

Implementation and Evaluation of an Interdisciplinary and Coordinated Process  
Focusing on the Transitional Care of High-Risk Adult Patients  
With Type 2 Diabetes Mellitus and/or Hyperglycemia

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### Abstract

Diabetes mellitus is a major and escalating chronic illness that affects more than nine percent of the United States' population and is the seventh leading cause of U. S. deaths. Many hospitalized patients present without a prior diagnosis of hyperglycemia, but are recognized as pre-diabetic, while others experience transient stress hyperglycemia during hospitalization. Still others present with evidence of poor diabetes self-management, education, and support, and hospitalization provides an opportunity to assess and improve their current health status and glycemic control regimens. A growing body of evidence demonstrates that comprehensive glycemic control and interventions to increase patients' knowledge and self-care management skills are essential components of treatment, as is continuing support. Passage of the Patient Protection and Affordable Care Act of 2010 has re-focused attention on quality, to include effective patient care transitions, improved self-care management, and avoidable hospital readmissions. The purpose of this study was to describe and evaluate the implementation of an interdisciplinary inpatient diabetes care process that optimizes coordinated care transitions and patients' self-care knowledge. Although there were no significant differences in 30-day readmission rates or attendance at initial follow-up discharge appointments between the intervention and control groups of this pilot randomized control trial, observational and descriptive aspects of the study provided insight into the study institution's current processes with regard to standards of diabetes care, patient care coordination, and patient transitions. Deficiencies in these processes led to several recommendations and to the conclusion that implementation of an interdisciplinary diabetes care coordination pathway could be instrumental in improving the delivery and quality of care for patients with Type 2 Diabetes Mellitus.

*Key words: transitional care, diabetes mellitus, patient outcomes*

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**Implementation and Evaluation of an Interdisciplinary and Coordinated Process  
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**Type 2 Diabetes Mellitus and/or Hyperglycemia**

**I. Introduction and Research Question**

**Overview of the Problem**

Diabetes mellitus (DM) is a major and escalating chronic illness that affects more than 29 million individuals (9.3% of the United States population) and is the seventh leading cause of U. S. deaths; a diagnosis of pre-diabetes characterizes 37% of the population. Moreover, the incidence of DM is expected to triple by 2050 (Centers for Disease Control and Prevention [CDC], 2014). Type 1 Diabetes Mellitus (T1DM) is an autoimmune condition in which insulin-producing pancreatic beta cells are destroyed, and there is a lifelong need for exogenous insulin to avoid hyperglycemia, diabetic ketoacidosis, and death. Type 2 Diabetes Mellitus (T2DM) is a more insidious form of DM in which there is resistance to insulin action and a progressively inadequate compensatory insulin secretory response. T2DM accounts for 90% – 95% of all diagnosed cases of DM, and when not controlled, is a major cause of heart disease and stroke, and the leading cause of kidney failure, non-traumatic lower-limb amputations and new cases of blindness among adults in the United States (American Diabetes Association [ADA], 2010).

Type 2 Diabetes Mellitus is a multi-faceted illness of several diagnoses, and is estimated to total \$176 billion in direct medical costs annually (ADA, 2013). In 2008, nearly one in five hospitalizations were related to patients with DM, totaling over 7.7 million stays and \$83 billion in hospital costs. Hospital stays for patients with DM are longer, more costly (\$10,937 vs. \$8,746 for patients without DM), and more likely to originate in an emergency department (Fraze, Jiang, & Burgess, 2010). Furthermore, a recent analysis by the Agency for Healthcare

Research and Quality (AHRQ) demonstrated higher hospital readmission rates following a hospital stay for a chronic illness such as DM (2012).

Diabetes care is complex, progressive, and includes regulation of blood glucose (BG) levels, control of hypertension and blood lipids, and preventive care practices for patients' kidneys, eyes and feet. First-line treatment for patients with T2DM incorporates diabetes self-management education (DSME), which focuses on self-care behaviors such as healthful eating, physical activity, and self-monitoring of blood glucose (SMBG). Additionally, many patients are prescribed oral and injectable glycemic-control medications, and/or insulin. Patients are asked to translate a great deal of information regarding their disease process and its management into knowledge and skills, and new behaviors must be adopted. A growing body of evidence demonstrates that comprehensive glycemic control and interventions to increase patient knowledge and self-care management skills are essential components of treatment, as is continuing support (ADA, 2014). Inpatient diabetes education is associated with earlier discharge and improved outcomes following discharge (Seley & Wallace, 2009), whereas failure to acknowledge diabetes prior to hospital release is associated with increased 30-day readmission rates (Healy, Black, Harris, Lorenz, & Dungan, 2013). Moreover, while patients who receive structured outpatient diabetes care have been shown to have better glycemic control and outcomes, appointment-keeping behavior in the outpatient setting is crucial to achieving this (Cook et al., 2009).

As national awareness of inadequacies in quality within specific care settings increases, evidence demonstrates how poor care transitions are contributing to negative outcomes for patients, their caregivers, and healthcare systems. The 2001 Institute of Medicine (IOM) report, *Crossing the Quality Chasm: A New Health System for the 21<sup>st</sup> Century*, identified poor care

transitions as a major cause of poor patient outcomes and increased healthcare costs, and recommended that “clinicians and institutions actively collaborate and communicate to ensure an appropriate exchange of information and coordination of care” (p. 9). In this era of healthcare in multiple settings (hospitals, short- and long-term skilled nursing facilities, physicians’ offices, nurse-led clinics, community safety-net facilities, and homes), and the growth of the hospitalist model of inpatient care, problems related to care transitions arise frequently (Coleman & Williams, 2007; Pham, Grossman, Cohen, & Bodenheimer, 2008). Type 2 diabetics are among the most complex participants of care transitions because they require input from a variety of healthcare organizations and providers. Multiple researchers have found deficiencies in knowledge, skills and attitudes among healthcare practitioners in the care of patients with diabetes, and have identified an interdisciplinary, coordinated, and well-educated staff as essential for optimal care (Modic et al., 2009; Munoz et al., 2012). Yet, debate persists regarding how to motivate healthcare personnel to work collaboratively and effectively to improve patient, family, and provider experiences in care transitions (Health Policy Brief, September 13, 2012).

Quality and patient safety often are compromised when patients transition between different settings because systems fail to ensure that vital elements of care are communicated among the various practitioners and facilities that a chronically ill person with acute exacerbations might encounter. Among the resultant hazards are conflicting recommendations regarding chronic disease self-management, medication errors and/or duplication, lack of follow-up care, omission of planned services, and failure of patients to receive the education and support necessary to overcome self-care barriers. Moreover, patients suffer poorer clinical outcomes, care dissatisfaction, and often must rely upon emergency departments or re-hospitalization to correct avoidable and costly oversights (Coleman, Min, Chomiak, & Kramer, 2004).



Researchers posit that a major barrier to improving the quality of transitional care is recognizing it as a significant issue requiring its “own agenda and unique set of strategies to address the multiple and complex factors that affect its quality” (Coleman & Berenson, 2004, p. 534).

Overall, hospital- and community-based physicians increasingly work in silos, and few studies describe the back-and-forth between evolving hospitalist models and related changes in healthcare delivery of outpatient services that may affect patient outcomes (Pham et al., 2008).

The patient-centered medical home (PCMH) has become a major focus of current healthcare delivery. According to the Agency for Healthcare Research and Quality (AHRQ), the medical home model holds promise as a way to improve American healthcare by transforming how care is organized and delivered. The PCMH framework encompasses five core functions and attributes: 1) comprehensive care (prevention, wellness, acute and chronic); 2) patient-centered care (relationship-based and holistic with recognition of each patient’s needs, values, culture, and preferences); 3) coordinated care (communication and collaboration across all elements of the healthcare system); 4) accessible services; and, 5) quality and safety (AHRQ, 2014). Cipriano (2012) states that patient-, family-, and population-centered interprofessional approaches to care coordination and transitional care are imperative. Rittenhouse and Shortell (2009) opine that successful healthcare reform will “require a shift in emphasis from fragmentation to coordination and from highly specialized care to primary care and prevention” (p. 2038). Defining the four cornerstones of the PCMH model as primary care, patient-centered care, new-model practice, and payment reform, Rittenhouse and Shortell (2009) conclude that an insufficient practice structure currently exists to support widespread implementation of the PCMH model, and suggest the need for a team-based approach to care and a significant cultural change from viewing patients as passive recipients of information to engaged and knowledgeable

participants in their care. Cook et al. (2009) have concluded that with regard to diabetes management, few data involve the transition of care from inpatient to outpatient settings, and that development of such strategies is a high priority. Furthermore, although good discharge planning mandated by the Joint Commission makes inpatient education essential, management philosophies differ greatly with regard to which inpatient education resources are essential to the process, and who should do the educating (Nettles, 2005).

