, η^2 = .03**	F = .309, p=.58, η^2 =.002
PA2	F=.289, p =.59 partial η^2 =.001 *Grp F=.217, p = .64, η^2 =.001	**F=2.699, p = .1, η^2=.01**

Notes: HE1: Healthy Eating 1, HE2: Healthy Eating 2, HE3: Healthy Eating, PA1: Physical Activity 1; PA2: Physical Activity 2.

Table 6: One-way repeated measures ANCOVA		
	Within Group Covariate/Group Interaction effect (1,192); BMI F, p, partial η^2	**Between Group Covariate interactions** (1, 191) F, p, partial η^2
HE1	***Race F=4.494, p=.04, η^2 = .02** *Grp F= .001, p=.98, η^2 =.00 *Lang F=.808, p= .37, η^2 =.004 *Grp F = .000, p=.99, η^2 = .00 * GDM F = 1.869, p=.17, η^2 =.01 *Grp F = .037, p=.85, η^2 =. 00	**Race F = 9.105, p = .003, η^2 = .05** **Lang F = 3.316, p=.07, η^2 = .02** **GDM F =5.212, p=.02, η^2 = .03**
HE2	*Race F=2.276, p=.133, η^2 = .01 ***Grp F=3.56, p=. 06, η^2 =.02** *Lang F=.015, p= .9, η^2 = .00 ***Grp F = 3.485, p=.06, η^2 = .02** * GDM F =2.258, p=.14, η^2 =.01 ***Grp F =4.242, p=.04, η^2 =.02**	**Race F= 3.602, p =.06, η^2 = .02** Lang F = 1.752, p =.19, η^2 = .01 GDM F = .198, p=.66, η^2 = .001
HE3	*Race F=.729, p=.39, η^2 =. 004 ***Grp F=8.801, p=. 003, η^2 = .04** *Lang F= .022, p=.88, η^2 =.000 ***Grp F = 8.729, p=.004, η^2 = .04** ***GDM F = 3.698, p=.06, η^2 =.02** ***Grp F = 7.383., p<.01, η^2 =.04**	**Race F= 19.517, p≤.001, η^2 = .09** **Lang F =14.87, p≤.001, η^2 = .07** GDM F =.672, p=.41, η^2 = .003
PA1	*Race F=1.806 p=.18, η^2 = .01 ***Grp F=6.569, p=.01, η^2 =.03** *Lang F= .585, p=.45, η^2 = .03 ***Grp F = 6.935, p=.01, η^2 = .04** * GDM F = 1.01, p=.32, η^2 =.01 ***Grp F = 5.754., p=.02, η^2 =.03**	Race F= .185, p= .67, η^2 = .001 Lang F =.415, p=.52, η^2 = .002 GDM F = .661, p=.42, η^2 = .003
PA2	*Race F=.784, p=.38, η^2 =.004 *Grp F=.221, p .64, η^2 = .001 *Lang F= .616, p= .43, η^2 =.003 *Grp F = .331, p=.57, η^2 = .002 ***GDM F=2.965, p=.09, η^2 =.02** *Grp F = .057, p=.81, η^2 =.00	Race F=1.585, p=.21, η^2 = .01 Lang F =1.201, p=.27, η^2 = .01 GDM F =.002, p=.97, η^2 = .00

Notes:

HE1: Healthy Eating 1, HE2: Healthy Eating 2, HE3: Healthy Eating, PA1: Physical ctivity 1; PA2: Physical Activity 2, **p<0.1**

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APPENDICES

Appendix A

Table of Abbreviation

Table 1: Abbreviations
BMI: Body Mass Index DSES: Diabetes Self-Efficacy Scale EBQ+1: Eating Breakfast Questionnaire +1 GC: Gender Concordance GDMPFH: Personal/Family History of Gestational Diabetes Mellitus/ Diabetes Mellitus GM1: Glucose Monitoring Question 1: Glucose Monitoring days/week GM2: Glucose Monitoring Question 2: Glucose Monitoring 4 times/day GM3: Glucose Monitoring Question 3: Abnormal blood glucose results/weekly GMQ: Glucose Monitoring Questionnaire ΔHE1: Healthy Eating 1 Change Score: Frequency of Eating Breakfast/Weekly ΔHE2: Healthy Eating 2 Change Score: Eating Protein for Breakfast ΔHE3: Healthy Eating 3 Change Score: Vegetable Portions/Daily HP specialty: Healthcare Provider Specialty LC: Language Concordance MLQ: Multifactor Leadership Questionnaire- Healthcare Provider Leadership Type P1: Phase 1 P2: Phase 2 PAS: Physical Activity Scale ΔPA1: Physical Activity Change Score 1: Stretch/Strengthen Exercise Minutes/Weekly ΔPA2: Physical Activity Change Score 2: Aerobic Exercise Minutes/Weekly QOII: Quality of Information and Interaction GDM QOIIDE: Quality of Information and Interaction GDM-Diabetes Nurse- Educator Total Score QOIIHP: Quality of Information and Interaction GDM-Healthcare Provider Total Score RC: Race Concordance SIQ: Social Influence Questionnaire-GDM SIQDE: Social Influence Questionnaire-GDM-Diabetic Nurse-Educator SIQHP: Social Influence Questionnaire-GDM-Healthcare Provider TAL: Transactional Leadership TFL: Transformational Leadership

Appendix B

Manuscript I: Integrative Review and Development of a Model of Healthcare Provider Influence

Integrative Review and Development of a Model of Healthcare Provider Influence

Denise K. FRYZELKA, MS, CNM
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Abstract

Background: Effective communication impacts several patient and healthcare measures, including patient satisfaction, health status, and treatment adherence. Influence, frequently associated with communication, is used ubiquitously and primarily to describe an action or effect between persons, however the concept of healthcare provider influence has not been explicitly described in nursing or health sciences literature

Aim: To understand the process of healthcare provider influence on patient health behavior modification.

Design: Integrative review of the healthcare literature

Data Sources: PubMed and CINAHL 1992-2013

Review Methods: The research questions and recommendations by Whittemore and Knafl (2005) guided the methods used for retrieval and analysis of relevant publications and synthesis of the literature.

Results: Synthesis of the relevant publications (n=8) resulted in the development of a model and definition of healthcare provider influence. Healthcare provider influence is defined as a process wherein a purposeful interpersonal interactive, collaborative, and transformative relationship develops between a patient and healthcare provider working together toward a specific focus of health behavior modification. Components include social, communicative, emotive, cognitive, concordant, and logistic factors. Conditions include a healthcare need, mental capacity for decision-making, and potential for interaction. Outcomes include health behavior modifications and cognitive and emotive enhancement. Relevance to populations wherein values and beliefs vary significantly from the interpersonal collaborative perspective that underpins this healthcare provider influence model may not be possible.

Conclusion: A definition and model of Healthcare Provider Influence can be utilized to understand and research the influence providers can exert on health behavior modification.

Keywords: influence, healthcare, provider, professional, clinician, integrative literature review.

SUMMARY STATEMENT

Why is this review needed?

- Extensive research has explored patient-centered communication by healthcare providers and its relationship to patient outcomes, including patient satisfaction, preventive health practices, adherence to treatment plans, and improved patient health.
- Patient-centered communication is foundational to healthcare provider influence, but it is only part of the process.
- Understanding the healthcare provider role in influencing patients can provide a new perspective or approach for modifying health behaviors, improving health outcomes, and decreasing costs associated with poor health behaviors.

What are the key findings?

- An integrative review of the literature unearthed very few references to healthcare provider influence and found it to be a form of social influence. There was no description, definition, or model to explain the process.
- HPI is the name given to a concept that is used to describe the process of how and what HPs do that contribute to patients envisioning, desiring, and activating steps to make modifications in their thinking, desires, motivation, goals for health behavior modification.
- Healthcare provider influence is a process wherein a purposeful interpersonal interactive, collaborative, and transformative relationship develops between a patient and a healthcare provider working together toward a specific focus of health behavior modification.

How should the findings be used to influence policy/practice/research/education?

- The definition and conceptual model of healthcare provider influence should facilitate the complex process of influence that can affect transformative health behavior changes in a patient through interaction and collaboration.
- Healthcare policy, practice and research should incorporate the concept of healthcare provider influence which places the onus of responsibility on the healthcare provider to stimulate patient health behavior changes in a manner that emphasizes patient self-advocacy.

INTRODUCTION

Healthcare literature is replete with communication research that describes effective patterns and characteristics of patient-provider relationships, barriers to and factors to improve communication among individuals, groups and systems within the health care professions, and how communication impacts health behaviors and outcomes. Multiple variables affect patients and their modification of health behaviors and health outcomes. However, a noticeable gap in the literature revealed lack of a comprehensive description regarding the intricate process or essential components of the relationship between healthcare providers (HPs) and patients that are necessary to influence patient adaptation and modification of health behaviors and ultimately health outcomes. This comprehension of how patients prioritize and modify health behaviors in interaction and collaboration with their HP, what HPs do or do not do, and how HPs do or do not influence these changes is important for HP educational preparation and for planned implementation of health promotion strategies. HP-patient communication is ubiquitous to all areas of healthcare. The term "healthcare provider" (HP) will be hereafter used to include all terms for or categories of trained health professionals that designate provision of care to a patient, including but not limited to providers, professionals, healthcare professionals, healthcare providers, advanced practice nurses or advanced nurse practitioners, nurses, clinicians, physicians, doctors, and allied healthcare providers.

REVIEW

Aim

The aim of this integrative review was to gain a greater understanding of the interpersonal process of influence and the role that HPs have on patients' decisions and goals, and in facilitating, initiating, and supporting implementation of health behavior modifications in order to address chronic or acute healthcare concerns, problems, or diagnoses and improve health outcomes. Understanding this influence from the perspective of the patients and how this influence drives or assists in increasing knowledge and motivation for health behavior change is

imperative.

Two specific questions provided the direction for this review: (1), "What is known in the health care research literature about the influence of HPs on the patients' adaptation and modification of health behaviors related to treating or preventing acute and chronic illness and diseases? and (2), "What are the most influential elements that HPs contribute to patient understanding, motivation, adaptation and modification of health behaviors related to acute and chronic health problems?"

Design

The integrative review of the healthcare literature was undertaken to understand the published literature related to the concept of influence specific to HPs. The search methods, analyses, and synthesis for this review were guided by the recommendations of Whittemore and Knafl (2005).

Search Methods

Searches were conducted utilizing PubMed and Cumulative Index of Nursing and Allied Health Literature (CINAHL) electronic databases to provide a comprehensive perspective from nursing, socio-psychology, medicine, and allied health care professions research. To include an international perspective and current relevant research findings, criteria included national and international research and scholarly publications, in English from 1992-2013. The search term "influence" was linked with "healthcare", "health care", "provider", "professional", and "clinician" in seven different search combinations to retrieve the largest number of references possible for review.

Due to the scarcity of publications and to expound the complex concept of healthcare provider influence, hereafter named HPI, it was necessary to further explore patient-centered communication (PCC), one of its main tenets. Several principal research publications regarding PCC, from the copious supply available, were retrieved as essential references for describing HPI.

Search Outcome

The final number of publications referencing "influence" obtained and reviewed after elimination of duplicates totaled 26. After a review of these publications for relevance, however, the total number included in the analysis was reduced to eight. The search strategy, terms, and total retrieved for each combination are presented (Table 1). Additional theory and PCC references were also included in the final analysis.

Quality Appraisal

After relevance was determined, ancestral searching was conducted, and publication reference lists were scrutinized for additional relevant references. References were retained if they were retrieved from peer-reviewed publications or scholarly commentaries and included a description or reference to HPI, theoretical or experimental, even if related to a specific disease or population.

Data Abstraction

The publications were analyzed for type of research, population, research query or theoretical basis, relation to HP or patient, health behaviors, outcomes, as well as descriptors, definition, process or characteristics of influence. A matrix was used to organize the references and findings (Table 1) to facilitate synthesis.

Synthesis

Requiring an iterative and reflective process, all references were reviewed for conditions, components or descriptors, and outcomes that were then classified and named. Several classifications serve as categories of components as well as conditions or outcomes of the process of influence. For example, cognitive knowledge and awareness serve as both a category of transformation as well as, when enhanced, also functions as an outcome, and physical, also

functions as both a category of condition as well as an outcome (Figure 1). A synthesis of the data ensued, and a conceptual model was developed to clarify and describe the characteristics and components of HPI.

RESULTS

Throughout the literature, the term 'influence' has been utilized as an action or result between factors or individuals or as a description of an individual or a system, including references to the influence that HPs have on patients. It has not been well described or analyzed as a concept, which embodies a process of impacting or affecting a change or modification. It has however been used frequently as a verb in association with other terms such as when discussing or describing outcomes or behaviors. Surrogate terms for influence include affect, effect, and impact. Due to the lack of description and definition of HP influence, the process selected to clarify HPI was the development of a conceptual model from the integrative synthesis of the literature.

Influence cannot occur without communication, one of its main components. It could not therefore be well isolated from the patient-provider and effective communication (EC) literature. When EC is described, it is almost always in relation to the EC results, its effects, or influences. Therefore, multiple references related to aspects and emerging trends in the healthcare communication research literature are included as they provided vital foundational elements for the development of the HPI model.

Development of the HPI Definition and Conceptual Model

After synthesizing the results from the integrated review of the healthcare literature, the necessary components for describing HPI became apparent and within the context of health care, a description, definition, and conceptual model of HPI were developed (see Figure 1). HPI is the name given to a concept that is used to describe the process of how and what HPs do that contribute to patients envisioning, desiring, and activating steps to make modifications in their thinking, desires, motivation, goals for health behavior modification. HPI is defined as a process

wherein a purposeful interpersonal interactive, collaborative, and transformative relationship develops between a patient and a HP working together toward a specific focus of health behavior modification. The conditions, components and outcomes of the concept are described.

Conditions

For HPI to occur, there are necessary conditions that must be in place. These are patient-related and categorized as mental-physical and resources. Mental-physical includes an existent or elevated risk for an impending health problem or need, the mental and physical capacity for decision-making and health behavior modification, and finally, an awareness of how to access and initiate a relationship. Access may include navigation of the infrastructure established by healthcare policy, insurance, and organizations and there must be an opportunity for interaction. Resources include time and means, such as finances, insurance, and transportation to access or seek care whether in a physical or virtual space (Jucks et al., 2012). Some patients lack the ability to interact or process and understand basic health information they need to make decisions due to cognitive, mental or speech disorders (Travaline et al., 2005, Tarkan, 2008), creating barriers to HPI. Events of illness, pain or stress, prolonged wait or access times, time constraints, physical space or ambiance as well as lack of income or resources, such as, insurance, transportation or technology may also impede or influence the HP-patient interaction and adherence to recommendations (Sheppard et al., 2004, Travaline et al., 2005, Verlinde et al., 2012).

Components

Fundamental to HPI is a relationship that is interpersonal between a patient and HP within a healthcare context and purposeful due to the designated roles of each. The central and essential dimension upon which the concept of HPI is based is social-communication. The HPI model describes a process that evolves because of this relationship that includes three primary components: interaction, collaboration, and transformation. Four additional categories are described under the primary components they most strongly support, although there is

unquestionably a relationship across components. The categories are logistics and concordance, linked to interaction, and cognitive and emotive, linked to transformation.

Social-Communication

Pivotal to HPI and all its components and categories is social-communication, and more specifically, PCC. Effective interpersonal communication (EC) is described as a dynamic and ongoing process between patients and providers leading to understanding of each other's perspectives, cooperation, and coordination (Stewart, 1995, Epstein & Street, 2007). EC becomes PCC when the patient is viewed and approached as a whole person with a unique personal history and having individual needs from a bio-psycho-social or holistic perspective (Charlton et al., 2008, Hartog, 2009, Verlinde et al., 2012). PCC skills and care are based in human respect, central to culturally competent care, used in verbal, non-verbal and virtual communication, and involve patient-value guided clinical decisions (DiMatteo, 1995, National Research Council, 2001, Verlinde et al., 2012). Examples of PCC skills include; (a) understanding patient's perspective of illness, causes, treatment options, and ability to adhere to recommended treatment; (b) active and careful listening; (c) asking non-judgmental questions about concerns and expectations for treatment; (d) empathetic understanding; (e) providing clear and thorough information, explanations, and recommendations; (f) not avoiding discussion of sensitive topics: and (g) engaging in negotiation by involving and working with patient to problem-solve and set realistic and achievable health lifestyle goals for behavior change as well as coaching and empowerment (Koster et al., 2005). Both EC and PCC have been described as important components for clinical management of chronic diseases, patient compliance and adherence to treatment recommendation, self-management, influence on patient health behavior modification, alteration of patient perception of health-damaging effects and as well as reduction in preventable adverse events (Jerant et al., 2005, Durant et al., 2009, Jensen et al., 2010). An analysis of seven studies of nurse practitioners' communication styles demonstrated that use of PCC influences patient outcomes, such as increased understanding of problem, adherence to treatment, pain

control, symptom resolution, overall health status and satisfaction as well as diagnostic expediency and accuracy by the HPs (Charlton et al., 2008). Multiple research efforts have demonstrated that the overall quality and consistency in communication as well as specific characteristics of the HP-patient interaction utilizing PCC positively impacts these same outcomes (Street, 2002, Duberstein et al., 2007, Jensen et al., 2010). When communication is not effective or PC, the opposite outcomes have been demonstrated (DiMatteo, 1995, Koster et al., 2005, Durant et al., 2009).