Health care reform and newer interprofessional models of education and clinical practice have increased the demand for advanced practice nurses; and, their value in a variety of patient care settings, to include the PCMH, is becoming well established. *The Future of Nursing: Leading Change, Advancing Health* begins with the assumption that nursing “brings a steadfast commitment to patient care, improved quality and safety, and better outcomes” (IOM, 2010, p. xi), and concludes that nurses who are allowed to practice in accordance with advanced professional training, could fill expanded roles in a redesigned healthcare system. The report further professed that effective teamwork among all healthcare professionals is directly linked to better patient outcomes (IOM, 2010). The American Association of Colleges of Nursing’s (AACN) Task Force on the Essentials of Doctoral Education for Advanced Nursing Practice (2006) identifies several content areas for graduate education in nursing within a context of societal healthcare needs and interprofessional work environments: 1) development of needed advanced competencies for increasingly complex practice and leadership roles; 2) enhanced knowledge to improve nursing practice and patient outcomes; and, 3) enhanced leadership skills to strengthen practice and health care delivery. Regardless of model, the current and often fragmented network of U.S. healthcare is in need of improvement, and advanced practice nurses are in an ideal position to help lead innovations (Dambaugh & Ecklund, 2014). According to

Sroczynski and Dunphy (2012) advanced practice nurses, as the largest group of primary care providers, are “the critical element in the provision of care, prevention, and quality outcomes” (p. 464). A recent Vanderbilt University study demonstrated decreased hospital lengths-of-stay, complications, and readmissions among patients who were managed by interprofessional acute care teams that were led by nurse practitioners (Jones & Kapu, 2014). And, clinical nurse specialists overcome barriers to evidence-based practice through their competencies as clinical experts, educators, consultants, and researchers who can identify gaps in practice and/or patient outcomes (Colwill et al., 2014).

Cook et al. (2009), in a review article on inpatient-to-outpatient transfer of diabetes care, define an effective diabetes discharge as “one where the patient has received the necessary skills training and been provided with a clear and understandable post-discharge plan for diabetes care that has been clearly documented and is accessible by the patient’s outpatient healthcare team” (p. 263). Furthermore, the 2008 National Patient Safety Goals Disease Specific Care Program incorporates four goals that are applicable to care transitions and patient discharge planning: 1) improve the effectiveness of communication among caregivers; 2) improve the safety of using medications – accurately and completely reconciling medications across the continuum of care; 3) encourage the active involvement of patients and their families in the patient’s own care; and, 4) improve recognition and response to changes in a patient’s condition (The Joint Commission, 2008).

The health system at which this research was conducted initiated its vision of improved hospital discharges and care coordination with the implementation of a Transitional Care Management (TCM) program in 2011, using Coleman’s (2014) Transitional Care Program<sup>®</sup> as one structural component. More recently, Dvorak and Garcia observed that the institution’s

referral process between inpatient and outpatient settings would likely benefit from a more interdisciplinary approach to patient screening, care, and engagement, and that a method of shared documentation among healthcare providers must be created (2013).

### **Purpose of the Study**

The purpose of this study was to describe and evaluate the implementation of an interdisciplinary inpatient diabetes care process that optimizes coordinated care transitions and self-care knowledge of high-risk adult patients with Type 2 Diabetes Mellitus and/or hyperglycemia.

### **Conceptual Framework**

The Care Transitions Intervention<sup>®</sup> (CTI<sup>®</sup>), which was designed by Coleman et al. (2002) in response to the need for a patient-centered, interdisciplinary intervention addressing safety and continuity of care across multiple settings and practitioners, was used as a conceptual framework for this study. Coleman (2014) defines care transitions as the “movement patients make between healthcare practitioners and settings as their condition and care needs change during the course of a chronic or acute illness,” and refers to transitional care as a set of actions that ensure coordination and continuity of health care, and encompass both the sending and receiving aspects of the transfer, including logistical arrangements, education of the patient and family, and communication among healthcare professionals (Coleman & Boulton, 2003). Coleman’s intervention is comprised of four conceptual models or pillars: 1) medication self-management; 2) use of a dynamic patient-centered record; 3) timely primary care and/or specialist follow-up; and, 4) patient knowledge and response to “red flags” that are indicative of a worsening condition (Coleman et al., 2002). A key component of the model is patient/family interaction with a transition coach who provides care continuity while fostering communication,

collaborative problem solving, and support with medications and self-management (Parry, Coleman, Smith, Frank, & Kramer, 2003).

The original design of the CTI<sup>®</sup> was shaped by the literature evaluating interdisciplinary teams and care transitions. Coleman and colleagues (2002) gathered empirical data through the conduction of focus groups with chronically ill older adults and their caregivers. The purpose of those interviews was to understand the challenges faced by patients who were receiving care during transitions between multiple settings. Discussions explored patients' perspectives of their transitions, communication among healthcare providers, patients' understanding of medications and discharge instructions, and patients' and caregivers' knowledge and ability to elicit answers to their questions from appropriate healthcare practitioners (Coleman et al., 2002). More specifically, patients were asked questions that addressed the extent to which their care needs were met following hospital discharge, whether primary care providers were informed of their hospitalization and subsequent plan of care, and the level of patients' and caregivers' understanding of self-management responsibilities and the level of preparation required for a successful post-hospital discharge. These new data, coupled with existing evidence, provided the foundation for the development of the CTI<sup>®</sup>. Since its implementation, Coleman and colleagues have evaluated and refined the intervention, and studies have shown that hospitalized subjects who receive the CTI<sup>®</sup> are significantly less likely to be readmitted to the hospital at 30, 60, and 180 days than subjects not receiving it (Coleman et al. 2004; Coleman, Parry, Chalmers, & Min, 2006; Parry et al., 2003; Parry, Min, Chugh, Chalmers, & Coleman, 2009). Further exploration of intervention sites and project sustainability has demonstrated five important characteristics for fulfillment of the framework: 1) a viable sustainability plan; 2) executive leadership support; 3) dedicated and consistent transition coaches; 4) effective and strong project

management support; and, 5) site team commitment to the CTI<sup>®</sup> (Parrish, O'Malley, Adams, Adams, & Coleman, 2009). In contrast to traditional case management discharge approaches, the CTI<sup>®</sup> is a self-management model that shifts institutional-centered team care to patient-centered team care, with an emphasis on patient empowerment and smooth transfer of information along the healthcare continuum (Parry et al., 2003).

Coleman's CTI<sup>®</sup>, which incorporates self-management within its framework, draws from principles of adult learning and behavior. According to Coleman (2003) "in the majority of care transitions the patient and caregiver are the only common thread between sites of care and by default have been given the added responsibility of facilitating their care transitions, often without the necessary skills or confidence to do so" (p. 550). Bandura (2004) posits that healthcare is changing from an illness model to a relative wellness model that mandates self-management of chronic illness and of risk factors related to disease. In this context, Bandura (2005) proclaims self-management to be a well-received model of care because it is tailored to patients' individual needs and can be community- and/or home-based. An early architect of Social Learning Theory and later the theory of self-efficacy, Bandura (2004) states that self-efficacy (one's belief in one's ability to succeed in certain situations) acts together with goals, expectations, and perceived environmental barriers and facilitators to alter motivation, behavior, and well being. He further proclaims "belief in one's efficacy to exercise control is a common pathway through which psychosocial influences affect health functioning" (p. 143), and asserts that it is of "limited value to motivate people to change if they are not provided with appropriate resources and supports to realize those changes" (p. 151).

Once a topic garnering little attention, care transitions have been deemed a priority for research and translation of evidence into practice. Organizations including the Joint

Commission, the Centers for Medicare and Medicaid Services, and the Society for Hospital Medicine all have conveyed the need for further investigation and potential solutions for the resultant lapses in quality and safety of inadequate care transitions. Provisions within the Patient Protection and Affordable Care Act of 2010 and other national incentives to improve organizational transitions of care, coupled with institutions' perceived opportunities for improvement, have led many healthcare groups to re-examine their current practices and to develop better strategies of care coordination and illness management. Recognition that care, or lack thereof, received in the outpatient setting can affect the need for hospitalization, and that lessons learned in the inpatient setting could impact self-care knowledge and behaviors following discharge, have led practitioners to focus on the full continuum of diabetes care.

### **Research Questions**

Two major questions guided the development of this project:

1) Will high-risk adult patients hospitalized with T2DM and/or hyperglycemia whose care and education are guided by implementation of an interdisciplinary and patient-centered Diabetes Care Coordination Pathway, which is coordinated by an advanced practice nurse (APN), demonstrate a higher percentage of attendance at their initial clinic appointments following hospital discharge than those patients receiving usual hospital care?

2) Will high-risk adult patients hospitalized with T2DM and/or hyperglycemia whose care and education are guided by implementation of an interdisciplinary and patient-centered Diabetes Care Coordination Pathway, which is coordinated by an APN, demonstrate a lower percentage of hospital readmissions within 30 days of discharge than those patients receiving usual hospital care?

Secondary questions driving this project probed glycemic control, patient diabetes self-management education and survival skills, and patient and provider satisfaction with inpatient-to-outpatient transitional processes.