PCC training models teach HPs the process of EC with patients as well as behaviors to avoid in order to improve the HP-patient interaction. One such model, AGENDA, stands for Agenda and health Goal setting; Expressing concerns, questions, and negotiations; Navigating health literacy issues; Disclosing detailed information; and Active types of listening (Arnold et al., 2012). Patient communication training has improved interaction and increased patient health knowledge, organization, and positive attitudes during visits (Talen et al., 2011).

Non-verbal communication behaviors, such as eye gaze, tone of voice, and proximity of the patient and HP to each other affect outcomes, such as patient satisfaction (Mast, 2007). In written HP-patient communication interactions, such as email, the importance of awareness, anticipation, and continuous vigilance to elements of PCC by the HP were deemed to be necessary to identify discrepancies in patient self-reports of knowledge and understanding of medical conditions that indicated lack of full comprehension (Jucks et al., 2012).

When "influence" is used in the health communication literature, PCC is frequently referenced. Not only the HP's communication style but also the HP's personal qualities have been identified as sources of potential influence (Verlinde et al., 2012). HPI is considered a form of social influence wherein a social process occurs between the HP, the social influencer and the patient, the influenced. "Social influence is the attempt of one or more individuals to alter, modify or change the attitudes, reactions or behaviors of another individual or group (Gabel, 2012). The Integrated Theory of Health Behavior Change (ITHBC) classifies professional influence, a type

of social influence, under social facilitation, and describes a knowledgeable person in a position of perceived authority who sways the thinking and motivation of another, leading to engagement in behavior (Ryan, 2009). In a study based on ITBHC, social influence was associated with postpartum weight self-regulation, but the influencers included family, friends, and/or providers (Ryan et al., 2011).

Interactive

HPI is a process, which may occur within a single patient encounter but is more successful if it is continuous, evolving, and builds on previous steps or events. It is an interpersonal interactive process, thus involving and between at least two persons or individuals, in this case, a patient and a HP, and denoting an intended productive action and a positive outcome. It is not a unidirectional HP to patient instruction, characterized by passive receptivity on the part of the patient that is more representative of an oppressive relationship between the individuals wherein the HP is significantly more dominant and controlling or demanding. The process does not have to be person to person within the same space but there must be an interaction. This means that HPI can occur in virtual as well as physically shared space settings (Jucks et al., 2012). While the work of the process may be predominantly social-communicative, the external portrayal of that action may be presented as behavior or behavior modification outcome.

Logistics

Time and physical and virtual environment have an impact on patient behaviors and perspectives. Measures of influence in published research frequently focused on logistical aspects of time, such as time spent in interaction or counseling, length of the HP-patient relationship, and timing of interaction correlating to increased patient disclosure and seeking of health care (Morrison, 1996, Scholle & Kelleher, 2003, Orford et al., 2006). Increased time spent or continuity of care over time in the HP-patient relationship increased trust, access to and quality of health care, more preventive services, higher patient satisfaction and improved patient's

perception of the quality of interactions between themselves and their HP (Sheppard et al., 2004, Wallace et al., 2009, Verlinde et al., 2012). HPs who interacted and spent adequate time inside and outside of the exam room were perceived by patients to be more competent (Shay et al., 2012).

Concordance

Concordant factors refer to the similarity of characteristics that the HP and the patient share such as race, culture, age, gender, socioeconomic status, language, literacy, religion, and personality (Cooper-Patrick et al., 1999, Travaline et al., 2005). HP-patient concordance in demographics, language, culture, values and beliefs, experiences, and patient characteristics are important sources of potential influence and have been shown to impact patient expectations, health behaviors and status (Anderson, 1999, DeVoe et al., 2009, Verlinde et al., 2012). Discordance can negatively affect a patient's perceptions of the relationship and interaction with their HP, the content of the consultation, and healthcare delivery (Bertakis, 2009, Verlinde et al., 2012). Less time and explanation regarding treatment and diagnoses and less patient participation were reported when socioeconomic discordant factors, such as low income, limited education or health literacy were present (Verlinde et al., 2012). Discordance in culture and native language, as well as failure to provide or correct these via interpretive services, for example, have been found to correlate with increases in health care use and costs, hospitalizations, misdiagnoses, infection transmission rates, sicker patients, missed appointments, as well as, decreases in patient trust, satisfaction, willingness to follow advice, compliance with medical or treatment recommendations, continuation of care, health status, preventative behaviors, and provider satisfaction (Smith & Pietrzyk, 2012).

Significant practice style behavior and foci differences, such as emphasis on preventive services and psychosocial counseling, and higher satisfaction ratings and empathy were found in female compared to male HPs with increased rates for both found for female HPs, even after adjustments for patient characteristics, physician practice style, gender discordant factors and

other variables such as age, ethnicity, and personal experience were examined (Bylund & Makoul, 2002, Bertakis, 2009). These differences and discordant variables can alter the structure of the communication and affect goals, skills, perceptions, emotions and overall influence the HP-patient interaction (Street, 2002, Markova & Broome, 2007, Bertakis, 2009).

Corrections to or modification of discordant factors or use of collaborative PCC in discordant relationship interactions positively influenced patient perception of communication quality, increased emotive factors such as faith and trust, and other outcome measures (Anderson, 1999, Schoenthaler et al., 2012, Verlinde et al., 2012). Provision of language access services for improved language concordance increased EC, trust, access to and quality of health care, more preventive services, higher patient satisfaction and improved patient's perception of the quality of interactions between themselves and their HP (Gregg & Saha, 2007; Wallace et al., 2009).

Collaborative

The process of HPI is also collaborative, with a patient and HP working together on a mutual understanding of information, agenda setting, goal congruence and decision-making. Collaboration requires interaction via EC between a patient and HP within a relationship that is therapeutic, balanced, and reciprocal with shared power and responsibility and equal participation (Mead & Bower, 2000, Talen et al., 2011, Verlinde et al., 2012). Sharing information, appreciating the other's strengths and differences, establishing mutually agreed upon priorities and goals, and sharing decision-making are all aspects of collaboration and found to be essential for improved health status (Cegala et al., 2000, Street & Millay, 2001, Bylund et al., 2010).

The primary purpose of collaboration is decision-making. Patients have different perspectives, priorities, needs, preferences and approaches to decision-making. HPs have been described as influential in both autonomous and shared decisions with patients. They are encouraged to be cognizant of their own professional influence in this process (Rempel et al., 2004). Awareness of communication differences, understanding the different values and beliefs that guide decisions, and providing active support and assistance rather than pressure are

influential in optimizing PC decision making (Anderson, 1999, Rempel et al., 2004). Tailoring information, eliciting perspectives, asking questions, determining outcomes, ensuring collaboration and assessing other HP-patient characteristics are also imperative to this process (Tinetti & Basch, 2013, Verlinde et al., 2012).

When shared decision-making was emphasized, self-reports of greater adherence to treatment recommendations and improved health outcomes in patients with chronic diseases resulted (Stewart, 1995, Stewart et al., 2000). Shared decision making with HPs is the preference of more than 70% of patients, although this is not consistent across all patient populations as certain subsets prefer HP-delegated decision-making (Chewning et al., 2012).

Transformative

The process of HPI is also transformative. Cognitive and emotive transformation can begin as soon as HP-patient interaction is initiated and continues as the relationship evolves. It can occur with HP provision of health information, skills, and recommendations that lead to increased patient knowledge, awareness, motivation, desire, trust, respect, rapport and confidence, if received and acted upon for health behavior modification.

Power and leadership are required for this transformative component of HPI, a type of social influence (Gabel, 2012). The Transformational Leadership Model developed by Gabel (2012), social psychologist, provides a strong foundation upon which HPI is constructed. It describes a relationship between power and leadership, the types of power that play a potential role, and the appropriate exertion of power and leadership that is necessary to foster PC goals (Gabel, 2012). Expert power is that which comes from the HP as the "health problem expert" in the relationship and referent power is that which is derived from being respected or trusted, increasing as the relationship builds (Raven, 2008, Gabel, 2012). "Leadership involves working in socially appropriate ways to influence others in subordinate or follower positions to achieve principle-driven goals or objectives that these individuals may not have wanted to reach, may not have thought of reaching, or may not have had the courage or motivation to attempt on their own"

(Gabel, 2001) whereas, power is described as the strategies used by leaders to influence those in subordinate or follower positions to achieve important goals (Gabel, 2012). HPI adopts these two concepts, placing the onus of responsibility on HPs as experts and leaders to potentiate patient health behavior modification.

The idea of power and leadership may appear to be in contrast with negotiation, sharing information, "power sharing" and reciprocity, essential components of PC communication (PCC), however a power differential does not negate these components but rather reinforces them via referent power, resulting in empowerment. Empowerment of patients promotes patient engagement in decision-making and consequently improves health outcomes (Stoddart & Bugge, 2012, Verlinde et al., 2012).

Cognitive

The cognitive component should continuously evolve as awareness, understanding, and knowledge about one's health problem or needs, and involvement in treatment choice is enhanced. Cognitive transformation requires HP use of PCC during interaction and collaboration to modify information, strategies, or recommendations to address alterations in patient goals, values, lifestyle factors, motivation, intention and desire for decision-making. In many of the references specific to HPs, influence was described or measured as a transformative component. Inquiries, discussion, and provision of information by HPs via teaching and demonstration increases knowledge, understanding, and adoption of healthy practices (Morrison, 1996, Rempel et al., 2004, Orford et al., 2006, Farmer et al., 2007, Binns et al., 2009). In a study of predictors of breast self-examination (BSE), personal HP-to-patient teaching and HP inquiries about BSE practices were described as provider influence, categorized as enabling and reinforcing factors, and were associated with the proficiency and frequency of patient BSE practice (Morrison, 1996). Similarly, when the HP discussed colorectal cancer screening, odds of patient screening significantly increased (Farmer et al., 2007). Delivery of new or different information than previously received from HPs led to nervousness and subsequently negatively influenced

pursuing previously determined procedures (Gilliam et al., 2008). Discussion of treatment availability and provision of timely referrals for health problems by HPs was categorized as an external influence measure (Orford, et al., 2006). Counseling influenced the patient's perception of HP's role or status as expert, as well as the HP's awareness of own professional and personal values and beliefs and assessment of patient's personal values and beliefs (Anderson, 1999, Rempel et al., 2004). Decreased patient understanding of information was related to decreased questioning about a medical condition, treatment plans, or advice and options, and subsequently less adherence and compliance to treatment recommendations (Arnold et al., 2012).

Emotive

The emotive component includes rapport building with increasing mutual respect, trust, caring, confidence, support, and encouragement. Patient perception of the relationship with their HP, the HP's competence, and faith and trust in their HP were found to be influenced by a number of provider, patient, and visit factors (Shay et al., 2012). Poor HP perceptions and past unfortunate patient experiences can adversely impact trust in HPs and contribute to decreased adherence to treatment recommendations for some patients (Ciechanowski et al., 2001, Sheppard et al., 2004). Conversely, HP use of PCC skills, such as understanding patient's and own values, preferences and emotions while listening and discussing diagnosis and treatment options, allowing control and choice, and expressing concerns stimulated increased trust and positively predicted increased patient perception of HP competence and subsequent adherence to certain protective health behaviors (Epstein & Street, 2007, Sheppard et al., 2004, Verlinde, et al., 2012, Wallace et al., 2009,). Empathy, truthfulness, and hopefulness in HP-patient communication are more effective when compared to purely information-based medical consults (Hartog, 2009; Travaline et al., 2005). Influence has been described as faith and trust in the HP (Anderson, 1999, Rempel et al., 2004).

Outcomes

Patient-related outcomes of HPI can be categorized as cognitive, psychological, behavioral, and physical. Cognitively and psychologically, positive outcomes include an increased awareness, understanding, and knowledge of a personal health problem or need, a heightened perception of self and ability for change, increased desire, intention, and resolution for behavior modification, improved personal health outcomes, and increased satisfaction. Behaviorally and physically, positive outcomes include behavior modification activation, distal and proximal health goal(s) achievement, and improved health status and outcomes. The process of HPI is intended to stimulate patient activation (PA), a concept in the health literature that describes patient's acquiring the understanding, knowledge, skills, beliefs, and confidence and then assuming a primary role in the care process by adapting health behaviors that result in better outcomes and satisfaction with care experiences (Hibbard et al., 2004, Hibbard & Greene, 2013).

Related Models

Two models contain similar constructs to those included in the HPI. Health Behavior Framework (HBF) (Bastani et al., 2010) identifies two categories: (1) physician and health care system factors, under which HP characteristics, health care settings and environment are listed and (2) individual factors: knowledge, communication with provider, health beliefs, social norms and support, past health behaviors, barriers and supports, cultural factors and beliefs. In this patient-centric model, the HBF does not address the HP leadership and expert role or HP communication, only that of the individual patient and HP characteristics. The second model, the Ecological Model of Communication (Street, 2002) describes the social and reciprocal nature and PCC aspects for decision- making and how HP and patient characteristic concordance is influential but lacks other components of influence, health behavior modification outcomes, and the leadership and expert role of the HP.

DISCUSSION

Components of communication, such as different styles, demographic and language concordance, and milieu have been previously described as influencers of health care outcomes

but neither a definition nor a model describing the process of HPI on patient health behavior modification and outcomes has previously been fully described in healthcare research.

HPI Model

A diagrammatic representation of the HP concepts (Figure 1) depicts the components intentionally situated to demonstrate their relationship to one another. Social-communication is centrally located, placed under and extends across the three components (interaction, collaboration, and transformation) as it represents the primary process for the work of these components. The concordance and logistics factors are located under interaction as these primarily relate to space, time, and positive or negative aspects of the interaction. Emotive and cognitive are located under transformation as these are the transformation foci that result from interaction and collaboration. The left to right ordering of interaction, collaboration, and transformation is intended to denote a primarily left to right direction of action although a spiral would illustrate the circular nature of this process ideally.

The HPI model will likely have utility and applicability to a variety of populations, health behaviors, problems, and diseases as health behavior modification is first and foremost an individual issue and this model emphasizes an individual rather than a collective approach, focusing on individual HP-patient characteristics and relationship. The conditions within this model however may not be conducive for use in settings, communities, cultures, or countries in which social or cultural values do not support interaction and collaboration between HP and patient or in which reciprocity in the relationship, mutual respect and trust are not valued.

There are several limitations to this integrative review of the literature and analysis. The HPI model is newly developed and has not yet been utilized or tested in practice or research. Limiting the literature review to PubMed and CINAHL and utilizing quotations around search terms to extract references with conceptual descriptions of influence rather than an action may have limited exposure to other relevant descriptions of the concept HPI or another closely termed concept, although no references reviewed suggested otherwise. There is a wide range of years

selected for publications but restricting to English language may have limited finding international research or descriptions about HPI.

CONCLUSION

The development of the HPI model derived from a synthesis of relevant literature serves to fill a gap regarding the multifaceted process of HPI by providing an expansive and methodical depiction of the role the HP plays in the interaction with patients in transforming the patient's adoption or modification of health behaviors. This model extends the conceptualization of PCC, an essential and well-researched component, to include multiple other variables that collectively correlate to distal or short term as well as proximal or long-term health improvement and outcomes. Clarifying how influence has been described and measured along with this current conceptualization contributes to knowledge development and understanding by HPs about how their demeanor, actions, understanding, communication and interaction with patients contribute to health status.

HPI model research could contribute to the definition, description and measurement of the social facilitation construct in Ryan's Integrated Theory of Health Behavior Change (2009), which serves as an ideal theoretical framework to support the HPI model. Using the HPI model in conjunction with TFL model concepts (Gabel, 2012) provides the framework for the development of new or modifications of existing PCC education and training models and interventions for HPs that have the potential to optimize their interactions during healthcare consultations to assist in achieving optimal patient health outcomes.

The new HPI model provides a foundation for the development of future knowledge, research, interventions, and tailored instruments to measure the influence of nurses and other health care providers across a broad spectrum of patient populations and practice settings, on health behaviors with the long-range goals of improved health care status, decreased healthcare costs, and reduction in the myriad of burdens that accompany health problems. Individual health status and outcomes is a common empirical measure used to grade the overall wealth and well-

being of a community or a country. An influential HP is critical to achieving these outcomes.

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Table 1: Search Strategy and Summary of Articles on Healthcare Provider Influence

Database: CINAHL and PubMed, Years 1992-2013

Combined search terms and results: "influence" linked with each of the following:

healthcare provider (1); health care provider (2); healthcare professional (0); health care professional (0); provider (18); professional (21); and clinician (3).

Cumulative Results: Total 42- duplications (13) = 29 - Dissertations (3, unable to obtain) = 26 - irrelevant (18) = Final (8).

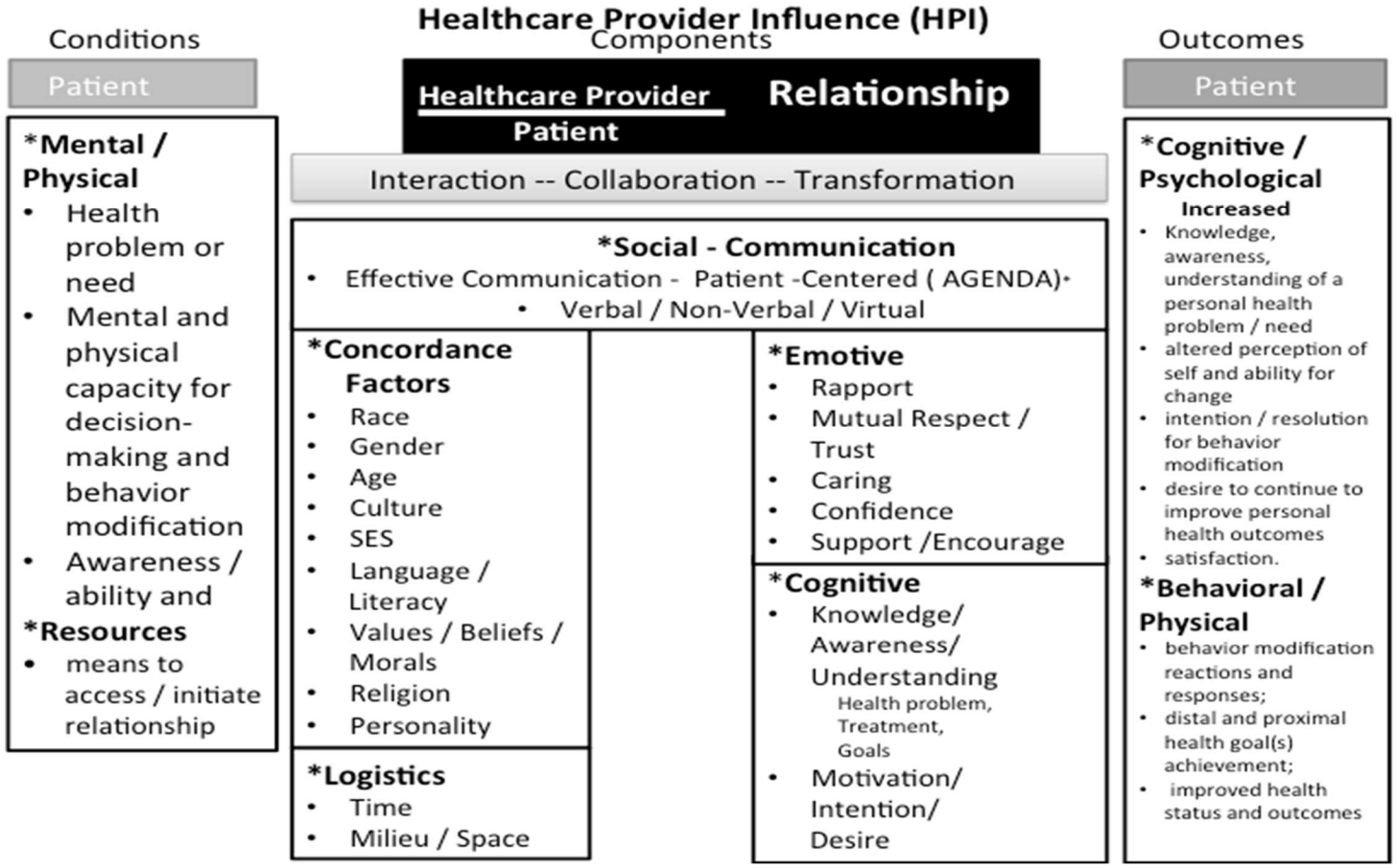
Study	Search Term	Aim	Method	Sample	Influence Measure/ Descriptor	Major findings
Anderson, 1999 (USA)	"provider influence" and "health care provider influence"	Document values and beliefs that influence a pt's decision to accept or decline prenatal genetic diagnosis	Qualitative Interviews	N=24 Advanced maternal age women (>35 years) and male spouses	*Discussion/Information sharing (genetic counseling) *HP behavior *Pt perception of HP as expert authority and behavior	*HPs professional and personal biases, values and morals affect medical knowledge presentation and clinical decisions. *listened/heard/understood by HP: "knowing the pt." and faith/trust in HP help pts make informed and autonomous decisions about screening and diagnostic tests
Bins et al., 2009 (USA)	"clinician influence"	Understand clinician influence on parental smoking bans in homes of children living with a smoker	Quantitative Surveys	N=463 adults of diverse households with smokers	*Discussion/Information sharing (query / counseling about smoking)	*Perception of harm was strongly associated with having bans *Recall of child's doctor query about smoking status were less likely to have a home smoking ban - possible inadequate/too short counseling = less concern
Farmer et al., 2007 (USA)	"provider influence"	Predictors of colorectal cancer (CRC) screening	Quantitative Repeated cross-sectional surveys	> 50 years (women / men equal) 1: n=498 2: n=482	*Discussion/Information sharing (CRC) with HP	1 (of 2) strongest determinants of obtaining CRC screening: HP influence- discussion significantly increased screening

Gilliam et al., 2008 (USA)	"provider influence"	Barriers to postpartum sterilization	Qualitative Interviews	N=34 Low income minority women postpartum with unfulfilled sterilization requests	*Discussion/Information sharing with HP *interactions with HP	1 (of 5) last-minute themes for not undergoing postpartum sterilization. HPI: new/different information than given previously→ nervous and "leery"; convincing to opt for reversible options. Negative interactions- neglected / treated poorly.
Morrison, 1996 (USA)	"provider influence"	Predictors of breast self-examination (BSE)	Quantitative Survey	N=204 Low income women (ages 40-86)	*Discussion/Information sharing (personal 1:1 pt.-HP) BSE demo/instruction)	1 (of 10) variables found to predict BSE behavior in this population: HP influence-influential teaching, exposure to clinician messages – timing and frequency
Orford et al., 2006 (England)	"professional influence"	Understand why pts seek professional treatment for drinking problems	Qualitative Interviews	N=98, Male and female (> 16 years), primary problem with alcohol	*Discussion/Information sharing (query about drinking-nature of problem-treatment availability drinking /referral) *Timing-referral/relationship with HP	External Influence → seeking professional help for drinking problems: pressure / referral – from HPs
Rempel et al., 2004 (USA)	"professional influence"	Describe parent decision making after antenatal diagnosis of congenital heart disease	Qualitative Interviews	Mothers (N=19) and fathers (N=15) of babies diagnosed congenital heart disease antenatally	*Discussion/Information sharing (post-diagnosis options) *HP behavior, understanding of pt. perspective, timing, and support *Pt perception of HP role and input from expert	Parent perception of HP role and expert authority varied. Some sought HP opinion if greater deliberation about decision Some offended by information – even if option not decision based Recommendations for HPs: Aware of parents' perspective, cognizant of own professional

						influence and provide active support
Scholle et al., 2003 (USA)	"provider influence"	Preferences/ factors for depression advice among high- risk women.	Quantitative Survey	N=147 women (18-44 years) on Medicaid	*Time-length/continuity of HP-pt. relationship	Greater HP-pt. familiarity influences women's disclosure / solicitation of depression advice

Notes: Healthcare provider (HP); patient (pt.)

Figure 1: Healthcare Provider Influence Diagram



Conflict of interest

No conflict of interest has been declared by the author(s).

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This research received no specific grant from any funding agency in the public, commercial, or not- for-profit sectors.

Appendix C:

Institutional Review Board Approval, Recruitments Flyers and Consent Forms

MARQUETTE UNIVERSITY
Be The Difference.

Office of Research Compliance
Schroeder Complex, 102
P.O. Box 1881
Milwaukee, Wisconsin 53201-1881

P 414.288.7570
F 414.288.6281
W marquette.edu/researchcompliance

April 14, 2015

Ms. Denise Fryzelka Nursing

Dear Ms. Fryzelka:
Your protocol number HR-2942, titled, *"Healthcare Provider Influence on Health Behavior Modifications in Gestational Diabetics"* was expedited on April 14, 2015, by a member of the Marquette University Institutional Review Board.

Your IRB approved informed consent form and Authorization to Use and Disclose Protected Health Information in Research is enclosed with this letter. Use the stamped copies of this form when recruiting research participants. Each research participant should receive a copy of the stamped consent form for their records.

Subjects who go through the consent process are considered enrolled participants and are counted toward the total number of subjects, even if they have no further participation in the study. Please keep this in mind when conducting your research. This study is currently approved for 66 subjects.

If you need to increase the number of subjects, add research personnel, or make any other changes to your protocol you must submit an IRB Protocol Amendment Form, which can be found on the Office of Research Compliance web site: http://www.marquette.edu/researchcompliance/research/irbforms.shtml. All changes must be reviewed and approved by the IRB before being initiated, except when necessary to eliminate apparent immediate hazards to the human subjects. Any public advertising of this project requires prior IRB approval. If there are any adverse events, please notify the Marquette University IRB immediately.

Your approval is valid until April 13, 2016. Prior to this date, you will be contacted regarding continuing IRB review.

An IRB Final Report Form must be submitted once this research project is complete. The form should be submitted in a timely fashion and must be received no later than the protocol expiration date.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Sincerely,

Benjamin Kennedy
Research Compliance Officer-Human Subjects & Radiation Safety

cc: Dr. Marianne Weiss Enclosures (1)
BK/tk

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Office of Research Compliance

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Milwaukee, Wisconsin 53201-1881

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December 7, 2015

Ms. Denise Fryzelka Nursing

Dear Ms. Fryzelka:

The amendment you submitted for your protocol number HR-2942, titled, "*Healthcare Provider Influence on Health Behavior Modifications in Gestational Diabetics,"* received expedited approval on December 7, 2015, from a member of the Marquette University Institutional Review Board.

This amendment:

- Adds Christine Kern Steffan to research personnel;
- Adds a control group;
- Increases sample size to 200;
- Modifies data collection instruments; and
- Adds a $10 incentive to GDM participants.

Your protocol is valid until April 13, 2016. Prior to this date, you will be contacted regarding continuing IRB review. Any public advertising of this project requires prior IRB approval. If there are any changes in your protocol or adverse events, please notify the IRB immediately.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Sincerely,

Jessica Rice
IRB Manager
Office of Research Compliance

Enclosures (2) JR/tk

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P.O. Box 1881
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April 7, 2016

Ms. Denise Fryzelka Nursing

Dear Ms. Fryzelka:

Your protocol number HR-2942, titled "*Healthcare Provider Influence on Health Behavior Modifications in Gestational Diabetics"* received expedited continuing approval on April 7, 2016, from a member of the Marquette University Institutional Review Board.

You are approved to recruit a total of 200 subjects, of which you have already recruited 7.

You are also approved to add Stephanie Conley, Julie Hillard, Kandra Barb, Keeley Johnson Crosby and Alexandra Ramirez to your research personnel.

Any changes to your protocol must be requested in writing by submitting an IRB Protocol Amendment Form. All changes must be reviewed and approved by the IRB before being initiated, except when necessary to eliminate apparent immediate hazards to the human subjects. Any public advertising of this project requires prior IRB approval. If there are any adverse events, please notify the Marquette University IRB immediately.

Your approval is valid until April 17, 2017. Prior to this date, you will be contacted regarding continuing IRB review.

An IRB Final Report Form must be submitted once this research project is complete. The form should be submitted in a timely fashion and must be received no later than the protocol expiration date.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Sincerely,

Jessica Rice
IRB Manager
Office of Research Compliance
cc: Ms. Sherri Lex, Graduate School Dr. Marianne Weiss, Adviser
JR/tk

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March 21, 2017

Ms. Denise Fryzelka College of Nursing

Dear Ms. Fryzelka:

The amendment you submitted for your protocol number HR-2942, titled, "*Healthcare Provider Influence on Health Behavior Modifications in Gestational Diabetics,"* received expedited approval on March 20, 2017, from a member of the Marquette University Institutional Review Board.

This amendment approves the following:
- addition of Associate Physicians of Madison, WI as a recruitment site

Your protocol is valid until April 17, 2017. Prior to this date, you will be contacted regarding continuing IRB review. Any public advertising of this project requires prior IRB approval. If there are any changes in your protocol or adverse events, please notify the IRB immediately.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Sincerely,

Jessica Rice, MPH, CIP
IRB Manager
Office of Research Compliance

MARQUETTE UNIVERSITY
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Office of Research Compliance

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P.O. Box 1881
Milwaukee, Wisconsin 53201-1881

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March 30, 2017

Ms. Denise Fryzelka College of Nursing

Dear Ms. Fryselka:

Your protocol number HR-2942, titled "*Healthcare Provider Influence on Health Behavior Modifications in Gestational Diabetics"* received expedited continuing approval on March 30, 2017, from a member of the Marquette University Institutional Review Board.

You are approved to recruit a total of 200 subjects, of which you have already recruited 162.

Any changes to your protocol must be requested in writing by submitting an IRB Protocol Amendment Form. All changes must be reviewed and approved by the IRB before being initiated, except when necessary to eliminate apparent immediate hazards to the human subjects. Any public advertising of this project requires prior IRB approval. If there are any adverse events, please notify the Marquette University IRB immediately.

Your approval is valid until April 17, 2018. Prior to this date, you will be contacted regarding continuing IRB review. Please note that it is the PI's responsibility to be aware of the study's expiration date and submit continuing review materials as needed. Continuing review materials submitted less than two weeks before the expiration date may lead to a lapse in study approval.

An IRB Final Report Form must be submitted once this research project is complete. The form should be submitted in a timely fashion and must be received no later than the protocol expiration date.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Sincerely,

Jessica Rice, MPH, CIP
IRB Manager
Office of Research Compliance

MARQUETTE UNIVERSITY
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Office of Research Compliance

Schroeder Complex, 102
P.O. Box 1881
Milwaukee, Wisconsin 53201-1881

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April 6, 2018

Ms. Denise Fryzelka College of Nursing

Dear Ms. Fryselka:

Your protocol number HR-2942, titled "*Healthcare Provider Influence on Health Behavior Modifications in Gestational Diabetics"* received expedited continuing approval on April 5, 2018, from a member of the Marquette University Institutional Review Board.

You are approved to recruit a total of 200 subjects, of which you have already recruited 162.

Any changes to your protocol must be requested in writing by submitting an IRB Protocol Amendment Form. All changes must be reviewed and approved by the IRB before being initiated, except when necessary to eliminate apparent immediate hazards to the human subjects. Any public advertising of this project requires prior IRB approval. If there are any adverse events, please notify the Marquette University IRB immediately.

Your approval is valid until **April 17, 2019**. Prior to this date, you will be contacted regarding continuing IRB review. Please note that it is the PI's responsibility to be aware of the study's expiration date and submit continuing review materials as needed. Continuing review materials submitted less than two weeks before the expiration date may lead to a lapse in study approval.