## **II. Review of the Literature**

### **The Problem Being Addressed**

Glycemic control benchmarks have been incorporated into public reporting, regulatory compliance, professional guidelines, and national quality initiatives; and, passage of the Patient Protection and Affordable Care Act of 2010 has re-focused attention on improved self-care management and support, effective patient care transitions, and avoidable hospital readmissions. However, despite nearly 15 years since the IOM (2001) publication *Crossing the Quality Chasm*, there remains a gap between what we know to be best-practice healthcare and what is performed clinically on a daily basis. Diabetes is a complex chronic illness that requires the involvement of various personnel in numerous settings. Each exacerbation and/or complication of this disease can trigger multiple transitions of care, and there is a growing consensus among national policymakers to address key questions about sequential yet coordinated approaches to care. As distinctively asked by Pham and colleagues (2008), how should healthcare providers best address the “black hole of accountability” that commonly exists between hospital treatment and outpatient management (p. 1325)?

### **Objectives of the Literature Review**

The objectives of this literature review were two-fold: 1) to identify and evaluate recent studies in which individuals with DM undergo management and care transitions, to report their outcomes, and to identify key factors for successful communication, collaboration, and coordination among patients and healthcare practitioners; and, 2) to provide a summary of



findings, identified by their quality of evidence, that would serve as a rational foundation for the development of a coordinated, interdisciplinary pathway of care and education for high-risk patients with T2DM and/or hyperglycemia.

### **Search Strategy**

To identify recent research involving the use of transitional care models among patients with T2DM, the literature from January 2002 through 2013 was systematically reviewed. The electronic databases Ovid MEDLINE and CINAHL were searched initially. Types of studies sought included all randomized control trials (RCTs), quasi-experimental cohort comparison studies, and qualitative analyses of patients with T2DM undergoing healthcare transitions in which outcomes were assessed. Investigations using innovative or specialized care before, during, and/or after care transitions; individual and/or focus group interviews or surveys; and prospective or retrospective medical record reviews or longitudinal observations to determine patient outcomes are included. The combination of key words transitional care (continuity of care, health transitions: education, evaluation, methods); diabetes mellitus; and patient outcomes (treatment outcomes, outcome and process assessment) returned 81 citations. Adding the English language and male and female adults (19 years of age and older) as limitations pared that number to 39. The same key words were used to search the Cochrane Library, which returned one completed systematic review. A hand search of references from relevant articles identified an additional 12 studies. Following the exclusion of duplications and the examination of all article abstracts for conformity with study, participant and intervention criteria, 23 articles were read and critiqued in their entirety: one systematic review article, five randomized control trials, seven quasi-experimental (non-randomized comparison cohort studies), and ten qualitative (individual and focus group interviews, surveys, and observations) studies. Each study was

carefully evaluated with regard to publication, design, and baseline group characteristics: population (diabetes status), setting, and informed consent/IRB status; blinding of patients, healthcare providers, and/or data assessors; sample size and calculations; study attrition with descriptions of exclusions; study withdrawals and losses to follow-up; intention-to-treat analysis; details of intervention and control or comparison strategies; duration of treatment; outcome measures; adverse effects; and, financial considerations.

### **Summary of the Literature**

While there is an emerging body of evidence in the healthcare literature that addresses care across settings, little of it deals with patients younger than 65 years of age, and even less speaks specifically to the T2DM population.

Coleman et al. (2004) examined the use of advanced practice nurses (APNs) and other registered nurses (RNs) working within an integrated system of care to provide adult patients who had at least one of nine chronic conditions (to include DM) with an intervention using a four-pillared model of care transition: medication self-management, patient-centered record, medical follow-up, and patient knowledge of signs and symptoms indicative of a worsening condition. Patients in the APN-intervention group were half as likely to return to a hospital within 30 days of discharge as those who received usual care. Coleman and colleagues (2006) further examined this concept in an RCT that provided transitioning patients and their caregivers with tools to promote cross-site communication while encouraging them to take more active roles in their care. In this study, intervention patients again had significantly lower re-hospitalization rates at 30 and 90 days than patients in the control group.

Daly, Douglas, Kelley, O'Toole, and Montenegro (2005) tested the effect of an in-hospital disease management program on hospital readmission patterns and costs among the

chronically ill, and demonstrated that chronic *critical* illness may have a natural trajectory of morbidity and mortality that is not affected by the provision of additional care coordination services; however, patient death, dropout, and loss to follow-up caused this study to be underpowered. Another RCT in which high-risk, multi-morbid adults were randomized to receive a “guided-care” intervention vs. usual care demonstrated higher quality care scores among the intervention group. In this study, “specifically trained” RN coaches prepared patients for self-management, and were responsible for smoothing transitions between care sites, and for coordinating efforts among care providers (Boyd et al., 2009).

Liu, Einstadter, and Cebul (2010) completed a longitudinal observation of nearly 4,000 adult patients to evaluate the association between patterns of fragmented care and emergency department use among patients with diabetes, and concluded that “posited benefits of specialist referrals among patients with complex diabetes may be negated by care fragmentation” (p. 419), and that better models for care coordination might be needed.

Chen and Cheng (2011) looked specifically at adults with a diagnosis of diabetes when they analyzed associations between continuity of care and healthcare utilization and expense, and found that diabetic patients with a higher continuity-of-care index had significantly lower emergency department visits and hospitalizations. Alazri, Neal, Heywood, and Leese (2006) and Alazri, Heywood, Neal, and Leese (2007) more specifically examined the concept of care continuity from both patients’ and providers’ perspectives. They identified advantages and disadvantages of three types of continuity of care: relational, cross-boundary, and informational, and concluded that both patients and providers recognized the importance of information sharing as essential to all aspects of care continuity.

Dearinger, Wilson, Griffith, and Scutchfield (2008) concluded that interpersonal

continuity may be of benefit in patients with illnesses that require self-management behaviors, and Hueston (2010), in a descriptive chart review of 705 adults aged 18–75 with a diagnosis of T2DM, found that those patients identified as having a regular healthcare provider had lower average hemoglobin A1C (HbA1C) values than those who didn't. Worrall and Knight (2011) demonstrated similar results, establishing an association between higher continuity of care and reductions in the likelihood of hospitalizations and death in older Canadian patients with diabetes. Contrary to these findings was a study by Gulliford, Naithani, and Morgan (2007) of adult patients with T2DM who were receiving care within 19 family practice groups in the United Kingdom, which established no statistical significance between the HbA1C of patients who experienced continuity of care and those who didn't. This study, however, was underpowered with a dropout rate of greater than 15%. Furthermore, the results of both studies, which took place under systems of nationalized healthcare, may not be generalizable to patients in the United States.

Other researchers moved beyond continuity of care for closer examinations of the importance of providing comprehensive outpatient instructions and plans of care prior to hospital departures. In a descriptive study, Cook et al. (2009) reviewed data on diabetes discharge planning, and provided a definition of an effective diabetes discharge: “one where the patient has received the necessary skills training and has been provided with a clear and understandable discharge plan for diabetes care that has been clearly documented and is accessible by the patient's outpatient healthcare team” (p. 263). Cook and colleagues provide a model of continuum diabetes care in which they claim few data about the transition of diabetes care from the inpatient to the outpatient setting, but assert “defaulters from outpatient follow-up have more severe hyperglycemia (and are) at greater risk for developing complications” (2009, p. 264).

Forster, Murff, Peterson, Gandhi, and Bates (2003) completed a prospective cohort study in which medical records were reviewed and consecutive patients were telephoned three weeks following hospital discharge, and discovered adverse events in 19% of patients, with adverse drug events being most common (66%). Study conclusions led to system modifications that incorporated patient assessments prior to discharge, as well as pre-discharge patient education with regard to drug therapy, side effects, and symptoms of a worsening condition. Ginde, Pallin, and Carmargo (2008) and Kimmel, Sullivan, and Rushakoff (2010) also documented inadequate discharge instructions, and Mahto et al. (2009) found that development and implementation of a structured diabetes outreach program improved hospital discharges and reduced avoidable readmissions.

Jack et al. (2009) used an RCT design to test the effects of an interdisciplinary intervention designed to minimize hospital readmissions following discharge, and demonstrated that patients in an intervention group who worked with a nurse discharge advocate to arrange follow-up appointments, reconcile medications, provide patient education, develop an individualized patient instruction book, and who were called by a clinical pharmacist two to four days following discharge to reinforce the plan and to review medications, had significantly lower rates of hospital utilization than those receiving usual care. In another RCT, Wong, Mok, Chan, and Tsang (2005) demonstrated a practical and cost-effective model of nurse-led transitional care that lowered the average length of stay among patients hospitalized with diabetes.

While much of the published literature on transitional care includes older, non-diverse patients, two researchers expanded this patient pool and provided insight into the needs of others. Peek et al. (2009) used in-depth interviews and focus groups with diabetic African-American adults and their primary care providers to identify patient-provider power imbalances, which

included factors related to health literacy, self-efficacy, fear, and interpersonal skills. Davachi and Ferrari (2012) provided individual and informal group diabetes education that focused on coaching, patient empowerment, and goal setting to a group of homeless adults with elevated blood glucose levels, and described improvements in self-care and better access to healthful food and medications following their interventions.