An IRB Final Report Form must be submitted once this research project is complete. The form should be submitted in a timely fashion and must be received no later than the protocol expiration date.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Sincerely,

Benjamin Kennedy
Compliance Officer – Human Subjects and Radiation Safety Office of Research Compliance

Are you interested in participating in research to gain further knowledge regarding Gestational Diabetes Mellitus?

DO YOU QUALIFY?

If you are 18 years or older, pregnant, speak and write English or Spanish, **and** have been told that you will be tested for Gestational Diabetes Mellitus because you are at higher risk or have an elevated blood sugar result from your one-hour glucose test, **you may qualify.**

WHY IS IT IMPORTANT?

Acquiring more knowledge about how to better treat Gestational Diabetes Mellitus during pregnancy is important to help prevent complications in pregnancy and following pregnancy for mothers and babies and reduce the risks of Diabetes Mellitus later in life.

BENEFITS:

Participating in this research study allows you to help us learn more about how healthcare providers can help women with Gestational Diabetes Mellitus engage in healthy behaviors, in order to treat themselves to reduce the complications for themselves and their babies during pregnancy and prevent Diabetes Mellitus in the future.

TIME COMMITMENT:

It will only take **5 minutes to complete questionnaires** for Phase 1. **It will take an additional 2-3 minutes** to complete questionnaires for Phase 2 if **you do** not have Gestational Diabetes Mellitus **and approximately 25 minutes** to complete questionnaires if you **do have** Gestational Diabetes Mellitus.

It will **not require** any additional laboratory testing or extra visits.
You can complete it during a clinic visit before or after you see your healthcare provider.
If you **are interested**, please contact ***
Conducted by Denise Fryzelka, PhD student, Marquette University

If you have any questions about this research project, you can contact Denise Fryzelka by phone at 816-716- 9901 or by email at dfryzelkacnm@hotmail.com.

¿Ud. interesa participar en la investigación para adquirir más conocimientos sobre Diabetes Mellitus Gestacional?

¿CALIFICA USTED?

Si Ud. tiene 18 años o más, está embarazada, habla y escribir inglés o español **y** le han dicho que le harán la prueba para Diabetes gestacional porque Ud. Corre un mayor riesgo o ya tiene un resultado de azúcar en la sangre elevada en su prueba de glucosa de una hora, usted puede calificar.

¿POR QUÉ ES IMPORTANTE?

Adquirir más conocimientos sobre cómo tratar mejor la Diabetes gestacional durante el embarazo es importante para ayudar a prevenir complicaciones en el presente embarazo y el siguiente embarazo para las madres y los bebés y reducir los riesgos diabetes más adelante en vida.

BENEFICIOS:

Participar en este estudio de investigación permite que nos ayuden a aprender más sobre cómo los prestadores de servicios pueden ayudar a las mujeres con Diabetes gestacional involucrarse en comportamientos saludables, para tratar ellos mismos para reducir las complicaciones para ellas y sus bebés durante el embarazo y prevenir la Diabetes más adelante en la vida.

CUANTO TIEMPO TOMA:

Solo **tardará 5 minutos para completar cuestionarios** de fase 1. Tomará unos 2 a 3 minutos más para completar la segunda fase si Ud. no tiene diabetes gestacional y 25 minutos completar la segunda fase si Ud. tiene diabetes gestacional.

No requerirá visitas adicionales o pruebas de laboratorio adicionales.
Usted puede completar durante una visita a la clínica antes o después de ver su proveedor de atención médica. **Si usted está interesado**, póngase en contacto con:
Realizado por Denise Fryzelka, CNM, PhDc, estudiante de doctorado, Universidad de Marquette. Si usted tiene alguna pregunta acerca de este proyecto de investigación, puede comunicarse con Denise Fryzelka por teléfono al 816-716-9901 o por correo electrónico a dfryzelkacnm@hotmail.com.

MARQUETTE UNIVERSITY
AGREEMENT OF CONSENT FOR RESEARCH PARTICIPANTS

HEALTHCARE PROVIDER INFLUENCE ON HEALTH BEHAVIOR MODIFICATIONS IN GESTATIONAL DIABETICS

Denise K. Fryzelka, CNM, MS
College of Nursing

You have been invited to participate in this research study. Before you agree to participate, it is important that you read and understand the following information. Participation is completely voluntary. Please ask questions about anything you do not understand before deciding whether or not to participate.

PURPOSE: The purpose of this research study is ask questions about eating and physical activity practices you engage in and who and how pregnant women with gestational diabetes are influenced to make changes in their diet and physical activity levels. You will be one of a minimum of 66 participants in this research study.

PROCEDURES: You will be asked to complete a set of questionnaires. Following your laboratory testing, if you are diagnosed with gestational diabetes you will be invited to participate in a second phase, wherein you will be asked to complete another set of questionnaire and surveys when you return for one of your prenatal visits at approximately 34-36 weeks gestational age. After completion of the questionnaires, your participation in the study is fulfilled

DURATION: Your participation may take approximately 5 minutes to complete questionnaires for the first phase today and 25 minutes for the second phase to complete questionnaires.

RISKS: There are no risks associated with participation in this study or at least none greater than you would experience in everyday life.

BENEFITS: The benefits associated with participation in this study include assisting research efforts in understanding how healthcare providers can improve their care and counseling for pregnant women with gestational diabetes. Additionally, your participation may provide you with a better understanding and an increased awareness of the educational components that are involved in caring for and treating gestational diabetes and how these may prevent or decrease future risks for developing Diabetes Mellitus.

MARQUETTE UNIVERSITY
Office of Research Compliance

INSTITUTIONAL REVIEW BOARD
Informed Consent for Research
Protocol Number: HR-2942
IRB Approval Period: 04/14/2015 – 04/13/2016
Consent Form

CONFIDENTIALITY: All information you reveal in this study will be kept confidential. All your data will be assigned an arbitrary code number rather than using your name or other personal information that could identify you as an individual. When the results of the study are published, you will not be identified by name at any time and results will be reported grouped together with others. The data will be destroyed by shredding paper documents and deleting electronic files three years after the completion of the study. All data in hard copy or electronic copy will be stored in a locked and secure location and all computer files will be password protected.

VOLUNTARY NATURE OF PARTICIPATION: Participating in this study is completely voluntary and you may withdraw from the study and stop participating at any time without penalty or loss of benefits.

COMPENSATION: Due to the additional length of time to complete the questionnaires in Phase 2 of the study **if you do** have gestational diabetes; you will be compensated with a $10.00 gift card to a local department or grocery store (e.g. Target, Walmart, Woodmans, or other) following completion of Phase 2.

CONTACT INFORMATION: If you have any questions about this research project, you can contact Denise Fryzelka by phone at 816-716-9901 or by email at dfryzelkacnm@hotmail.com. If you have questions or concerns about your rights as a research participant, you can contact Marquette University's Office of Research Compliance at (414) 288-7570 or orc@mu.edu.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT.

_____
(Printed Name of Participant)

_____
(Signature of Participant)

_____
Date

_____
(Printed Name of Individual Obtaining Consent)

_____
(Signature of Individual Obtaining Consent)

_____
Date

INSTITUTIONAL REVIEW BOARD
Informed Consent for Research
Protocol Number: HR-2942
IRB Approved 12/07/2015
Consent Form

MARQUETTE UNIVERSITY
AGREEMENT OF CONSENT FOR RESEARCH PARTICIPANTS

HEALTHCARE PROVIDER INFLUENCE ON HEALTH BEHAVIOR MODIFICATIONS IN GESTATIONAL DIABETICS

Denise K. Fryzelka, CNM, MS
College of Nursing

You have been invited to participate in this research study. Before you agree to participate, it is important that you read and understand the following information. Participation is completely voluntary. Please ask questions about anything you do not understand before deciding whether or not to participate.

PURPOSE: The purpose of this research study is ask questions about eating and physical activity practices you engage in and who and how pregnant women with gestational diabetes are influenced to make changes in their diet and physical activity levels. You will be one of a minimum of 200 participants in this research study.

PROCEDURES: You will be asked to complete a set of questionnaires. Following your laboratory testing, you will be invited to participate in a second phase, wherein you will be asked to complete another set of questionnaire and surveys when you return for one of your prenatal visits at approximately 34-36 weeks gestational age. The number of questionnaires will depend on whether you are diagnosed with gestational diabetes or not. After completion of the questionnaires, your participation in the study is fulfilled

DURATION: Your participation may take approximately 5 minutes to complete questionnaires for Phase 1 today. It will take approximately 2-3 minutes to complete Phase 2 if you do not have gestational diabetes and 25 minutes for Phase 2 if you do have gestational diabetes.

RISKS: There are no risks associated with participation in this study or at least none greater than you would experience in everyday life.

BENEFITS: The benefits associated with participation in this study include assisting research efforts in understanding how healthcare providers can improve their care and counseling for pregnant women with gestational diabetes. Additionally, you participation may provide you with a better understanding and an increased awareness of the educational components that are involved in caring for and treating gestational diabetes and how these may prevent or decrease future risks for developing Diabetes Mellitus.

MARQUETTE UNIVERSITY
Office of Research Compliance

INSTITUTIONAL REVIEW BOARD
Informed Consent for Research
Protocol Number: HR-2942
IRB Approved 12/07/2015
Consent Form

CONFIDENTIALITY: All information you reveal in this study will be kept confidential. All your data will be assigned an arbitrary code number rather than using your name or other personal information that could identify you as an individual. When the results of the study are published, you will not be identified by name at any time and results will be reported grouped together with others. The data will be destroyed by shredding paper documents and deleting electronic files three years after the completion of the study. All data in hard copy or electronic copy will be stored in a locked and secure location and all computer files will be password protected.

VOLUNTARY NATURE OF PARTICIPATION: Participating in this study is completely voluntary and you may withdraw from the study and stop participating at any time without penalty or loss of benefits.

COMPENSATION: Due to the additional length of time to complete the questionnaires in Phase 2 of the study **if you do** have gestational diabetes; you will be compensated with a $10.00 gift card to a local department or grocery store (e.g. Target, Walmart, Woodmans, or other) following completion of Phase 2.

CONTACT INFORMATION: If you have any questions about this research project, you can contact Denise Fryzelka by phone at 816-716-9901 or by email at dfryzelkacnm@hotmail.com. If you have questions or concerns about your rights as a research participant, you can contact Marquette University's Office of Research Compliance at (414) 288-7570 or orc@mu.edu.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT.

_____
(Printed Name of Participant)

_____
(Signature of Participant)

_____
Date

_____
(Printed Name of Individual Obtaining Consent)

_____
(Signature of Individual Obtaining Consent)

_____
Date

UNIVERSIDAD MARQUETTE
ACUERDO DE CONSENTIMIENTO PARA LOS PARTICIPANTES DE LA INVESTIGACIÓN

INFLUENCIA DEL PROVEEDOR DE LA SALUD EN LAS MODIFICACIONES DEL COMPORTAMIENTO EN DIABÉTICAS GESTACIONALES

Denise K. Fryzelka, CNM, MS
Facultad de Enfermería

Ud. ha sido invitada a participar en este estudio de investigación. Antes de que Ud. acceda a participar, es importante que Ud. lea y entienda la siguiente información. Su participación es completamente voluntaria. Por favor pregunte si no entiende algo antes de decidir participar.

PROPOSITO: El propósito de este estudio de investigación es el de preguntar con respecto a prácticas de alimentación y actividad física que Ud. hace y quién y cómo las mujeres embarazadas con diabetes gestacional son influenciadas a hacer cambios en su dieta y niveles de actividad física. Ud. será una de un mínimo de 66 participantes en este estudio de investigación.

PROCEDIMIENTOS: Le pedirán completar una seria de cuestionarios. Después de la prueba de laboratorio, y si se le diagnostica diabetes gestacional le invitarán a que participe en un segunda fase en la cual se le pedirá que complete otra serie de cuestionarios y encuestas cuando usted venga para una de sus visitas prenatales entre las semanas 34-36 aproximadamente. Después de la terminación de los cuestionarios, su participación en el estudio se ha completado.

DURACION: Su participación puede tomar aproximadamente 5 minutos para completar los cuestionarios de la primera fase. Tomará unos 2 a 3 minutos más para completar la segunda fase si Ud. no tiene diabetes gestacional y 25 minutos completar la segunda fase si Ud. tiene diabetes gestacional.

RIESGOS: No hay riesgos asociados a la participación en este estudio o por lo menos ninguno mayor al que usted experimentaría en la vida diaria.

BENEFICIOS: Las ventajas asociaron a la participación en este estudio incluyen ayudar a los esfuerzos de investigación entendiendo como los proveedores de salud pueden mejorar los cuidados de salud al aconsejar embarazadas con diabetes gestacional. Además, su participación puede darle a usted una comprensión mejor y mayor conocimiento de los componentes educacionales que implican cuidar y tratar la diabetes

gestacional y de cómo estos previenen o disminuyen los riesgos futuros para desarrollar la Diabetes Mellitus.

CONFIDENCIALIDAD: Toda la información que usted revela en este estudio será mantenida confidencial. Todos sus datos serán asignados un número de código en vez de utilizar su nombre u otra información personal que pudiera identificarla individualmente. Cuando los resultados del estudio se publiquen, usted no va a ser nunca identificada por nombre y sus resultados se reportaran agrupados con otros. Los datos serán destruidos y todo papel será pulverizado tres años después de haber completado el estudio y los archivos electrónicos serán destruidos.. Todos los datos en computadores serán protegidos con contraseñas y los computadores estarán en un lugar seguro y bajo llave.

NATURALEZA VOLUNTARIA DE LA PARTICIPACION: El participar en este estudio es completamente voluntario y Ud. puede retirarse del estudio y parar de participar en cualquier momento sin ningún tipo de multa o pérdida de beneficios.

COMPENSATION: Si le diagnostican diabetes gestacional y participa en la Segunda fase del estudio, se le compensará con una tarjeta de regalo por $10.00 de un almacén local de departamento o de la tienda de comestibles (e.g. Target, Walmart, Woodmans entre otras.

INFORMACION DE CONTACTO: si usted tiene alguna pregunta acerca de este proyecto de investigación, puede comunicarse con Denise Fryzelka por teléfono al 816-716-9901 o por correo electrónico a dfryzelkacnm@hotmail.com. Si Ud. tiene preguntas con respecto a sus derechos como participante Ud. Puede contactar la oficina de Cumplimiento de Investigación de la Universidad Marquette al (414) 288-7570 o orc@mu.edu.

HE TENIDO LA OPORTUNIDAD DE LEER ESTA FORMA DE CONSENTIMIENTO, HE HECHO PREGUNTAS ACERCA DEL PROYECTO DE INVESTIGACIÓN Y ESTOY PREPARADA PARA PARTICIPAR EN ESTE PROYECTO.

_____
(Nombre en imprenta de la participante)

_____
(Firma de la Participante)

_____
Fecha

_____
(Nombre en imprenta del individuo que obtiene el permiso)

_____
(Firma del individuo que obtiene el permiso)

_____
Fecha

Appendix D:

Study Forms and Instruments

Phase 1 HPI Research Study

You have been selected and invited to participate in this research study while you are completing laboratory testing for Gestational Diabetes Mellitus (GDM).

Consent: Participation is completely voluntary. Completion of this form indicates your willingness to participate in this study. Confidentiality will be maintained, as no personal information regarding you will be reported on these forms.

Purpose: Your participation in this study will support research intended to increase the knowledge and lend a greater understanding about GDM in pregnancy.

Procedure: You are asked to answer the questions below. If you qualify for the second part of the research project and you agree to participate, you will be asked to complete additional questionnaires at approximately 34-36 weeks of pregnancy before or following a prenatal appointment. After completion of those questionnaires, your participation in the study is fulfilled. Please place your name and contact information on the outside of the envelope only in order to allow us to contact you regarding the date of an appointment at which to complete the forms. Thank you for participating in this important research.