Throughout the past 20 years, an interdisciplinary team based at the University of Pennsylvania has been testing and refining a model of transitional care, the Transitional Care Model (TCM), which incorporates in-person contact and a nurse-led interdisciplinary team approach to care transitions among cognitively intact older adults with multiple chronic illnesses, poor self-health ratings, and frequent hospitalizations (Naylor et al., 2011). Naylor and Sochalski (2010) evaluated the impact of translating this model into mainstream, “real-world” practice, and found improvements in health status and quality-of-life measures of subjects employing the TCM intervention vs. those receiving usual care. Other sustained outcomes included significant all-cause reductions in hospital readmissions, enhancement of patient and family caregiver satisfaction, and reductions in total health-care costs. Data collected in these analyses are informative of the challenges of translating innovative and effective care management programs into mainstream practice.

### **Rationale and Implications for the Present Study**

The literature has established that poor care transitions are associated with poor patient outcomes and increased healthcare costs, and that patients with T2DM are among the most complex participants of care transitions because they frequently require treatment in multiple settings and input from a variety of healthcare organizations and providers. Furthermore, while walls between inpatient/outpatient status and acute/chronic illness are disappearing, healthcare

practitioners have continued to work in silos with poor information sharing and cross-boundary communication. The literature has verified that organizational modifications with better models for care coordination and systematic approaches to hospital discharges are needed, and that nurse-led transitional care is a practical and cost-effective prototype.

While there is an emerging body of evidence in the healthcare literature that addresses care across settings, little of it speaks specifically to the T2DM population, especially to those under the age of 65 years; hence, there remain many unanswered questions about how providers might best work with T2DM patients to improve their care and quality of life across the healthcare continuum. In reviewing the care transition literature, one is able to make several associations between the concerns of healthcare providers treating the older, chronically ill participants in the studies included in this systematic review and the needs of diabetic patients of any age as described recently in the National Standards for Diabetes Self-Management Education and Support: 1) internal structure and program coordination; 2) access; 3) an evidence-based curriculum and well-trained instructional staff; 4) individualization of care; and, 5) ongoing support of patient progress (Haas et al., 2013).

As the number of adults coping with multiple co-existing chronic illnesses increases, and with the Patient Protection and Affordable Care Act establishing community-based care transition programs as a priority, hospitals—as accountable care organizations with a goal of improving quality while decreasing costs of patient-centered care across healthcare settings—are in positions to initiate programs and partnerships that result in improved outcomes throughout their patient populations and continuums of care.

### **Implications for Nursing**

This literature review depicted nurses as care providers in varying capacities and with

variable levels of education from bedside “guides” to those with advanced-practice degrees. Researchers recognized deficiencies in knowledge, skills, and attitudes among nurses as a distinct problem with regard to the development of consistent and understandable plans of care for patients with DM. On the other hand, the “versatility of nurses in recognizing care coordination gaps and in designing, implementing, and evaluating efficient interventions focused on improving patient outcomes and satisfaction” is becoming increasingly recognized on a national level (American Nurses Association [ANA], 2012, p.17). Moreover, the unique patient-centered body of knowledge, clinical assessment skills, and effective interdisciplinary leadership proficiencies that define advanced practice nurses (APN)—especially at the Doctor of Nursing Practice level—could be critical to the creation of an infrastructure in which research innovations are translated into practice and improved outcomes for patients with T2DM are realized. The concept of an APN as a coordinator and facilitator for diabetes care, bridging gaps in the healthcare continuum and providing evidence-based care and education, is undeniably ripe for further consideration and appraisal.

### **Research Questions**

This study posed two primary questions:

- 1) Will high-risk adult patients hospitalized with T2DM and/or hyperglycemia whose care and education are guided by implementation of an interdisciplinary and patient-centered Diabetes Care Coordination Pathway, which is coordinated by an advanced practice nurse (APN), demonstrate a higher percentage of attendance at their initial clinic appointments following hospital discharge than those patients receiving usual care?
- 2) Will high-risk adult patients hospitalized with T2DM and/or hyperglycemia whose care and education are guided by implementation of an interdisciplinary and patient-centered Diabetes



Care Coordination Pathway, which is coordinated by an APN, demonstrate a lower percentage of hospital readmissions within 30 days of discharge than those patients receiving usual hospital care?

Secondary questions driving this project probed glycemic control, patient diabetes self-management education and survival skills, and patient and provider satisfaction with inpatient-to-outpatient transitional processes.

### **III. Methods**

#### **Introduction**

Numerous researchers and publications have established that glycemic control is increasingly being incorporated into public reporting, regulatory compliance, professional guidelines, and national quality initiatives. However, system failures in patient discharge processes and the “divorce of inpatient and outpatient care” (p. 1315) have led to poorly managed transitions that result in inadequate care coordination and less-than-optimal patient outcomes (Pham et al., 2008). It has been stated in the healthcare literature that “well-executed communication among hospital providers, patients, and receiving providers at the time of hospital discharge contributes to better health outcomes and lower overall healthcare costs” (Voss et al., 2011, p. 1232). Furthermore, researchers have validated the importance of pre-discharge patient education that is based upon in-hospital patient and family knowledge assessments (Cook et al., 2009; Forster et al., 2003; Ginde et al., 2008; Kimmel et al., 2010). Dvorak and Garcia (2013), developers of the study institution’s Transitional Care Management program, have opined that the system’s current referral process between inpatient and outpatient settings would likely benefit from a more interdisciplinary approach to patient screening, care, and engagement, and urged the creation of a more accessible and reliable method of

communication and shared documentation among healthcare providers.

### **Purpose of the Study**

The purpose of this study was to describe and evaluate the implementation of an interdisciplinary inpatient diabetes care process that optimizes coordinated care transitions and self-care knowledge of high-risk adult patients with Type 2 Diabetes Mellitus and/or hyperglycemia.

### **Hypotheses**

The specific aim of the DCCP was to utilize an inpatient diabetes care facilitator, an advanced practice nurse, to organize an interdisciplinary and patient-centered education and documentation process. There were two study hypotheses:

- 1) High-risk adult patients hospitalized with T2DM and/or hyperglycemia whose management is guided by implementation of the DCCP will demonstrate greater attendance at their initial healthcare appointments following hospital discharge than those patients receiving usual care; and,
- 2) High-risk adult patients hospitalized with T2DM and/or hyperglycemia whose management is guided by implementation of the DCCP will demonstrate fewer hospital readmissions within 30 days of discharge.

### **Research Design**

The research design was that of a pilot, randomized control trial of a behavioral intervention, the Diabetes Care Coordination Pathway (DCCP). The study was initially designed to enroll 36 subjects in each arm (intervention and control), but time constraints limited total enrollment to N=20 patients. Adult (age 18 and older) general medicine patients who were hospitalized at the study institution's main medical campus with a diagnosis of Type 2 Diabetes

Mellitus (T2DM) [ICD-9, MD chart diagnosis, or administration of a diabetes medication] and/or hyperglycemia [two or more episodes of a random blood glucose (BG) level of >180mg/dL], and who were eligible for care with the institution's Transitional Care Management program were screened and consented for study inclusion. Over a three-month period, the DCCP was applied to a prospective and randomly assigned sample (n=10) of intervention patients, while a comparable control group (n=10) received usual hospital care. Both groups were followed for 30 days post-hospital discharge.

### **Protection of Human Subjects**

The Human Research Protection Program (HRPP) of the study institution and the University of Virginia Institutional Review Board for Health Sciences Research approved this study (see Appendix A). At most, participants in this study incurred minimal risk, which is defined by Polit and Beck (2012) as "risks no greater than those ordinarily encountered in daily life or during routine tests or procedures" (p. 156). Primary ethical issues related to this proposal were anonymity, confidentiality, and data storage. All conversations, to include study consent, with patients without fluency in English were conducted using professionally translated materials and/or professional interpreters.

### **Intervention**

This study's intervention (independent variable) was the application of an interdisciplinary Diabetes Care Coordination Pathway that utilized an inpatient diabetes care facilitator, an advanced practice nurse (APN), to organize an interdisciplinary and patient-centered education and documentation process. The APN facilitated bedside diabetes education based upon current practice guidelines that were implemented on high-risk patients by nursing, nutrition, pharmacy, and social-work staff. The evaluations and recommendations of members

of this Diabetes Care Coordination Team (DCCT) were communicated to outpatient providers prior to patient discharges using an electronic Diabetes Care Coordination Note (DCCN). The APN provided medication reconciliation and discharge instructions during a “diabetes discharge appointment” that incorporated the *TeachBack* method of communication (AHRQ, 2014). Patients’ appointments were summarized in the DCCN, which was used to document completion of all components of a safe and effectual transition, and incorporated a diabetes quality assurance checklist.

The study’s dependent variables were its two primary outcomes: 1) the number of patients that attended their initial follow-up healthcare appointments after hospital discharge; and, 2) the number of patients that experienced a hospital readmission within 30 days of discharge. Secondary outcomes included glycemic control as measured by patients’ point-of-care blood glucose levels, and patient and provider satisfaction with the inpatient-to-outpatient transitional care processes.

### **Setting and Duration of the Study**

High-risk diabetic and/or hyperglycemic patients were identified, consented, and enrolled in the study from general medicine and hospitalist-based units on the campus of an 850<sup>+</sup>-bed, tertiary care hospital in the immediate suburbs of a large east coast city of the United States. Patients were followed through their initial post-discharge appointments and monitored electronically for evidence of a hospital readmission within 30 days of discharge.