Study Participant #_____
Date _____

Participant Demographic Questionnaire (PDQ)

- Age _____
- Completed years of education_____
- What is your Race/Ethnicity _____?
- Have you ever had Gestational Diabetes Mellitus: Yes_____ No_____?
- Do you have a family history of Diabetes Mellitus: Yes_____ No_____?
  - If yes, who had Diabetes Mellitus? _____
- How long have you lived in the United States? _____
- What is your primary language? _____
- Are you seeing the type of Healthcare provider you desired to see for your prenatal care? Y_____ N_____

To be completed by researcher

- Early GA GDM screening: Yes _____ if yes, indication _____ No_____

OR routine GDM screening Yes _____

- Parity_____
- Pre-pregnancy BMI: _____

Eating Breakfast Questionnaire + 1 (EBQ+1)

1. How many times last week (past 7 days) did you **eat breakfast when you got up**? (within 2 hours of getting up) _____times last week?

2. This morning, did you eat **any of the following foods** for breakfast? (please check all that apply)

- ○ Milk (1/2 cup) / nut "milk" (for example, almond milk, coconut milk)
- ○ eggs
- ○ cheese / cottage cheese
- ○ meat, poultry, or fish
- ○ yogurt
- ○ beans
- ○ nuts/nut butters (for example, almond butter / peanut butter)

If you **ate anything else**, please write here: _____

3. How many **portions of vegetables** do you eat every day? _____

Physical Activity Scale (PAS)

During the past week, even if it was not a typical week for you, how much **total** time (for the **entire week**) did you spend on each of the following? (Please circle only **one** number for each question)

How much time total during the past week (past 7 days) …	None	Less than 30 minutes/ week	30-60 minutes/ week	1-3 hours/ week	More than 3 hours/ week
1. Stretching or strengthening exercises (range of motion, using weights, etc.)	0	1	2	3	4
2. Walk for exercise	0	1	2	3	4
3. Swimming or aquatic exercise	0	1	2	3	4
4. Bicycling (including stationary exercise bikes)	0	1	2	3	4
5. Other aerobic exercise equipment (Stairmaster, rowing, skiing machine, etc.)	0	1	2	3	4
6. Other aerobic exercise Specify_____ _	0	1	2	3	4

Phase 2 HPI Research Study

You have been selected and invited to participate in the second phase of this research study due to your experience with Gestational Diabetes Mellitus (GDM).

Consent: Participation is completely voluntary. Completion of these questionnaires indicates your willingness to participate in this study. Confidentiality will be maintained, as no personal information regarding you will be reported on these forms. A few pieces of information regarding your biometrics will be collected from your medical record related to factors effecting GDM after which no more information will be accessed from your medical records.

Purpose: Your participation in this study will support research intended to increase the knowledge and lend a greater understanding about GDM in pregnancy.

Procedure: You are asked to complete the questionnaires below. After completion of those questionnaires, your participation in the study is fulfilled. Thank you for participating in this important research.

Study Participant #_____
Date _____

Healthcare Provider Demographic Questionnaire (HPDQ)

- Where do you receive your prenatal care: clinic name?
  _____
- What is the name of your healthcare provider or group?
  _____
- What is the gender of your healthcare provider?
  _____
- What is the race/ethnicity of your healthcare provider?
  _____
- What language does your healthcare provider use with you at your visits?
  _____
- Does your healthcare provider use an interpreter?
  Yes _____ No_____

To be completed by researcher

- Phase 2 BMI: _____
- Professional discipline: MD/DO: OB or FP, CNM, NP, PA
- HP Age _____ HP Years in practice_____
- Was the teaching / counseling conducted in patient primary language?
  Y_____ N_____

Social Influence Questionnaire (SIQ)

Please tell me how who gave you counseling regarding Gestational Diabetes Mellitus (GDM).
(Can mark more than one)
1. Nurse/Nurse Practitioner
2. Midwife
3. Doctor
4. Diabetic Nurse-Educator/Registered Dietitian
5. Other (Provider Type/Specialty) _____

Please tell me how much influence each healthcare provider or group of healthcare providers has / have on decisions you make about your health management, such as food and drink intake and physical activity by circling one number from 1 to 5 that best describes how you feel. For example, circling number 4 means you feel more like the description of number 5 ("strongly influences") than number 1 ("no influence") but not completely.

1	5
"no influence"	"strongly influences"

My _____ has/or _____decisions I make about my health management such as food/drink intake and physical activity…	**1 meaning "no influence and 5 meaning "strongly influences"**				
Nurse/Nurse Practitioner	1	2	3	4	5
Midwife or Doctor	1	2	3	4	5
Diabetic Educator/Registered Dietitian	1	2	3	4	5
Other (Provider type or specialty) _____	1	2	3	4	5

Social Influence Questionnaire – Healthcare Provider (SIQHP)

Please rate how strongly you think each healthcare provider agrees with the following statement on a scale of 1-5 by circling one number from 1 to 5 that best describes how you feel. For example, circling number 4 means you feel more like the description of number 5 ("strongly agrees") than number 1 ("strongly disagrees") but not completely.

1	5
"strongly disagrees"	"strongly agrees"

My perinatal healthcare provider (Midwife or Doctor) _____that …	**1 meaning "strongly disagrees" and 5 meaning "strongly agrees"**				
I can treat my Gestational Diabetes if I change what I eat and drink now	1	2	3	4	5
I can treat my Gestational Diabetes if I become more physically active now	1	2	3	4	5
I could develop Diabetes Mellitus later in life if I do not change what I eat and drink now	1	2	3	4	5

I could develop Diabetes Mellitus later in life if I do not become more physically active now	1	2	3	4	5
I am able to change what I eat and drink	1	2	3	4	5
I am able to become more physically active	1	2	3	4	5
If I begin to change what I eat and drink, I could prevent Diabetes Mellitus later in life	1	2	3	4	5
If I become more physically active, I could prevent Diabetes Mellitus later in life	1	2	3	4	5
Lot of things get in the way of me changing what I eat and drink and/or becoming more physically active	1	2	3	4	5

Social Influence Questionnaire – Diabetic Educator (SIQDE)

Please rate how strongly you think each healthcare provider agrees with the following statement on a scale of 1-5 by circling one number from 1 to 5 that best describes how you feel. For example, circling number 4 means you feel more like the description of number 5 ("strongly agrees") than number 1 ("strongly disagrees") but not completely.

1	5
" strongly disagrees"	"strongly agrees"

The Diabetic Educator/Registered Dietitian _____ that …	**1 meaning "strongly disagree" and 5 meaning "strongly agree"**				
I can treat my Gestational Diabetes if I change what I eat and drink now	1	2	3	4	5
I can treat my Gestational Diabetes if I become more physically active now	1	2	3	4	5
I could develop Diabetes Mellitus later in life if I do not change what I eat and drink now	1	2	3	4	5
I could develop Diabetes Mellitus later in life if I do not become more physically active now	1	2	3	4	5
I am able to change what I eat and drink	1	2	3	4	5
I am able to become more physically active	1	2	3	4	5
If I begin to change what I eat and drink, I could prevent Diabetes Mellitus later in life	1	2	3	4	5
If I become more physically active, I could prevent Diabetes Mellitus later in life	1	2	3	4	5
Lot of things get in the way of me changing what I eat and drink and/or becoming more physically active	1	2	3	4	5

Quality of Information-Interaction-Gestational Diabetes Mellitus (QOII)

Please circle your answer by selecting one number from 0 to 10. The words below the numbers indicate what the 0 or the 10 mean. Pick a number between 0 and 10 that best describes how you feel. For example, circling number 7 means you feel more like the description of number 10 than number 0 but not completely.

1a. How much information did you need from your healthcare provider (nurse, midwife, or doctor) about treating Gestational Diabetes Mellitus after you were told about your diagnosis?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
1b. How much information did you receive from your healthcare provider (nurse, midwife, or doctor) about treating Gestational Diabetes Mellitus after you were told about your diagnosis?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
2a. How much information did you need from your healthcare provider (nurse, midwife, or doctor) about what changes to make in what you eat and drink?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
2b. How much information did you receive from your healthcare provider (nurse, midwife, or doctor) about what changes to make in what you eat and drink?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
2c. How much information did you need from the Diabetic Educator/Registered Dietitian about what changes to make in what you eat and drink?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
2d. How much information did you receive from the Diabetic Educator/Registered	0 1 2 3 4 5 6 7 8 9 10 None A great deal

Dietitian about what changes to make in what you eat and drink?	
3a. How much information <u>did you need</u> from your healthcare provider (nurse, midwife, or doctor) about increasing physical activity?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
3b. How much information <u>did you receive</u> from your healthcare provider (nurse, midwife, or doctor) about increasing physical activity?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
3c. How much information <u>did you need</u> from the Diabetic Educator/Registered Dietitian about increasing physical activity?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
3d. How much information <u>did you receive</u> from the Diabetic Educator/Registered Dietitian about increasing physical activity?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
4a. How much information <u>did you need</u> from the Diabetic Educator about how to take and record your blood sugars?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
4b. How much information <u>did you receive</u> from the Diabetic Educator about how to take and record your blood sugars?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
5a. How much **practice** <u>did you need</u> with checking your blood sugars before leaving your counseling appointment with the Diabetic Educator?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
5b. How much **practice** <u>did you have</u> with checking your blood sugars before leaving your counseling appointment with the Diabetic Educator?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
6a. How much information <u>did you need</u> from your healthcare provider (nurse, midwife, or doctor) about who and when to	0 1 2 3 4 5 6 7 8 9 10 None A great deal

call if you have problems at home after you received your diagnosis?	
6b. How much information <u>did you receive</u> from your healthcare provider (nurse, midwife, or doctor) about who and when to call if you have problems at home after you received your diagnosis?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
6c. How much information <u>did you need</u> from the Diabetic Educator/Registered Dietitian about who and when to call if you have problems at home after your counseling appointment?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
6d. How much information <u>did you receive</u> from the Diabetic Educator/Registered Dietitian about who and when to call if you have problems at home after your counseling appointment?	0 1 2 3 4 5 6 7 8 9 10 None A great deal
7a. How much did the information provided by your healthcare provider (nurse, midwife, or doctor) answer your **specific concerns and questions**?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
7b. How much did the information provided by the Diabetic Educator/Registered Dietitian answer your **specific concerns and questions**?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
8a. How much did your healthcare provider (nurse, midwife, or doctor) **listen** to your concerns?	0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely
8b. How much did the Diabetic Educator/Registered Dietitian **listen** to your concerns?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal

9a. Was your healthcare provider (nurse, midwife, or doctor) **sensitive** to your personal beliefs and values?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
9b. Was the Diabetic Educator/Registered Dietitian **sensitive** to your personal beliefs and values?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
10a. Did you like the way your healthcare provider (nurse, midwife, or doctor) **taught** you about how to take care of your Gestational Diabetes Mellitus?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
10b. Did you like the way the Diabetic Educator/Registered Dietitian **taught** you about how to take care of your Gestational Diabetes Mellitus?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
11a. Was the information your healthcare provider (nurse, midwife or doctor) provided about caring for Gestational Diabetes Mellitus **presented to you in a way you could understand**?	0 1 2 3 4 5 6 7 8 9 10 Not at all Always
11b. Was the information the Diabetic Educator/Registered Dietitian provided about caring for Gestational Diabetes Mellitus **presented to you in a way you could understand?**	0 1 2 3 4 5 6 7 8 9 10 Not at all Always
12a. Did your healthcare provider (nurse, midwife, or doctor) **check to make sure you understood** the information and instructions?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
12b. Did the Diabetic Educator/Registered Dietitian **check to make sure you understood** the information and instructions?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal

13. Did you receive **consistent** (the same) information from your healthcare provider (nurses, midwives, doctors) and Diabetic Educator/Registered Dietitian?	0 1 2 3 4 5 6 7 8 9 10 Not at all Always
14. Was the information about caring for your Gestational Diabetes Mellitus given to you at **times that were good for you**?	0 1 2 3 4 5 6 7 8 9 10 Not at all Always
15. Was the information you received from the Diabetic Educator/Registered Dietitian given at **times when your family member(s) or others could attend**?	0 1 2 3 4 5 6 7 8 9 10 Not at all Always
16a. Did your healthcare provider (nurse, midwife, or doctor) help you to **feel confident** in your ability to care for Gestational Diabetes Mellitus?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
16b. Did the Diabetic Educator/Registered Dietitian help you to **feel confident** in your ability to care for Gestational Diabetes Mellitus?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
17a. Did the information your healthcare provider (nurse, midwife, or doctor) provided about Gestational Diabetes Mellitus **decrease your anxiety** about taking care of yourself?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal
17b. Did the information your Diabetic Educator/Registered Dietitian provided you about Gestational Diabetes Mellitus **decrease your anxiety** about taking care of yourself?	0 1 2 3 4 5 6 7 8 9 10 Not at all A great deal

Multifactor Leadership Questionnaire 5-X (Sample*)

Healthcare provider name or group_____

This questionnaire is to describe the leadership style of the Healthcare Provider individual or Group mentioned above as you perceive it.
Please answer all items on this answer sheet. If an item is irrelevant, or if you are unsure or do not know the answer, leave the answer blank.
Please answer this questionnaire anonymously.

Judge how frequently each statement fits the Healthcare provider (Midwife/Doctor/Nurse Practitioner) you are describing. Use the following rating scale:

Not at all	Once in a while	Sometimes	Fairly often	Frequently, if not always
0	1	2	3	4

My healthcare provider (s) (midwife /doctor/nurse practitioner) …

1. Provides me with assistance when showing my efforts in making changes for my health	0	1	2	3	4
2. Delays responding to urgent questions	0	1	2	3	4
3. Treats me as an individual rather than just another patient	0	1	2	3	4
4. Makes clear what one can expect to receive when goals are achieved	0	1	2	3	4
5. Increases my willingness to try harder	0	1	2	3	4

mind garden

www.mindgarden.com

To whom it may concern,

This letter is to grant permission for the above named person to use the following copyright material;

Instrument: ***Multifactor Leadership Questionnaire*** Authors: ***Bruce Avolio and Bernard Bass*** Copyright: ***1995 by Bruce Avolio and Bernard Bass*** for his/her thesis research.

Five sample items from this instrument may be reproduced for inclusion in a proposal, thesis, or dissertation.

The entire instrument may not be included or reproduced at any time in any other published material.

Sincerely,

Robert Most Mind Garden, Inc. www.mindgarden.com

Diabetes Self-Efficacy Scale-Gestational Diabetes Mellitus (DSES)

We would like to know ***how confident*** you are in doing certain activities.

For each of the following questions, please choose the number scale 1-10 below that corresponds to your confidence that you can do the tasks regularly at the present time.

Not at all confident	1	2	3	4	5	6	7	8	9	10	Totally confident

Using the scale of 1-10 above, please score the questions below:

1. How confident do you feel that you can eat your meals every 4 to 5 hours every day, including breakfast every day? _____
2. How confident do you feel that you can follow your diet when you have to prepare or share food with other people who do not have gestational diabetes? _____
3. How confident do you feel that you can choose the appropriate foods to eat when you are hungry (for example, snacks)? _____
4. How confident do you feel that you can exercise 15 to 30 minutes, 4 to 5 times a week?
5. How confident do you feel that you can do something to prevent your blood sugar level from dropping when you exercise? _____
6. How confident do you feel that you know what to do when your blood sugar level goes higher or lower than it should be? _____
7. How confident do you feel that you can judge when the changes in your illness mean you should visit the doctor? _____
8. How confident do you feel that you can control your gestational diabetes so that it does not interfere with the things you want to do? _____

EBS+1 and PAS – Repeated in Phase 2

Glucose Monitoring Questionnaire (GMQ)

On how many days in the last week did you test your blood sugar levels?
(If you were sick in the last week, think of the most recent 7 days when you were NOT sick)

1. On how many days in the last week (past 7 days) did you **test your blood sugar levels**? _____
2. On how many days in the last week (past 7 days) did you **test your blood sugar levels 4 times** per day? _____
3. How many times during the last week (past 7 days) were **your blood sugar results higher than what is recommended**? _____
4. What do **you know think caused** the higher blood sugar elevations?