### **Description of the Sample**

#### **Study Population**

Patients with a diagnosis of T2DM [ICD-9, MD chart diagnosis, or administration of a diabetes medication] and/or hyperglycemia [two or more episodes of a random blood glucose

(BG) level of >180mg/dL] and hospitalized under a general medicine or hospitalist team were identified during a daily review of the EPIC electronic medical record (EMR) and screened as prospective study enrollees by the study coordinator utilizing the trial's Screening Criteria (see Appendix B) and LACE Index Scoring Tool (see Appendix C).

Male and female patients, 18 years of age and older, were eligible for enrollment in this study. Race and/or ethnic origin were not factors for the inclusion or exclusion of patients in this study; conversations with non-native English speakers utilized professional translators, and written materials were provided in patients' native languages as well as in English per need/request. Being economically disadvantaged and/or without a primary care provider was one criterion for enrollment, as the study institution's Transitional Care Management program and Transitional Services discharge clinics provide an initial medical home and care for such patients immediately following hospitalization.

### **Sample size**

A final sample size of ten patients per group (N=20) was employed. Due to time constraints, the original research proposal was abbreviated to become a pilot study.

### **Recruitment**

Patients with a diagnosis of Type 2 Diabetes Mellitus [ICD-9, MD chart diagnosis, or administration of a diabetes medication] and/or hyperglycemia [two or more episodes of a random blood glucose (BG) level of >180mg/dL] and hospitalized under a general medicine or hospitalist team were identified during daily review of the EPIC EMR and screened as prospective study enrollees by the study coordinator. Additionally, information about the study was displayed in the Department of Medicine and in nursing units on a recruitment poster for healthcare practitioner viewing, and any of the institution's healthcare providers could call the

study coordinator to evaluate patients for inclusion.

### **Inclusion Criteria**

1. Adult male and female patients aged 18 years and older
2. Known T2DM history/diagnosis (ICD-9, MD chart diagnosis, or prescribed medication for DM) and/or clinical demonstration of hyperglycemia (two or more random blood glucose levels >180 mg/dL) during current hospital admission
3. LACE (Length of stay, Activity on admission, Co-morbidities, Emergency department visits in the previous six months) index score of 5 or greater
4. Eligibility for post-hospital care with Inova's Transitional Care Management program.

### **Exclusion Criteria**

#### **Patients:**

1. with T1DM
2. with gestational diabetes
3. who are pregnant
4. who are receiving dialysis
5. who are receiving hospice services
6. who reside at a skilled nursing or long-term care facility
7. with psychological and/or behavioral issues that would prohibit participation
8. with decisional incapacity (lack of autonomy/mental capacity rendering him/her unable to understand and process the nature, scope, and possible consequences of study enrollment).

**Procedures**

1. All patients admitted to a general medicine or hospitalist service were screened for study eligibility by the APN study coordinator/DCCP facilitator using the criteria outlined in the Recruitment and Inclusion/Exclusion Criteria sections.

2. Eligible patients were consented for study participation by the APN study coordinator/DCCP facilitator according to CITI consent-training guidelines.

3. Upon completion of an IRB-approved Informed Consent, patients were randomly allocated to either the intervention or usual care arm of the study. Patients were consecutively entered into the study using constrained, permuted blocks of assignment until the final N=20 (intervention n=10; control n=10) was achieved. Study eligibility was determined prior to subjects' enrollment, and allocation concealment was ensured (Polit & Beck, 2012).

4. The APN/diabetes care coordination pathway facilitator collected baseline demographic and diabetes data on all consented and enrolled subjects. These data provided baseline demographic information as well as a basic health history and current diabetes health status to include diet, activity, medications, and self-monitoring of blood glucose, which were used to risk-strategize each subject allocated to the study's intervention arm for customization of patient education and interdisciplinary consultation.

5. EPIC EMR laboratory data (baseline A1C and serum and/or point-of-care blood glucose values) and medications were reviewed.

**Intervention Group**

1. Patients allocated to the intervention arm (n=10) received coordinated care and education related to their diagnosis of T2DM and/or hyperglycemia based upon the American Diabetes Association (ADA) Standards of Medical Care in Diabetes - 2014, which were

incorporated into the study's Diabetes Care Coordination Pathway. The DCCP is a tool that coordinates multidisciplinary educational activities and communication among members of a Diabetes Care Coordination Team (DCCT) [see Appendices D and E for detailed information].

2. As the diabetes care coordination facilitator, the APN coordinated Diabetes Self-Management Education and Support (DSME/S), Survival Skills training, and inpatient-to-outpatient transitions for each subject allocated to the intervention group. The APN flagged the electronic medical record of each DCCP patient, created a Diabetes Care Coordination Note, and consulted members of the DCCT as necessary to ensure initiation and completion of all components of this record. The DCCN (see Appendix F) is a tool that summarizes the inpatient care and survival skills education of each subject in the study's intervention group, indicates barriers to achievement of patient-care goals, confirms each patient's referral to the Transitional Care Management program following discharge, and establishes a date/time for the patient's initial follow-up appointment.

3. Patients enrolled in the intervention arm of the study were provided with literacy-appropriate and culturally sensitive Diabetes Self-Management Education and Support by the APN and members of the DCCT based upon American Association of Diabetes Educators (AADE, 2012) Survival Skills recommendations (see Appendix G for checklist).

4. Patients enrolled in the intervention arm of the study participated in a physician-and/or APN-led *TeachBack* discharge appointment on the day of their anticipated release from the hospital. Elements of this appointment included reinforcement of medication adherence and lifestyle modification, emphasis on patients' self-care management as described in the Survival Skills checklist and a booklet, *Diabetes 101: Caring for Your Diabetes – Basic Information to*



*Help You Get Started*, which was provided to each intervention patient, and referral to a Transitional Services discharge clinic with a confirmed date and time for the initial visit.

### **Control Group**

A comparable control group of appropriately screened and consented high-risk diabetic and/or hyperglycemic patients hospitalized under a general medicine or hospitalist service (n=10) received usual hospital care; patient education and care documentation were not coordinated by an APN, and neither the DCCP nor the DCCN was utilized.

### **Both Groups**

1. All study enrollees were followed for the duration of their hospitalizations and initial post-discharge appointments.

2. The Coleman (2014) Care Transitions Measure<sup>®</sup> (CTM-3<sup>®</sup>) [see Appendix H] was administered to study enrollees who could be traced to their initial discharge follow-up appointments.

3. The study's Care Transitions Provider Survey [see Appendix I] was administered to accessible healthcare providers at subjects' initial follow-up appointments.

4. Point-of-care blood glucose testing of all patients was assessed if completed during the initial follow-up appointments.

5. All patients enrolled in the study were followed electronically (EPIC EMR) for one month following hospital discharge to assess 30-day hospital readmission rates.

## **Outcomes**

### **Primary**

Two primary outcomes were measured in this study: 1) the number of patients that attended their initial follow-up healthcare appointments after hospital discharge; and,

2) the number of patients that experienced a hospital readmission within 30 days of discharge.

### **Secondary**

Secondary outcomes that were assessed included patients' glycemic control, diabetes self-management education and survival skills, and patient and provider satisfaction with inpatient-to-outpatient transitional care processes.

### **Measures, Reliability and Validity**

The study's primary measures were determinations of the number of patients that attended their initial healthcare appointments following hospital discharge and the number of patients not experiencing a hospital readmission within 30 days of discharge. These data were extracted from the study institution's electronic medical record, as were measures of patients' serum and/or point-of-care blood glucose values. Secondary measures included patient and provider satisfaction with inpatient-to-outpatient transitional care processes. Coleman's (2014) Care Transition Measure<sup>®</sup> (CTM-3<sup>®</sup>) was used to determine patients' satisfaction with the overall quality of the care transition. The CTM-3<sup>®</sup> is three-item, uni-dimensional measure to assess the quality of care transitions. Psychometric testing of the CTM<sup>®</sup> has been completed, demonstrating high internal consistency, reliability, and applicability for assessment across multiple sites of care; the tool is published in both English and Spanish. Permission to use the CTM<sup>®</sup> was granted. A Likert-scale survey developed by the study's interdisciplinary team of healthcare providers was used to ascertain practitioners' satisfaction with the overall quality of care transitions.

### **Data Analysis**

Levels of data measurement were both quantitative and qualitative. Statistical testing for quantitative data was performed by the study institution's statistician, who utilized SAS

software (v. 9.3, SS Institute Inc., Cary, NC). Qualitative analyses methods (observations; discussions with patients, families, and providers; patient and provider surveys) also were used during the research process. De-identified written notes and data spreadsheets were composed during these interactions to insure accuracy in later descriptions of healthcare practitioners' application of knowledge and adherence to current ADA Standards of Medical Care in Diabetes (ADA, 2014), and to discern trends in patients' and providers' perceptions of care and transition procedures.