_____
_____
_____
_____

Appendix E:

Manuscript II: Healthcare Providers' Influence on Health Behavior Modification in Gestational Diabetics Results Manuscript

Research Paper

Patient and User Perspectives and Characteristics

Healthcare Providers' Influence in Gestational Diabetics Health Behavior Modification

Denise K. Fryzelka[a*]
MS, CNM
PhD Nursing student

Marilyn Frenn[a]
PhD, CNE, ANEF, FTOS, FAAN, RN
Professor and Director PhD Program

Debra Oswald[b]
PhD
Professor

Ginger Breedlove[c]
PhD, CNM, FACNM, FAAN

Marianne E. Weiss[a]
DNSc, RN
Professor of Nursing and
Wheaton Franciscan Healthcare, St. Joseph/Sister Rosalie Klein Professor of Women's Health

[a] College of Nursing, Marquette University, Milwaukee, WI, USA
[b] Department of Psychology, Marquette University, Milwaukee, WI, USA
[c] Grow Midwives, Shawnee, KS, USA

ABSTRACT

Objective: To explore associations between healthcare provider professional influence of maternity healthcare providers and diabetic nurse-educators on gestational diabetes mellitus (GDM) patient engagement in modification of eight healthy eating, physical activity, and glucose monitoring behaviors.
Methods: In an exploratory study that utilized a longitudinal correlational design, participants (N=78) completed questionnaires at initial high-risk GDM screening and 34-36 weeks gestational age.
Results: Professional influence and quality of information and patient interaction during teaching encounters by maternity healthcare providers and diabetic nurse-educators contributed to increased breakfast frequency/weekly (p=.09). Maternity healthcare providers leadership style, specialty, and provider-patient concordance variables were associated with modification of other health behaviors.
Conclusion: Patients' perception of their healthcare providers' influence, quality of information and interaction in teaching encounters and leadership style, and patient-healthcare provider concordance factors influence GDM patients' engagement in health behavior modifications.
Practice Implications: Self-reflection about professional influence, quality of teaching, and leadership style could improve provider capacity to influence health behavior modification in GDM patients. Attention to provider-patient concordance can also be an influencing factor in health behavior change.

Keywords: Healthcare provider influence, Health behavior modification, Gestational diabetes mellitus, Healthy eating, Physical activity, Glucose monitoring

Highlights

- Maternity and diabetic nurse-educator healthcare providers are professional influencers
- Professional influence, information and interaction were associated with healthy eating
- Interpersonal power dynamics of race and gender affect health behavior change
- Professional influence from nurse-midwives predicted increased physical activity
- Providers using transformational leadership influenced physical activity

1. Introduction

1.1. *Background*

Gestational diabetes mellitus (GDM), diagnosed in pregnancy, has an estimated prevalence rate of 9.2%-19.9%, in the US and globally with steadily rising incidence rates up to 25% [1-4]. Rates of reoccurrence of GDM in subsequent pregnancies range from 30-84%, and up to 74% for developing Diabetes Mellitus (DM) [5-7]. Risks for GDM include a complex and inter-related pattern of demographic characteristics (such as advanced maternal age, higher parity, non-white race, lower economic status, acculturation to the U.S), health history (previous history, pre-pregnancy obesity, increased intra-pregnancy weight gain, family history of DM), and health behaviors (unhealthy eating habits, lack of physical activity) [8-10]. Improperly managed or uncontrolled GDM can result in significant pregnancy and long-term maternal-child complications, including malformations, pre-eclampsia, preterm delivery, macrosomia, maternal and fetal birth injury, childhood/adult obesity, maternal/neonatal hypoglycemia, increased labor inductions or operative deliveries, increased miscarriage, stillbirth and infant mortality rates [11-13].

Evidence-based practice for managing GDM and preventing future GDM and DM includes recommendations for early high-risk and routine screening in pregnancy, postpartum, and lifelong. Treatment modalities include support by reiterative education and counseling by healthcare providers on initiation and continuation of health behavior modifications to healthy eating, physical activity, and glucose monitoring [14-16]. The goal is to prevent complications by establishing and maintaining good glucose control throughout the pregnancy and beyond [4,14,17].

GDM patient-identified barriers to self-management in pregnancy include communication problems with healthcare providers, specifically, language discordance, lack of discussion time in patient visits, not being heard about needs and inability to control sugars, and inadequate verbal or written information [18]. Other discordance factors of race, culture, attitude, age, and gender are also potential barriers to healthcare provider-patient communication [19-21].

Multiple sources of social influence have been found to be associated with health behaviors [23-25]. As a credible authority, healthcare providers can influence patients to engage in health behavior modification and provide informational support and recommendations for action. Insufficient GDM/DM knowledge in patient understanding around a lifelong risk, and belief that diabetes is transient and will go away after childbirth, can impede attentiveness to diet and other lifestyle modification recommendations [13,18,22]. While a lack of social support and influence from healthcare providers contribute to barriers for women engaging in GDM self-care, alternately their influence can potentiate the modification and maintenance of relevant health behaviors throughout pregnancy and well beyond the postpartum period [19].

The Integrated Theory of Health Behavior Change (ITHBC) [26] includes constructs for engagement in health behaviors, one of which is social facilitation comprised of social support and social influence. One source of social influence is *professional influence* from healthcare providers. An integrated conceptual framework based on the ITHBC and Transformational Leadership theory [27,28] was developed to

name, describe and define the process of "healthcare provider influence" (HPI) as a purposeful interpersonal interactive, collaborative, and transformative relationship that develops between a patient and a healthcare provider working toward a specific focus of health behavior modification [29]. Leadership is characterized as responsive to the follower's needs in aligning goals and objectives, and, through empowerment stimulates, inspires and moves followers to meet and exceed performance expectations and strive for higher levels of potential [27,28]. Having advanced knowledge of health, disease pathology, and prevention/treatment measures to improve health status and outcomes, the healthcare provider is their source of expert power. This power can be transferred to a patient-centered source of power (called referent power) through professional influence. Influence occurs by using transformational leadership skills and increasing the patient's knowledge, internal motivation, and self-efficacy leading to the ability to engage in healthy behavior modification and improve health outcomes [30,31].

Fig. 1 presents the theoretical constructs and components of the ITHBC and Leadership theory as represented by HPI concepts and their empirical measures. The ITHBC is situated on the conceptual level with constructs of social influence, specifically professional influence, knowledge and beliefs, and proximal outcomes, along with Transformational Leadership theory, the referent power process for HPI. On the theoretical levels, HPI represents the healthcare provider as the professional influencer, and includes logistics, concordance, emotive, cognitive, and social/communication components as well as behavioral outcomes. On the empirical level, measures of the theory and framework concepts are linked to study questionnaires (Section 2.4).

2. Methods

2.1. *Purpose/Aims*

The purpose of the study was to explore possible mechanisms underlying health provider influence (HPI) on health behavior modification during pregnancy in GDM patients. As GDM patients are cared for by two healthcare provider types whose roles in care and counseling are distinct yet complementary, the influence from both maternity healthcare providers (HPs) and diabetic nurse-educators (DEs) was the focus in this study. GDM-related care and counseling provided by HPs focuses on prenatal maternal-fetal surveillance, review of glucose results, and a review/reiteration of recommendations provided by DEs. Care and counseling from the DE focuses on specific recommendations for healthy eating, including nutrient intake/restriction, portions, timing and frequency of eating, physical activity, including benefits, frequency, and duration of exercise, and glucose monitoring, including demonstration, timing, frequency, desired result ranges, and follow-up.

Specific aims were to determine if 1) HPI, measured as professional influence and the quality of interaction and information from HPs and DEs are associated with health behavior modifications, specifically, healthy eating (HE), physical activity (PA), and glucose monitoring (GM), and 2) patient characteristics (race and language concordance and personal/family history of GDM/DM) and HP characteristics (gender concordance, HP specialty and leadership style) moderate this relationship.

2.2. *Design*

This longitudinal correlational design measured patient and HP factors associated with change in health behaviors of women with GDM from screening, routinely at 24-28 weeks gestational age or the initial prenatal visit if high-risk (Phase 1) and subsequently, at 34-36 weeks gestational age (Phase 2).

2.3. *Sample*

A priori, the sample size estimate of 75 was based on two tested, one mediating, and ten total predictor variables for multiple linear regression analyses to achieve a desired power of 0.80, a moderate effect size f^2 of 0.15, and a significance level of $p<0.10$ (Gpower) [32] for this exploratory study.

The patient sample was recruited using flyers distributed at seven different obstetric, nurse-midwife, and family practices, in an academic medical center and federally qualified health clinic settings in a U.S. Midwestern city. Maternity care was managed by two HP specialties: nurse-midwives and physicians. Inclusion criteria were pregnant women, screened for high-risk GDM status, ≥ 18 years who were English or Spanish speakers with literacy levels sufficient to comprehend and complete surveys.

2.4. *Ethical considerations*

Clinical site and university IRB approval was obtained. Interested patients were contacted, a detailed description of the study provided, and informed consent obtained by the principal investigator or trained research assistants.

2.5. *Data Collection Instruments*

Study instruments were available in English and Spanish; instruments not previously available in Spanish were forward and backward translated by certified medical translators. These questionnaires were completed by patients at their prenatal care appointments in Phases 1 and 2. A participant demographic questionnaire, completed in Phase 1, collected information for sample description (patient age, years of education, years in the U.S., personal/family history of GDM/DM, insurance, and intendedness of pregnancy) as well as items for determining race and language concordance with provider. Parity and body mass index were obtained from the patient's health record. A healthcare provider questionnaire completed in Phase 2, included the clinic site, HP specialty, age, years in practice, race/ethnicity, gender, language, use of interpreter, and GDM management. The following dichotomous variables were constructed for concordance between patient and HP response: race, language, and gender, coded as 0= discordant, 1= concordant.

Two questionnaires, the Social Influence Questionnaire-GDM (SIQ) and the Quality of Information-Interaction-GDM (QOII) measure social/communication and emotive/cognitive components of HPI. The Multifactor Leadership Questionnaire (MLQ) measures HP leadership characteristics. These three scales were modified for use with

GDM patients, following author permission, licensed if required, and pilot tested with content experts. The content validity index for SIQ = .90, QOII = .95, and MLQ = .67. All three instruments reflect patients' perceptions.

The SIQ measures patients' perceptions of their HPs influence on their health behaviors computed separately for HPs (SIQHP) and DEs (SIQDE). The scale consists of provider-belief items paired with a degree of influence item. Both are rated on a 1-5 scale; the paired items are multiplied, and the resulting scores added together for a total range of 9-225. Higher scores indicating greater provider influence on and belief in the patient's ability to modify their behaviors. Prior reliability and validity testing from mammography and postpartum weight loss research resulted in Cronbach's α = .83-.84 and a Goodness of Fit chi-square, $p \leq .78$, model chi-square, $p \leq .01$ [33,34]. In this study, Cronbach's α for SIQHP = .86 and SIQDE, α = .87.

The QOII was modified from the Quality of Discharge Teaching Scale [35] to include GDM-behavior modification content. It measures the quality of informational content received by the patient and the interactional skills of providers in teaching encounters, as reported by patients. A total QOII score, calculated separately for HPs (QOIIHP) and DEs (QOIIDE) is reported as the mean of items, each scored on a 0-10 scale, with higher scores indicating higher quality teaching. The original scale, tested in medical-surgical adult patients, parents of hospitalized children, and postpartum mothers, had reliability estimates of Cronbach's α = .87- .92 [35-37]. In this study, the Cronbach's α for the QOIIHP = .95 and QOIIDE = .93.

The MLQ, modified from the Multifactor Leadership Questionnaire-5X for eight minor stem changes but not domain or content, measures nine leadership characteristics to determine dominant leadership style: transformational, transactional, or laissez-faire non-leadership. In this study, patients were asked to complete the scale by rating their healthcare provider. As laissez-faire non-leadership style did not emerge as a dominant style, HP leadership style, was coded as a dichotomous variable: 0= transactional, 1= transformational. The MLQ has been used widely in many large, and varied study samples, with reliability estimates exceeding α of .80, convergent, divergent and construct validity testing supporting the nine-factor scales and leadership composite scores, and indices of goodness of fit = .93 in confirmatory factor analysis [27,28, 38,39]. In this study, the Cronbach's α = 0.85.

The Eating Breakfast Questionnaire (EBQ +1) records the following healthy eating (HE) behaviors in three separate scores: breakfast frequency/weekly (HE1), eating protein for breakfast (HE2), and daily portions of vegetables (HE3) [40-42]. Correlations between Phases 1 and 2 were r =.51, .04, and .70 respectively. Similarly, the Physical Activity Scale (PAS) records the following physical activity (PA) behaviors in two separate scores: total minutes weekly of stretching/strengthening (PA1) and aerobic exercise (PA2). Previous test-retest results for the two scores were, r = .56 and .72 in English and r =.91 and .89 in Spanish-speaking adults [40-43]. In this study, correlations between Phases 1 and 2 were r =.54 (PA1) and .56 (PA2). The Glucose Monitoring Questionnaire (GMQ) extracting 1-item from the Glucose Testing questionnaire [40, 41, 43] documents the frequency of glucose monitoring days/weekly (GM1), 4 times/daily (GM2), and the number of abnormal glucose results/weekly (GM3). In this study, inter-item correlation of GM1 and GM2 was r = .63. EBQ+1 and PAS were collected in Phases 1 and 2 and the GMQ was collected in Phase 2 only.

2.6. *Data Analyses*

Demographic data were analyzed using descriptive statistics (Table 1). Paired t-tests were performed to determine if there were changes from Phase 1 to 2 in the healthy eating and physical activity outcomes (Table 2). Simple and hierarchical multiple linear regressions were used to analyze Aims 1 and 2 respectively. Outcomes variables were the change scores for EBQ+1 (denoted for the 3 items as ΔHE1, ΔHE2, ΔHE3) and PAS (ΔPA1, ΔPA2) and GMQ (1, 2, 3). Separate models were calculated for the influence of patient (Table 3), HP (Table 4) and DE (Table 5) characteristics. HPI variables, SIQ and QOII were centered and entered into step 1. In step 2, three patient characteristic variables were entered. To test moderation, interaction terms between step 1 and 2 variables were entered into step 3. The same process was repeated with three HP characteristic variables, in step 2.

3. Results

3.1. *Demographics*

The total sample completing Phase 1 and 2 was 78 patients. Six patients (7.1%) were lost to follow-up due to pregnancy loss, transfer of care, or relocation. Maternity care was managed by physicians (n=48) and nurse-midwives (n=30). Patients reported receiving GDM counseling from HPs (61.5%) and DEs (92.3%). Table 1 presents demographic and descriptive data about the patient participants and HPs.

3.2. *HPI and Outcomes*

Table 2 presents mean scores on HPI measures and changes in outcome variables from Phase 1 to Phase 2. Overall, patients reported that both HPs and DEs had some professional influence on their health behaviors (SIQHP & SIQDE scores =149-151/225) and the quality of interaction and information received from both was similar and moderately high (QOII=7.8-8.0/10). The distribution of HP leadership style was 73.1 % (N=57) transformational and 26.9% (N=21) transactional. Significant increases in outcome measures between Phase 1 and Phase 2 occurred for breakfast frequency/weekly (ΔHE1), portions of vegetables/daily (ΔHE3) and stretching/strengthening exercise minutes/weekly (ΔPA1). Patients reported good adherence to glucose monitoring recommendations, performing monitoring on average >6 day per week (GM1), >5 days per week of monitoring 4 times/daily (GM2), and with <2 abnormal readings per week (GM3).

Results of hierarchical regression analyses exploring the association between HPI measures of HP professional influence (SIQHP) and quality of information and interaction (QOIIHP) and the eight health behavior modification outcomes are presented in table 3 (patient characteristics) and table 4 (HP characteristics). In table 3, the only

significant model was for increased breakfast frequency/weekly (ΔHE1) where, in step 3, SIQHP, QOIIHP, race and language concordance and an interaction effect between SIQHP and language discordance were significant with improvement. In table 4, the model for ΔPA2 and GM1 were significant in step 2, with gender concordance and HP specialty-physician associated with improvement in aerobic exercise minutes/weekly (ΔPA2), and gender discordance and transformational leadership associated with more glucose monitoring days/weekly (GM1). At step 3, testing interaction effects, the only significant model was for ΔPA1, where gender concordance, HP specialty-physician and SIQHP/HP specialty-nurse-midwife and SIQHP/transformational leadership interactions were significantly associated with improvements in stretching/strengthening minutes/weekly (ΔPA1). Supplementary tables S1-S2 present the full analytic model results for all eight outcomes.

Table 5 presents the significant model results between HPI measures of DE professional influence (SIQDE) and quality of information and interaction (QOIIDE). QOIIDE was positively associated with breakfast frequency/weekly (ΔHE1). Supplementary table S3 presents the full analytic model results for all eight outcomes.