### **Strengths and Weaknesses of the Design**

An experimental research design originally was chosen to enable the investigator to infer causal relationships between use of the DCCP and patients' primary outcomes regarding medical follow-up and hospital readmission. However, time constraints turned this strength into a weakness, as the eventual small sample size did not have the power to impart quantitative validity. Patients' multiple medical co-morbidities and psychosocial barriers to treatment easily could have confounded the design's internal validity—the degree to which the researchers could infer that the APN and use of the DCCP rather than uncontrolled, extraneous factors were responsible for observed effects. Furthermore, the small sample size discounts external validity and generalizations to populations beyond the one examined.

Observational and descriptive aspects of the design allowed the researcher to probe secondary outcomes related to glycemic control and foundational components of care, which include diabetes self-management education and support. Moreover, daily interactions with healthcare providers, patients, and families over a period of three months allowed the researcher to determine first-hand many of the challenges of translating evidence into clinical practice. The researcher was able to perform an informal gap analysis comparing the healthcare

organization's current activities in the care of patients with diabetes against potential performance based upon current institutional infrastructure, clinical resources and champions, and perceived benefits for organizational change. Polit and Beck (2013) assert a growing interest in patient-centered interventions in real-world settings, opining that more research is needed in this area to better understand not only *what* works, but also what works for *whom*, and *why*.

### **Products of the Capstone**

Data from this study were presented to leaders within the institution's Departments of Medicine and Nursing, as well as within its Transitional Care Management program and Centers for Wellness and Metabolic Health, as a gap analysis comparison of the institution's observed inpatient and transitional care processes for high-risk adult patients with T2DM and/or hyperglycemia versus desired ADA medical standards of care (ADA, 2015), recommendations of care derived from Coleman's (2014) Care Transitions Intervention<sup>®</sup>, and other relevant medical and nursing literature.

Additionally, an article describing the development, implementation and evaluation of this coordinated, interdisciplinary diabetes management and transitional care project was written for submission and publication in the peer-reviewed journal of the American Association of Diabetes Educators (AADE), *AADE in Practice*.

## **IV. Results**

This study's intervention (independent variable) was the application of an interdisciplinary Diabetes Care Coordination Pathway that utilized an inpatient diabetes care facilitator, an advanced practice nurse, to organize an interdisciplinary and patient-centered process of education and documentation.

The study's dependent variables were its two primary outcomes: 1) the number of patients that attended their initial follow-up healthcare appointments after hospital discharge; and, 2) the number of patients that experienced a hospital readmission within 30 days of discharge.

Patients' glycemic control, diabetes self-management education and survival skills, and patient and provider satisfaction with inpatient-to-outpatient transitional care processes were assessed qualitatively as secondary outcomes.

Time constraints reduced this Doctor of Nursing Practice capstone project to a pilot study; ten subjects were enrolled in each arm for a total of 20 research participants. Overall, the study included 13 male and seven female adult patients. Participants' ages varied from 34 to 76, with a mean of 49.6 years-of-age in the study's intervention arm, and 50.6 years-of-age in the control group. Educational levels extended from some elementary school through completion of a college degree. Fifty percent of the study's enrollees were Hispanic (five in each arm), 30% were Caucasian, 15% were African American, and one patient was of Indian descent. The primary language spoken by the participants was English (55%), with 45% of the subjects speaking Spanish only. Seventy-five percent of the patients had no health insurance, and thereby, were the recipients of charity care at the study's not-for-profit healthcare organization. Of the remaining five patients, one individual had established Medicaid coverage, three patients were receiving Medicare disability benefits, and one patient was eligible for standard Medicare reimbursements. Thirteen, or 65% of all subjects had a family history of T2DM. The average glycosylated hemoglobin A1C value for all patients upon admission to the hospital was 10% (standard recommended levels are <6.5–7%). *Baseline Characteristics of Study Participants*, as well as calculated *p* values confirming group comparability, are displayed in Table J1 (see

Appendix J).

### **Primary Outcomes**

There were two study hypotheses:

- 1) High-risk adult patients hospitalized with T2DM and/or hyperglycemia whose management is guided by implementation of the DCCP will demonstrate greater attendance at their initial healthcare appointments following hospital discharge than those patients receiving usual care; and,
- 2) High-risk adult patients hospitalized with T2DM and/or hyperglycemia whose management is guided by implementation of the DCCP will demonstrate fewer hospital readmissions within 30 days of discharge.

Neither hypothesis in this small pilot study was supported. As expected, statistical analyses demonstrated no significant differences in attendance at initial post-hospitalization medical appointments or of 30-day readmission rates between the intervention and control groups ( $p=0.58$  and  $p=1.00$  respectively). However, patients whose care was directed by an APN using the DCCP, were more likely to attend an initial post-discharge follow-up healthcare appointment than those whose care was not directed by an APN using the DCCP (see Appendix K, figure K1).

### **Secondary Outcomes**

Observational and descriptive aspects of the research allowed the investigator to gain insight into the study institution's current processes with regard to standards of diabetes care, patient and provider knowledge, and patients' care coordination and transitions. Written notes were made during patient and provider interactions to insure accurate recall of conversations, and de-identified spreadsheets were constructed to preserve patient-related information. Several

themes emerged from the observational and survey data, as well as through in-person discussions with patients, families, and healthcare providers. Although there was an expressed institutional commitment to an interdisciplinary team approach to diabetes care, the researcher found inconsistent awareness of and/or resources for provider knowledge and provision of patient self-management education, missed opportunities in the provision of recommended inpatient standards of medical care in diabetes, opportunities for improvement in the use of technology, as well as feelings of marginalization and disenfranchisement among patients.

**Identified themes.**

***Commitment to an interdisciplinary team approach to diabetes care.***

Stevens and Staley (2006) define the quality of healthcare as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with professional knowledge” (p. 94.e1). The health system at which this research was conducted initiated its vision of improved hospital discharges and care coordination with the implementation of a Transitional Care Management program in 2011, using Coleman’s (2014) Transitional Care Program<sup>®</sup> as one structural component. The organization continues to evolve its vision with a 2015 framework of hospital-based care, community-based coordinated care, and destination clinical services. Physical structures (Transitional Care Services discharge clinics and Centers for Wellness and Metabolic Health) and interdisciplinary teams of physicians, nurse practitioners, certified diabetes educators, pharmacists, nutritionists, and social workers are in place in the outpatient settings; however, there remains no certified diabetes educator (CDE) employed at the institution’s main medical campus. Furthermore, this project exposed a considerable lack of awareness among numerous in-patient personnel about outpatient diabetes resources, as well as the steps required to initiate the organization’s transitional care management

process. The APN pathway coordinator worked with case managers on ten different medical units to establish post-discharge medical follow-up appointments; not all of the individuals were aware of the requirements to establish care at the institution's Transitional Services discharge clinics or with Transitional Care Management (TCM) health coaches. TCM is instrumental in organizing initial post-discharge medical appointments and establishing or confirming medical homes for high-risk patients who are largely without primary care providers or medical insurance. The attendance rate of intervention patients for whom follow-up appointments were made by the APN study coordinator was 90% (one patient remained at a skilled nursing facility at 30 days post-hospital discharge); but, the process of securing financial assistance and/or of establishing a permanent medical home at one of the federal and/or county safety-net clinics in the metropolitan area, had been initiated for all (100%) discharged intervention patients. Of the ten patients in the control arm of the study (no APN intervention or use of the DCCP), one individual was completely lost to follow-up after placement in a skilled nursing facility, another had received no medical care within 30 days of his discharge despite continuing complaints of high blood glucose levels and blurred vision, and a third patient was provided with a glucometer and home-health services only after a telephone call with a health coach at the Transitional Care Management program revealed her needs. No inpatient referrals were made to the study institution's Centers for Wellness and Metabolic Health for continuing outpatient education and follow-up by a CDE independent of the APN.

***Inconsistent awareness of and/or resources for provider knowledge and the provision of Diabetes Self-Management Education.***

As mentioned, a striking omission to the organization's infrastructure is the inability to consult an inpatient CDE or APN with expertise in diabetes care. On more than one occasion,



after observing the researcher providing DSME to an intervention patient, physicians as well as an inpatient nurse manager asked for the provision of similar education for other patients, citing a “lack of educational resources and knowledgeable personnel” to adequately accomplish this. Each patient enrolled in the study’s intervention arm was provided with a *Diabetes 101* booklet and education packet, which were well received and used by the APN to reinforce diabetes self-management education and survival skills. The APN study coordinator spent hours assembling these packets using information from the institution’s medical campus library and Centers for Wellness and Metabolic Health; nurses on individual hospital units had access to the library’s resources, but lack of time and awareness prohibited consistent use of these materials. Furthermore, data analysis revealed a lack of agreement between the inpatient and outpatient settings with regard to patients’ knowledge of a diabetes diagnosis and/or understanding of diabetes self-management education. Comparison of patient and provider surveys demonstrated gaps in patient learning in both arms of the study; however, intervention patients and providers agreed that patients had a good understanding of their medications and self-management responsibilities more often than control patients and providers. While patient EMR discharge attachments such as the *After Visit Summary (AVS)* included data concerning patients’ admitting diagnoses, information about additional co-morbidities and/or chronic illness management often was not included. For example, in the case of a patient admitted with a primary diagnosis of gastritis, who also had a long-standing history of T2DM and an admission A1C of 11.2% (patient I-6), the *AVS* included no self-management information related to diabetes.