4. Discussion and Conclusion

4.1. *Discussion*

This is the first study to use measures of 'professional influence' in examining the role of the healthcare provider on change in health behaviors. Professional influence measures of social influence and quality of information and interaction were used as predictors of eight health behaviors. There were no significant differences in professional influence and quality of information and interaction scores between HPs and DEs. However, DEs more frequently provided patients with their GDM counseling. Although significant improvements were found in two healthy eating (Δ HE1, Δ HE3) and one physical activity behavior (Δ PA1), only breakfast frequency/weekly (Δ HE1) was associated with professional influence measures. Both physical activity (ΔPA1, ΔPA2) and one glucose monitoring (GM1) behavior were associated with HP characteristics.

These findings highlight the complementary roles of the HP and DE in GDM management and suggest that the influence of social/professional influence is an important feature of their roles. The findings also point out that, while education is an important professional strategy for behavior change, HP professional influence is an interactional strategy with potentially positive benefits. The effect sizes in this study are small suggesting lack of recognition and under-utilization of the power of influence. HPs have a broader scope of maternity care management and counseling is generally targeted to ameliorating glucose results. Healthy eating and physical activity are often not addressed by HPs prenatally due to insufficient time and knowledge [45,46]; this counseling in health behavior modification is left to the DE.

HP transformational leadership style influenced some outcomes, supporting it as a potential mechanism for influencing health behavior modification. This style concentrates on influencing individual personal transformation via inspirational motivation and intellectual stimulation [28]. In this study, professional influence by HPs who used

transformational leadership skills predicted increased stretching/strengthening exercises and HPs who used these same leadership styles also increased glucose monitoring frequency. Glucose monitoring provides biofeedback that can increase motivation during the pregnancy for active engagement in self-managing GDM. While transactional leadership style theoretically could promote the reward of a healthy pregnancy and baby for improvement in healthy behavior outcomes, the absence of association supports the role of transformational leadership as necessary for professional influence.

Gender concordance may also be an influencing factor on health behavior improvements in GDM. Female providers were stronger influencers of increasing or maintaining exercise in pregnancy, a challenge for many women as pregnancy advances due to increased fatigue and discomfort and decreased energy. Female HPs may be more comfortable in addressing exercise and female patients may be more receptive to a gender concordant provider. Professional influence by nurse-midwives (HP specialty) was positively associated with increased stretching/strengthening exercises. Many of the female providers in this study were nurse-midwives, which may have prompted a greater influence on health promoting behaviors. Although research has shown that pregnancy aerobic exercise recommendations are not always consistently reviewed or known by HPs, nurse-midwives were more likely than physicians to recommend exercise [45,46]. The association of gender concordance with increased physical activity and decreased glucose monitoring may reflect the correlation between improved glycemic control and decreased need for the same frequency of monitoring. It is important to consider in future studies whether this finding is reflective of the HP specialty (physician/nurse-midwife) or gender [47,48].

Language concordance and race discordance were associated with improved breakfast frequency (HE1) as was professional influence when there was language discordance between the HP and patient. Professional influence predicts improvement when an interpreter is used in patient encounters or the value of concordance may be lost if the provider is trying to interact in a concordant language but is not fluent. Similarly, race concordance may be interpreted differently by different patients. The referent power may be more influential in some HP/patient race pairs but not others. Evidence to support the association of race concordance to positive health outcomes in minority populations has been inconsistent and inconclusive in patient-provider communication concordance research [49,50].

Taken together, the findings provide beginning evidence that HPs can be professional influencers of patient health behavior change through social influence, quality of information and interaction, leadership style and concordant factors.

4.1.1. *Limitations*

This study was an exploration of relationships between provider factors and GDM patient health behavior outcomes. To facilitate the exploratory purpose of the study, aims were tested separately. The numerous equations raise the possibility of type 1 error. Based on projected availability of the target sample, the study was powered for $p<0.10$; thus, increasing the possibility of type 1 errors. The associations identified in this analysis should be considered opportunities for further study.

Additional limitations include the use of a convenience sample and self-reported outcome measures which have been associated with response and accuracy bias in

reporting expectations versus reality [51,52]. Many single items were used for the outcome measures which produced inconsistent results across the various measures. The availability of a single composite measure of health eating and physical activity specific to GDM would improve future research in this area. While outcome measures previously tested with English/Spanish-speaking patients in DM studies were selected, the MLQ is a lengthy and time intensive questionnaire which has not been used for patient perspective of their HPs and thus may not be the optimal measure of leadership in this context.

4.1.2. *Future Research*

The results of this study raise additional questions that warrant further exploration into HPI and set the trajectory for future research. What factors are associated with better social facilitation of health behavior modification in GDM and other health conditions? Do other factors associated with the provision of health care services (such as visit time, number of encounters), additional patient and healthcare provider characteristics (such as patient-perceived age-range, BMI-range, values and beliefs concordance) impact the health providers ability to influence health behavior modification? In the context of pregnancy or other illness in which morbidity and mortality is a greater risk, other components of the conceptual model of professional influence (e.g. patient fear for own or baby's health, an emotive component of the HPI model), should be considered. To understand if and how different HP leadership styles influence proximal and distal outcomes, a leadership questionnaire specific to healthcare providers, is needed to evaluate patient perceptions of HPs specific to HPI. Including other influencers, such as family or community health workers, may contribute to the effect of professional influence for increased behavior change as seen in other research [34].

4.2. *Conclusion*

This exploratory study provided initial insight into the role of healthcare provider influence on health behavior modification in GDM patients and beginning evidence that HPs can be professional influencers through social influence, quality of information and interaction, and transformational leadership in facilitating patient health behavior change. The study demonstrated that patient's perceptions of the professional influence, quality of information and interaction, leadership style, and concordance factors can play a role in healthy eating (breakfast frequency), physical activity (stretching/strengthening and aerobic exercise) and daily glucose monitoring.

4.3. *Practice Implications*

The findings support the recommendation that health care providers need to better understand how health behavior change is adopted and their role in facilitating these changes via their professional influence [26]. This influence derives from their social influence (their beliefs in patient's ability to overcome barriers and make optimal changes in behaviors and the degree of influence exerted) and the quality of interaction and information in patient-provider interactions including styles used. To improve influence, HPs and DEs should engage in reflective practice [53,54] to evaluate their current beliefs about their role in health behavior modification, the degree of influence they actively bring to the patient-provider encounters, their current and desired leadership style, the

nature of the information content and interaction style in patient-provider encounters and the role of concordance factors with patients. Greater awareness sets the stage for intentional modifications to leadership style and content that can improve influencing potential.

Transformational leadership skills can be useful to increase self-knowledge of how behavior modification in pregnancy can reach far beyond the benefits of treating GDM, into the lifelong outcomes of prevention/delaying DM, decreasing personal and child risks, and improving overall maternal mental/physical health, well-being, and quality of life. An awareness of how glucose results correlate to timing, type and amount of foods, and type and duration of physical activity provide specific self-management guidelines. Using strategies to increase listening and sensitivity, answer respectfully, inquire about and decrease anxiety, increase self-efficacy, improve patient confidence in abilities, and inquire about what works best for patients will assist in empowering and influencing decisions could transform their future.

Most importantly, healthcare providers should be effective professional influencers of health behavior. They must recognize their power to influence and should engage proactively throughout the childbearing cycle and lifelong to contribute to the prevention of GDM/DM and related chronic health problems while optimizing patient quality of life.

Declarations of interest or Conflict of Interest

None

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Appendix A. Supplementary data

Supplementary material data related to this research article shall be can be found online.

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Table 1
Demographics and Descriptors

	Participants (N=78)		HPs (N=32)	
	Mean(SD)	**Range**	**Mean(SD)**	**Range**
Age	32.06(5.14)	18-41	41.69(6.74)	28-55
Education	14.75(4.48)	3-23		
HP Practice Years			11.89(5.45)	2-27
Year in US	22.3(12.05)	.3-41		
BMI Pre-pregnant	30.07(7.28)	19.4-59.3		
	N(%)		**N(%)**	
Gender				
Female	78(100)		54(69.2)	
Male			24(30.8)	
HP specialty				
Nurse-Midwife			30(38.5)	
Physician			48(61.5)	
Race/Ethnicity				
White	35(44.9)		69(88.5)	
Black	11(14.4)		3(3.8)	
Asian	9(11.5)			
Latina	22(28.2)			
Other	1(1.3)		6(7.7)	
Primary language				
English	48(61.5)			
Spanish	19(24.4)			
Other	11(14.1)			
Language Used by HP				
English			72(92.3)	
Spanish			6 (7.7)	
Interpreter Used			18(23.1)	
Insurance				
Medicaid	34(43.6)			
Private	44(56.4)			
Nulliparity	26(33.3)			
Intended pregnancy	56(71.8)			
GDM counseling				
HP			48(61.5)	
DE			72(92.3)	
HP+DE			44(56.4)	
Personal history of GDM	20(25.6)			

Notes: BMI: Body Mass Index; GDM: Gestational Diabetes Mellitus; HP: Healthcare Provider

Table 2
Healthcare Provider Influence and Outcome Measures (N=78)

HPI Measures (Phase 2)					
Instrument (# items)	**Potential Range** Item Total/Mean score	**Actual Range**	**Mean(SD)**		
SIQHP (10)	Item: 1-5	9-225	148.5(53.9)		
SIQDE (10)	Total: 9-225	21-225	150.9(58.41)		
QOIIHP (13)	Item: 0-10	2.38-10	8.01(1.98)		
QOIIDE (16)	Mean: 0-10	2.5-10	7.79(1.87)		
MLQ	Item: 0-4				
TFL (5)		.88-4	3.06(.74)		
TAL (2)	Mean: 0-4	.5-4	2.56(.83)		
Outcome Measures (Phases 1 and 2)					
Instrument (# items)	**Potential Range**	**Actual Range**	**Mean(SD) Δ (P2-P1)**	**P value for Δ (P2-P1)**	
				t (1,77)	**sig (p)**
EBQ+1					
HE1 (1)	0-7				
P1		0-7	5.43(2.23)		
P2		0-7	5.94(1.78)		
ΔHE1(P2-P1)		-7- +6	.51(2.03)	2.23	.03
HE2 (1)	0-1				
P1		0-1	.82(.39)		
P2		0-1	.88(.32)		
ΔHE2 (P2-P1)		-1- +1	.06(.49)	1.15	.25
HE3 (1)	0-no limit				
P1		0-8.5	2.3(1.51)		
P2		0-8	2.78(1.34)		
ΔHE3 (P2-P1)		-3.5- +4.5	.48(1.12)	3.79	.000
PAS					
PA1(1)	0-180				
P1		0-180	25.58(44.98)		
P2		0-180	44.62(53.24)		
ΔPA1(P2-P1)		-165- +180	19.04(47.91)	3.51	.001
PA2 (5)	0-900				
P1		0- +720	124.42(134.95)		
P2		0- +660	125(119.01)		
ΔPA2 (P2-P1)		-420- +360	.58(119.45)	.04	.97
Outcome Measures (Phase 2)					
GMQ					
P2 **GMQ1** (1)	0-7	0-7	6.33(1.52)		
P2 **GMQ2** (1)	0-7	0-7	5.25(2.43)		
P2 **GMQ3** (1)	0-28	0-8	1.75(1.71)		

Notes. ΔHE1: Healthy Eating 1 Change Score, ΔHE2: Healthy Eating 2 Change Score, ΔHE3: Healthy Eating 3 Change Score, ΔPA1: Physical Activity 1 Change Score, ΔPA2: Physical Activity 2 Change Score, EBQ+1: Eating Breakfast Questionnaire, GM1: Glucose Monitoring 1, GM2: Glucose Monitoring 2, GM3: Glucose Monitoring 3, GMQ: Glucose Monitoring Questionnaire, MLQ: Multifactor Leadership Questionnaire, P1: Phase 1, P2: Phase 2, QOIIDE: Quality of Information/Interaction-Diabetic Educator, QOIIHP: Quality of Information/Interaction-Healthcare Provider, PAS: Physical Activity Scale; SIQDE: Social Influence-Diabetic Educator, SIQHP: Social Influence- Healthcare Provider; TAL: Transactional Leadership, TFL: Transformational Leadership

Table 3
Hierarchical Regression of Health Behavior Modifications on Healthcare Providers Professional Influence and Patient Characteristics

Healthcare Provider Professional Influence and Patient Characteristics	**Health Behaviors**
Model Statistics	**Healthy Eating**
Step 1	**ΔHE1**
	R^2 = .04
	Adj R^2= .02
	p= .21
	β p
SIQHP	-.03 .84
QOIIHP	.21 **.09**
Step 2	R^2= .11
	Adj R^2= .05
	$R^2\Delta$=. .07
	p= .15
SIQHP	-.002 .99
QOIIHP	.2 .12
Race Concordance: 0=discordant, 1= concordant	**-.29** **.03**
Language Concordance: 0= discordant, 1= concordant	.2 .14
GDMPFH: 0= negative, 1= positive	-.03 .83
Step 3	R^2= .27
	Adj R^2= .14
	$R^2\Delta$= .16
	p= .04
SIQHP	**.5** **.05**
QOIIHP	**.7** **.04**
Race Concordance: 0=discordant; 1= concordant	**-.28** **.03**
Language Concordance: 0= discordant, 1= concordant	.22 **.10**
GDMPFH: 0= negative, 1= positive	-.06 .58
Race Concordance*SIQHP	.16 .34
Race Concordance*QOIIHP	-.22 .23
Language Concordance*SIQHP	**-.52** **.04**
Language Concordance*QOIIHP	-.1 .78
GDMPFH*SIQHP	-.25 .31
GDMPFH*QOIIHP	-.24 .36

Notes: GDMPFH: Gestational Diabetes Mellitus/Diabetes Mellitus Personal/Family History, ΔHE1: Healthy Eating 1 Change Score, QOIIHP: Quality of Information/Interaction- Healthcare Provider, SIQHP: Social Influence- Healthcare Provider,

Table 4
Hierarchical Regressions on Healthcare Provider Professional Influence and Healthcare Provider Characteristics

Healthcare Provider Characteristics Model Statistics	**Health Behaviors**					
	Physical Activity				**Glucose Monitoring**	
Step 1	**ΔPA1**		**ΔPA2**		**GM1**	
	R^2=	.02	R^2=	.001	R^2=	.02
	Adj R^2=	-.01	Adj R^2=	-.03	Adj R^2=	-.003
	p=	.48	p=	.95	p=	.43
	β	p	β	p	β	p
SIQHP	-.05	.67	.04	.74	-.13	.31
QOIIHP	-.11	.37	-.02	.89	-.05	.71
Step 2	R^2=	.08	R^2=	.09	R^2=	.12
	Adj R^2=	.02	Adj R^2=	.03	Adj R^2=	.06
	$R^2\Delta$=	.06	$R^2\Delta$=	.09	$R^2\Delta$=	.09
	p=	.19	**p=**	**.07**	**p=**	**.06**
SIQHP	-.1	.46	.05	.67	-.17	.19
QOIIHP	-.11	.40	-.03	.84	-.02	.84
Gender concordance: 0=discordant, 1=concordant	.28	**.04**	.19	**.05**	-.23	**.09**
MLQ: 0=Transactional, 1=Transformational	.03	.81	-.16	.17	.23	**.05**
HP specialty: 0=physician, 1=nurse-midwife	-.23	**.1**	-.25	**.06**	.18	.19
Step 3	R^2=	.22	R^2=	.18	R^2=	.21
	Adj R^2=	.09	Adj R^2=	.05	Adj R^2=	.08
	$R^2\Delta$=.	.14	$R^2\Delta$=	.09	$R^2\Delta$=	.10
	p=	**.09**	p=	.32	p=	.26
SIQHP	-.5	.16	-.26	.47	-.68	**.06**
QOIIHP	.19	.52	.61	**.05**	.38	.2
Gender concordance: 0=discordant, 1=concordant	.27	**.05**	.27	.19	-.28	**.05**
MLQ :0=Transactional, 1=Transformational	.06	.61	-.2	.12	.28	**.03**
HP specialty: 0=physician, 1=nurse-midwife)	-.24	**.08**	-.22	.12	.17	.21
Gender Concordance*SIQHP	-.3	.28	.08	.77	-.01	.98
Gender Concordance*QOIIHP	.03	.91	-.31	.17	-.23	.31
MLQ*SIQHP	.43	**.1**	.18	.49	**.56**	**.04**
MLQ*QOIIHP	-.34	.2	-.49	**.08**	-.33	.22
HP specialty*SIQHP	**.48**	**.02**	.16	.42	.06	.74