***Missed opportunities in the provision of recommended inpatient standards of medical care for diabetes.***

Another revelation of this research was the lack of adherence to standards of medical care

in diabetes as outlined in annual publications by the American Diabetes Association (ADA). The Professional Practice Committee (PPC) of the ADA, which receives input from an interdisciplinary group of physicians, advanced practice nurses, pharmacists, and nutritionists, is responsible for this yearly document. It has been published since 1988, and provides graded evidence-based clinical practice recommendations for diabetes care (ADA, 2015). These standards include foundations of diabetes care, glycemic targets, approaches to glycemic treatment, and diabetes management planning. As depicted in Table J2, *In-Hospital Glycemic Control and Medical Nutrition Therapy*, hospitalists at the study institution's main medical campus often failed to achieve these standards (see Appendix J).

None of the inpatients enrolled in the study consistently maintained blood glucose levels within the ADA target range, which consists of a pre-prandial capillary plasma glucose value between 80–130 mg/dL and a two-hour post-prandial capillary plasma glucose value of <180 mg/dL. Moreover, patients' BG levels were not always controlled prior to hospital discharge. Overall, only six of 20 subjects (30%) were discharged with a random BG value of <180 mg/dL; 65% were discharged with BG values of >200 mg/dL. As depicted in Table J2, attending medical providers and hospitalists missed opportunities to escalate pharmacotherapy, especially among those patients whose A1C values reflected poor glycemic control prior to hospitalization, as was the case for 75% of this study's enrolled patients. For two patients with documented hyperglycemia, no A1C levels were obtained despite the absence of any previously recorded values. Providers did meet the standard for using insulin (100% usage), the preferred method of glycemic control in hospitalized patients; however, they failed to achieve the ADA's level A evidence recommendation of not using insulin solely as a sliding scale order, which was the case in 25% of the study participants.

A final missed opportunity to meet standards of medical care in diabetes concerned the implementation of diabetes-appropriate nutritional therapy, which is a component of the ADA's foundations of diabetes care. All study participants were able to eat regular meals, and 85% were appropriately placed on consistent carbohydrate diets (100% in the intervention group, and 70% in the control group). One patient, who had been admitted for back pain with a subsequent recognition of pancytopenia, but who had an admission A1C of 13.3%, was initially placed on a regular diet. The patient's daughter, through a Spanish interpreter, said that this concerned her because "she (the patient) is afraid to eat at all because the food makes her sugar so high" (quote from family member, patient I-2). The patient and family members were grateful for a nutrition consult and placement of the patient on a consistent carbohydrate diet.

It should be noted that the APN study coordinator, although a certified nurse practitioner, did not have prescriptive authority at the study institution, and therefore could not alter patients' pharmacotherapy, even among the intervention cohort; however, dietary orders could be entered in the EMR.

***Opportunities for improvement in the use of technology.***

An examination of the institution's electronic medical record and intranet demonstrated opportunities for improvement. This study incorporated the use of a Diabetes Care Coordination Note, but its use proved less helpful than anticipated. Practitioners on the receiving end felt that while the note provided useful information, it simply became "another form with the same information that can be found elsewhere." One nurse practitioner at a Transitional Services discharge clinic spoke for others when she stated: "I don't have time to read everything associated with my patients prior to each appointment. I use the *After Visit Summary* for most information, especially about medications." She went on to opine:

...a fifteen-minute (medical follow-up) appointment doesn't give me much time for education. Ideally, I would hope that patients with diabetes have an appointment at the Center for Wellness and Metabolic Health on the same day so that I could simply walk them down the hall for education with the CDE...(quote from a Transitional Services clinic nurse practitioner).

The institution's intranet provides access to hospital- and system-wide policies, order sets, and patient education resources. Items, however, were found to be outdated; the latest iteration of the hospital's diabetes care policy dated back to 2009. Additionally, while the system's closed-circuit video system includes 15 offerings within the context of diabetes self-management education, only three videos are recorded in Spanish, with none focusing on oral medications, insulin, hypoglycemia, or overall self-management.

***Patients' feelings of marginalization and disenfranchisement.***

Although no survey question specifically addressed the topic, patients frequently articulated feelings of marginalization and disenfranchisement. One intervention patient, who had been hospitalized with lower extremity cellulitis and a gangrenous toe following an earlier partial foot amputation, initially refused a follow-up appointment at the Transitional Services discharge clinic. He shared his point of view concerning his first appointment following an angiography at one physician's office:

They told me I had to pay \$700 or they wouldn't see me. I told them I didn't have a cent. I appreciate the care...I know I shouldn't complain because I don't have insurance, but it's easy to get discouraged. I feel less than human (quote from patient I-3).

Another patient, a college graduate who disagreed with CTM<sup>®</sup> survey statement one (The hospital staff took my preferences and those of my family or caregiver into account in deciding

what my health care needs would be when I left the hospital), revealed: "...the case manager was dismissive. I never thought I'd be a charity case, but I'm still a human being. She made me feel like a bum" (quote from patient C-3).

## V. Discussion

Key objectives of diabetes care include optimizing provider and team behaviors, supporting patient behavior, and making appropriate changes in healthcare systems (ADA, 2015). National benchmarks and passage of the Patient Protection and Affordable Care Act of 2010 have re-focused attention on healthcare quality, to include effective patient care transitions, improved self-care management, and avoidable hospital readmissions. It was the purpose of this study to describe and evaluate the implementation of an inpatient-to-outpatient diabetes education and documentation process that optimizes interdisciplinary and coordinated care transitions and self-care knowledge of high-risk adult patients with Type 2 Diabetes Mellitus and/or hyperglycemia. As detailed in the previous section, while there were no significant differences in 30-day readmission rates or attendance at initial follow-up medical appointments between the study's intervention and control groups, the number of patients who attended an initial post-discharge healthcare appointment was greater among those whose care was directed by an APN using the Diabetes Care Coordination Pathway. This trend is noteworthy, in that other researchers have expressed that appointment-keeping behavior in the outpatient setting is critical to achieving desired glycemic control (Cook et al., 2009). Cook and colleagues further proclaim "defaulters from outpatient follow-up have more severe hyperglycemia (and are) at greater risk for developing complications" (2009, p. 264). Additionally, a diagnosis of T2DM or hyperglycemia is more than a one-time revelation; rather, it marks the beginning of a lifelong process of medical management, education, and command of self-care knowledge and skills.

In a recently published practice essentials update for Type 2 Diabetes Mellitus, one physician asserts:

No longer is it satisfactory to provide patients who have diabetes with brief instructions and a few pamphlets and expect them to manage their disease adequately. Instead, education of these patients should be an active and concerted effort involving the physician, nutritionist, diabetes educator, and other health professionals. Moreover, diabetes education needs to be a lifetime exercise; believing that it can be accomplished in one or two encounters is misguided (Khardori, 2014).

While the primary outcomes of this study were quantitative in nature, its qualitative secondary aspects allowed the researcher to gain greater insight into the study institution's current processes with regard to standards of diabetes care, patient care coordination, and transitions of care. Secondary data collected through patient assessments, surveys, and the provision of patient and family education were informative of patients' barriers to care and the challenges of translating innovative programs such as the study institution's Transitional Care Management program into everyday practice. In essence, a gap analysis comparing the healthcare organization's current activities against potential performance was performed.

As presented in the study's findings, there were myriad missed opportunities to provide recommended standards of medical care for patients with T2DM. Most striking was the medical teams' failure to maintain inpatient blood glucose levels within ADA-recommended targets. Two factors most likely contributed to this: a lack of escalation in pharmacotherapy, and inadequate nutritional therapy, both of which are reflective of lack of knowledge and/or clinical inertia. Although evidence about the effects of hyperglycemia and best practice strategies continue to evolve, many studies reported in the literature demonstrate that awareness and

implementation of current diabetes guidelines are imperative. Interventional analyses have linked inpatient reversal of hyperglycemia to better clinical outcomes. It has been demonstrated that benefits of in-hospital glucose control include decreased patient morbidity and risk of infection, decreased mortality, and reduced lengths-of-stay and hospital costs (Campbell, 2007; Thompson et al., 2009). Furthermore, gaps in evidence-based care and inconsistency in glycemic management across settings can result in patient confusion about diabetes treatment, and engender distrust of and resistance toward healthcare providers, as was seen in the case of patient I-2 and her family. In the recently published DIPSat study, frequent inpatient hyperglycemia and hypoglycemia were associated with significantly poorer overall patient satisfaction scores and negative well-being scores. The authors cite at least one hypoglycemic event among 26% of the study population, food choices that were inconsistent with previously established choices, and poor correlation between timing of medication with relation to meals (Rutter et al., 2013). Other researchers have found deficiencies in the knowledge, skill, and attitudes among healthcare practitioners in the care of patients with diabetes, and have identified an interdisciplinary, coordinated, and well-educated staff as essential for optimal care (Gerald, Griffin, & Fitzpatrick, 2010; Modic et al., 2009; Munoz et al., 2012).