HP specialty*QOIIHP	-.1	.53	.05	.75	.06	.73

Notes GM1: Glucose Monitoring 1, MLQ: Healthcare Provider Leadership Style, ΔPA1: Physical Activity 1 Change Score, ΔPA2: Physical Activity 2 Change Score, QOIIHP: Quality of Information/Interaction- Healthcare Provider, SIQHP: Social Influence- Healthcare Provider

Table 5

Multiple Linear Regression of Health Behavior Modifications on Diabetic Educators Professional Influence

Model	**Healthy Eating ΔHE1**	
	R^2=	.08
	Adj R^2=	.06
	p=	**.04**
	β	p
SIQDE	-.12	.37
QOIIDE	**.34**	**.01**

Notes: ΔHE1: Healthy Eating 1 Change Score, QOIIDE: Quality of Information/Interaction-Diabetic Nurse Educator, SIQDE: Social Influence-Diabetic Educator, All other models p>0.1

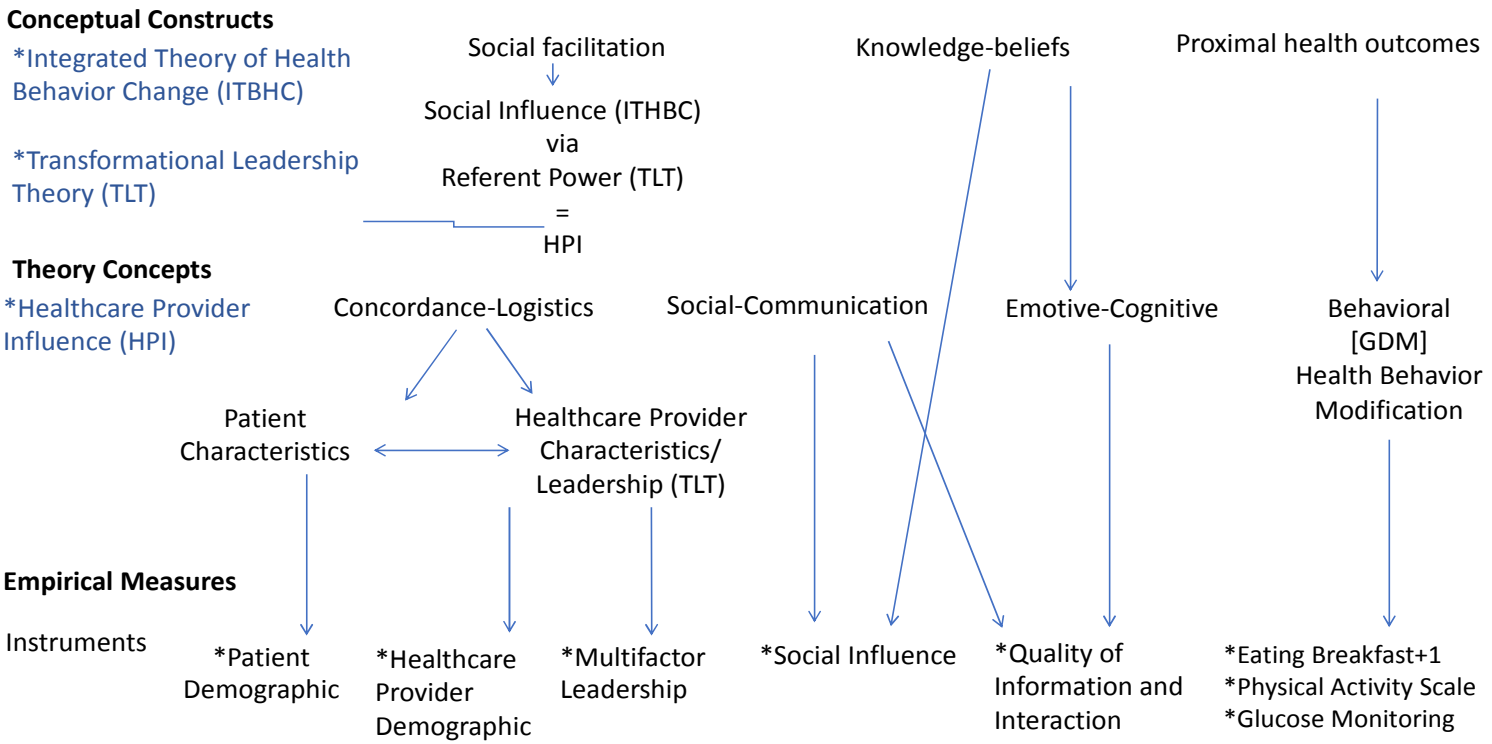

Fig 1. Conceptual Model for Professional Influence

Notes: * Theories/concepts and measures included in the study; GDM: Gestational Diabetes Mellitus

Appendix A: Online Supplemental Tables

Table S1
Healthcare Provider Professional Influence and Patient Characteristics Healthcare Provider Professional Influence and Patient Characteristics

Patient Characteristics Model Statistics		**Health Behaviors**													
		Healthy Eating						**Physical Activity**				**Glucose Monitoring**			
Model 1		**ΔHE1**		**ΔHE2**		**ΔHE3**		**ΔPA1**		**ΔPA2**		**GM1**		**GM2**		**GM3**	
	R^2=	.04		.02		.02		.02		.001		.02		.03		.01	
	Adj R^2=	.02		-.01		-.01		-.01		-.03		-.003		.004		-.02	
	p=	.21		.46		.57		.48		.95		.43		.33		.79	
		β	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**
SIQHP		-.03	.84	-.12	.35	.02	.85	-.05	.67	.04	.74	-.13	.31	-.18	.15	-.08	.52
QOIIHP		.21	**.09**	.14	.27	.11	.37	-.11	.37	-.02	.89	-.05	.71	.03	.80	.002	.99
Model 2	R^2=	.11		.07		.07		.05		.03		.05		.03		.04	
	Adj R^2=	.05		.01		.01		-.02		-.03		-.02		-.04		-.02	
	$R^2\Delta$=	.07		.05		.06		.03		.03		.02		.003		.04	
	p=	.15		.27		.22		.59		.50		.64		.98		.42	
		β	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**
SIQHP		-.002	.99	-.12	.32	-.01	.95	-.05	.68	.06	.61	-.14	.26	-.18	.15	-.07	.58
QOIIHP		.2	.12	.14	.28	.13	.31	-.12	.36	-.07	.61	-.001	.99	.05	.72	-.04	.76
RC	0=discordant 1 = concordant	-.29	**.03**	-.11	.42	.15	.25	-.11	.40	-.09	.49	.12	.37	-.002	.99	-.16	.23
LC	0= discordant 1= concordant	.2	.14	.11	.40	-.03	.83	.07	.60	-.1	.46	.05	.70	.06	.69	-.003	.98
GDMPFH	0= negative 1= positive	-.03	.83	.18	.14	.22	**.06**	.11	.37	-.09	.47	-.03	.81	-.01	.96	.1	.42
Model 3	R^2=	.27		.13		.14		.07		.05		.06		.13		.13	
	Adj R^2=	.14		-.02		-.01		-.09		-.11		-.1		-.02		-.01	
	$R^2\Delta$=	.16		.06		.07		.02		.02		.01		.09		.09	
	p=	**.04**		.65		.56		.94		.98		.99		.33		.36	
		β	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**
SIQHP		.5	**.05**	-.06	.84	-.002	1.0	-.21	.46	.07	.79	-.28	.32	-.49	**.07**	-.05	.87
QOIIHP		**.7**	**.04**	.6	.11	.44	.23	-.32	.40	.08	.84	-.04	.92	-.05	.89	-.13	.72

RC	0=discordant 1 = concordant	-.28	**.03**	-.12	.38	.16	.25	-.13	.35	-.07	.61	.11	.43	.03	.83	-.15	.28
LC	0= discordant 1= concordant	.22	.**10**	.19	.20	-.03	.83	. 06	.70	-.11	.47	.06	.68	-.01	.95	-.11	.44
GDMPFH	0= negative 1= positive	-.06	.58	.17	.17	.25	**.04**	.13	.29	-.1	.44	-.02	.88	.000	**.10**	.13	.30
RC*SIQHP		.16	.34	.11	.54	-.21	.26	.02	.91	.02	.93	.01	.94	.05	.78	.24	.20
RC*QOIIHP		-.22	.23	-.08	.67	-.21	.28	-.08	.68	.06	.76	.04	.84	.05	.79	-.38	**.05**
LC*SIQHP		-.52	**.04**	-.07	.79	.09	.73	.1	.73	.04	.89	.18	.53	.04	.89	-.2	.46
LC*QOIIHP		-.1	.78	-.47	.20	-.02	.96	.11	.77	-.01	.99	-.12	.75	.43	.24	.77	**.04**
GDMPFH*SIQHP		-.25	.31	-.12	.65	.04	.86	.06	.83	-.04	.89	-.01	.96	.32	.22	-.02	.94
GDMPFH*QOIIHP		-.24	.36	.07	.81	-.22	.42	.16	.58	-.2	.48	.13	.65	-.43	.13	-.42	.13

Notes: : : **significant finding p≤.1,** GDMPFH: Gestational Diabetes Mellitus/Diabetes Mellitus Personal/Family History, GM1: Glucose Monitoring 1, GM2: Glucose Monitoring 2, GM3: Glucose Monitoring 3, ΔHE1: Healthy Eating 1 Change Score, ΔHE2: Healthy Eating 2 Change Score, ΔHE3: Healthy Eating 3 Change Score, LC: Language Concordance, ΔPA1: Physical Activity 1 Change Score, ΔPA2: Physical Activity 2 Change Score, QOIIHP: Quality of Information/Interaction- Healthcare Provider, RC: Race Concordance, SIQHP: Social Influence- Healthcare Provider

Table S2

Hierarchical Regressions of Healthy Eating (HE) Physical Activity (PA) and Glucose Monitoring (GM) Behaviors on Healthcare Provider Professional Influence and Healthcare Provider Characteristics

Healthcare Provider Characteristics	**Healthy Behaviors**															
	Healthy Eating						**Physical Activity**				**Glucose Monitoring**					
Model Statistics																
Model 1	**ΔHE1**		**ΔHE2**		**ΔHE3**		**ΔPA1**		**ΔPA2**		**GM1**		**GM2**		**GM3**	
R^2=	.04		.02		.02		.02		.001		.02		.03		.01	
Adj R^2=	.02		-.01		-.01		-.01		-.03		-.003		.004		-.02	
p=	.21		.46		.57		.48		.95		.43		.33		.79	
	β	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**
SIQHP	-.03	.84	-.12	.35	.02	.85	-.05	.67	.04	.74	-.13	.31	-.18	.15	-.08	.52
QOIIHP	.21	**.09**	.14	.27	.11	.37	-.11	.37	-.02	.89	-.05	.71	.03	.8	.002	.99
Model 2 R^2=	.1		.03		.02		.08		.09		.12		.04		.08	
Adj R^2=	.04		-.04		-.05		.02		.03		.06		-.03		.01	
$R^2\Delta$=	.06		.01		.01		.06		.09		.09		.01		.07	
p=	.18		.88		.91		.19		**.07**		**.06**		.84		.15	
	β	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**
SIQHP	.03	.79	-.14	.30	.04	.79	-.1	.46	.05	.67	-.17	.19	-.21	.12	-.03	.84
QOIIHP	.19	.13	.13	.30	.1	.46	-.11	.40	-.03	.84	-.02	.84	.05	.71	.02	.90
GC:0=discordant; 1 = concordant	.08	.71	.09	.53	.06	.66	.28	**.04**	.19	**.05**	-.23	**.09**	-.04	.78	-.27	**.05**
MLQ: 0=Transactional, 1=Transformational	-.24	**.04**	.05	.67	-.05	.68	.03	.81	-.16	.17	.23	**.05**	.1	.41	-.11	.35
HP specialty :0= physician 1=nurse-midwife	-.08	.70	-.01	.93	.02	.90	-.23	**.1**	-.25	**.06**	.18	.19	-.01	.94	.06	.64
Model 3 R^2=	.19		.09		.15		.22		.18		.21		.17		.09	
Adj R^2=	.05		-.07		.01		.09		.05		.08		.03		-.06	
$R^2\Delta$=	.08		.06		.13		.14		.09		.10		.13		.01	
p=	.37		.67		.14		**.09**		.32		.26		.14		.99	
	β	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**
SIQHP	.45	.22	.31	.42	.2	.58	-.5	.16	-.26	.47	-.68	**.06**	-.87	**.02**	-.25	.52
QOIIHP	.04	.91	-.04	.90	.52	**.10**	.19	.52	.61	**.05**	.38	.2	.26	.41	.03	.94
GC:0=discordant; 1 = concordant	.12	.40	.13	.40	-.02	.90	.27	**.05**	.27	.19	-.28	**.05**	-.05	.75	-.27	**.07**
MLQ: 0=Transactional, 1=Transformational	-.31	**.01**	-.03	.83	-.09	.48	.06	.61	-.2	.12	.28	**.03**	.18	.16	-.09	.5
HP specialty:0= physician 1=nurse-midwife	-.12	.40	-.04	.78	.12	.40	-.24	**.08**	-.22	.12	.17	.21	-.03	.82	.05	.74

GC*SIQHP	-.24	.39	-.2	.5	.12	.67	-.3	.28	.08	.77	-.01	.98	-.09	.76	.06	.85
GC*QOIIHP	-.06	.78	-.14	.56	.2	.38	.03	.91	-.31	.17	-.23	.31	.07	.75	-.01	.97
MLQ*SIQHP	-.43	.11	-.46	.1	-.28	.3	.43	**.1**	.18	.49	**.56**	**.04**	**.64**	**.02**	.18	.52
MLQ*QOIIHP	.09	.74	.22	.44	-.48	**.08**	-.34	.2	-.49	**.08**	-.33	.22	-.27	.32	-.03	.91
HP specialty*SIQHP	.2	.31	.13	.53	.07	.75	**.48**	**.02**	.16	.42	.06	.74	.3	.13	.03	.9
HP specialty*QOIIHP	.29	**.09**	.22	.22	-.31	**.07**	-.1	.53	.05	.75	.06	.73	-.11	.5	.04	.79

Notes: **significant finding p≤.1,** GC: Gender Concordance, GM1: Glucose Monitoring 1, GM2: Glucose Monitoring 2, GM3: Glucose Monitoring 3, ΔHE1: Healthy Eating 1 Change Score, ΔHE2: Healthy Eating 2 Change Score, ΔHE3: Healthy Eating 3 Change Score, MLQ: Healthcare Provider Leadership Style, ΔPA1: Physical Activity 1 Change Score, ΔPA2: Physical Activity 2 Change Score, QOIIHP: Quality of Information/Interaction- Healthcare Provider, SIQHP: Social Influence- Healthcare Provider

Table S3

Multiple Linear Regression of Healthy Eating (HE) Physical Activity (PA) and Glucose Monitoring (GM) Behaviors on Diabetic Nurse Educator Professional Influence

Model Statistics	**Healthy Behaviors**															
	Healthy Eating						**Physical Activity**				**Glucose Monitoring**					
Model	**ΔHE1**		**ΔHE2**		**ΔHE3**		**ΔPA1**		**ΔPA2**		**GM1**		**GM2**		**GM3**	
R^2=	.08		.02		.004		.03		.00		.01		.02		.002	
Adj R^2=	.06		-.004		-.02		.01		-.03		-.02		-.01		-.02	
p=	**.04**		.43		.85		.28		1.0		.66		.49		.92	
	β	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**	**β**	**p**
SIQDE	-.12	.37	-.15	.27	.05	.74	-.13	.35	.01	.95	.13	.37	.15	.29	.04	.78
QOIIDE	**.34**	**.01**	.16	.24	.03	.83	-.08	.58	.003	.98	-.07	.59	-.14	.3	-.05	.7

Notes: **significant finding p≤.1**, GM1: Glucose Monitoring 1, GM2: Glucose Monitoring 2, GM3: Glucose Monitoring 3, ΔHE1: Healthy Eating 1 Change Score, ΔHE2: Healthy Eating 2 Change Score, ΔHE3: Healthy Eating 3 Change Score, ΔPA1: Physical Activity 1 Change Score, ΔPA2: Physical Activity 2 Change Score, QOIIDE: Quality of Information/Interaction-Diabetic Educator, SIQDE: Social Influence- Diabetic Educator