The Society of Hospital Medicine (SHM) Glycemic Control Task Force, which consists of a panel of experts from the American Association of Clinical Endocrinologists (AACE), the American Diabetes Association (ADA), the American College of Physicians (ACP), and other organizations, is dedicated to “closing the gap” between best practices and ineffective glycemic control in hospitalized patients through provision of evidence-based information, and process and workflow redesigns (SHM, 2014). The organization delineates seven essential elements for achieving improvement in the care of hyperglycemic patients: 1) institutional support; 2) a

multidisciplinary team or steering committee; 3) data collection and reliable metrics that reflect glycemic control, frequency of hypoglycemia, and insulin-use patterns; 4) defined, measurable and achievable glycemic-control goals; 5) standardized insulin order sets; 6) algorithms, policies, and protocols that are institution-specific and supportive of the order sets; and 7) comprehensive education programs for healthcare providers and patients (SHM, 2015). Maynard (2013) concludes that healthcare organizations fail to appreciate the magnitude of the problems that poor glycemic control create, and that clinical inertia and lack of prioritization are barriers to improving the care of hospitalized patients with diabetes.

As delineated previously, this study also revealed inconsistent awareness and/or resources for provider knowledge and provision of diabetes self-management education. Munoz and colleagues at Johns Hopkins University reported on the implementation and evaluation of a prototype for a multicomponent inpatient diabetes management program at their institution's medical center (2012). A major component was the development of an educational curriculum for healthcare providers, which included structured knowledge dissemination and updates of current glycemic-control policies and clinical-decision aids. Key to the success of this program was the establishment of a centralized, multidisciplinary glucose steering committee to guide its blood glucose management program. Other researchers have stressed the importance of developing a team of specially trained nurses in the provision and maintenance of updated and easily accessible educational resources (Jack et al., 2009; Naylor et al., 2011; Wong et al., 2005). In a project developed by Modic, Canfield, Kaser, Sauvey, and Kukla (2012) to enhance the knowledge of bedside nurses in the management of patients with diabetes, specially trained individuals served as mentors to other bedside nurses for diabetes clinical decision-making and the provision of appropriate diabetes self-management education and training (DSME/T).



Nurses at the main medical campus of this study have been attempting to form a Diabetes Unit Champion (DUC) team for several years; however, lack of institutional support (allocations of time and/or reimbursement for attendance) has been a recurring barrier to development and implementation. Current revelations of poor awareness and knowledge of current diabetes care and DSME/T among bedside practitioners indicate that it might well be time to revisit a commitment to this endeavor. Seley and Wallace (2009) write:

Patients who have mastered diabetes self-management skills in the outpatient setting are often frustrated when they become inpatients. The timing of glucose checks, insulin administration, and meal tray delivery may lack coordination in the hospital and result in unnecessary hypo and hyperglycemia. Patients will complain that they can do a better job of taking care of their diabetes at home. A further concern is that patients will model their own diabetes care behaviors after what they observe in the hospital such as poor timing of glucose testing, insulin delivery, and meals, as well as ignoring hyperglycemia (p. 89).

In a more recent publication, Modic and colleagues discussed in-depth, their endeavor to create a formalized educational program for bedside nurses to improve inpatient diabetes education (Modic et al., 2013). Bedside nurses were recruited to receive advanced education concerning diabetes self-management education and support with an emphasis on the AADE7™ Self-Care Behaviors or survival skills. In turn, they had a responsibility to “teach their peers, advocate for patients, and facilitate referrals for outpatient DSME programs” (p. 293). The authors concluded many merits of this project, but also recognized the challenges of obtaining support from all levels of nursing and institutional leadership.

It has been noted that this study's health system has successfully incorporated certain provisions of hospital-based care, community-based coordinated care, and destination clinical services as well as an interdisciplinary team of healthcare providers to support these activities. The diabetes care coordination pathway that was used in this study not only provided structure for the incorporation of Coleman's Transition Care Intervention<sup>®</sup>, but its use ensured inpatient initiation of long-term diabetes management, the hallmark of which is patient education, training, and support. According to the ADA (2015) Standards of Medical Care in Diabetes, diabetes discharge planning should start at hospital admission and individuals with diabetes should receive diabetes self-management education, training and support in accordance with national standards at the time of diagnosis and afterward for as long as needed. As previously described, an effective diabetes discharge is "one where the patient has received the necessary skills training and been provided with a clear and understandable post-discharge plan for diabetes care that has been clearly documented and is accessible by the patient's outpatient healthcare team" (Cook et al., 2009, p. 263). Interactions with this study's intervention cohort demonstrated that daily education and often more than one *TeachBack* appointment are necessary to accomplish this objective. This observation was supported by the patient and provider surveys administered in this study, which showed intervention patients and providers agreeing that patients had a good understanding of their medications and self-management responsibilities more often than control patients and providers. Engaging patients in a *TeachBack* discharge appointment is one aspect of a needed culture change in which patients are seen as engaged and knowing participants in their care as opposed to passive recipients of information. To accomplish this, however, patient education and discharge planning must begin at admission and be reinforced at every encounter by knowledgeable healthcare practitioners. Accordingly, the American Association of Diabetes

Educators makes two important practice recommendations that are supported by grade-A evidence: 1) All patients with diabetes should have access to diabetes self-management education and training; and, 2) DSME/T should be delivered by individuals who are prepared and competent (AADE, 2011).

As stated by Judith Fradkin, MD, director of the Division of Diabetes, Endocrinology and Metabolic Diseases at the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), “diabetes is the quintessential disease where the person with the disease is managing it. It’s the decisions they are making everyday...that are going to influence their health outcomes” (Butterfield, 2015). Psychosocial factors such as patient motivation and each individual’s concept of self-care must be assessed, and barriers recognized. An early architect of Social Learning Theory and later the theory of self-efficacy, Bandura (2004) states that self-efficacy (one’s belief in one’s ability to succeed in certain situations) acts together with goals, expectations, and perceived environmental barriers and facilitators to alter motivation, behavior, and well being. Bandura further proclaims “belief in one’s efficacy to exercise control is a common pathway through which psychosocial influences affect health functioning” (p. 143), and asserts that “it is of limited value to motivate people to change if they are not provided with appropriate resources and supports to realize those changes” (p.151). These proclamations certainly support the concept of DSME/T as a process to be initiated in the hospital, but continued at a time and place and in ways that are most conducive to patients’ learning. Moreover, positive patient outcomes are linked to DSME/T that builds self-efficacy and provides culturally relevant information; and, these processes require time, effective communication, and patient-provider collaboration in order to be successfully developed and implemented (AADE, 2011).

With regard to discharge documentation, providers at the health system's transitional care clinics as well as those within its physician medical groups, have access to each patient's electronic medical record; however, providers not within the organization do not have access, and have to depend upon hand-carried or faxed records. Perhaps as a solution to this accessibility issue and to the development of Coleman's recommendation for a *dynamic*, patient-centered record, the United States could learn from France. There, a patient's medical information is entered onto an encrypted chip, the *carte vitale*. This "vital card" contains a "digital record of every doctor visit, referral, injection, operation, X-ray, diagnostic test, prescription, etc." (Reid, 2010, p. 8). Meanwhile, one U. S. government organization emphasizes that any practitioner responsible for a patient's discharge minimally must document information about three key areas:

- Medication reconciliation: patient's medications must be cross-checked to ensure that no chronic medications were stopped and to ensure the safety of new prescriptions;
- Structured discharge information on medication changes, pending tests and studies, and follow-up needs must be accurately and promptly communicated to outpatient providers;
- Patient education: patients (and their families) must understand their diagnosis, their follow-up needs, and whom to contact with questions or problems after discharge (AHRQ, 2015).

### **Summary of Discussion – Implications and Recommendations for Practice**

The Diabetes Care Coordination Pathway developed and implemented for use in this study was deemed an effective tool for organizing and directing a multidisciplinary intervention for patient self-care knowledge and transitions from an inpatient to outpatient environment. The study's delineation of roles and responsibilities for each member of the Diabetes Care

Coordination Team were consistent with evidence-based recommendations that can be found in the recent healthcare literature. However, there were revelations about overall processes that warrant further consideration for change in order to meet the most current practice standards. In light of this, the investigators and members of the diabetes care coordination team make the following quality improvement recommendations for the healthcare organization at which this pilot study was implemented before continuing the research with a larger number of study participants:

- Integrate an **advanced practice nurse/certified diabetes educator** at the institution's main medical campus. In 2008, there were over 7.7 million hospital stays for patients with diabetes as either a principal diagnosis or as a co-existing condition, which is equivalent to one in five hospitalized patients (Fraze et al., 2010). According to the AADE (2011), although DSME/T is recognized as a critical component in diabetes care and is both cost-effective and efficacious, many patients never receive it. AADE practice guidelines (2011) stress that Level 5 practitioners (CDEs, APNs, physicians)
  - ...incorporate skills and strategies of DSME/T into more comprehensive clinical management of people with diabetes. Level 5 diabetes education practice is characterized by autonomous assessment, problem identification, planning, implementation, and evaluation of diabetes care. Providers at this level function either with protocols or have prescriptive authority. Level 5 diabetes educators may assume the lead role in care coordination. Within the context of the multi-level DSME/T team, they may supervise all other diabetes educators in the delivery of DSME/T (AADE, 2011).

At the study institution, this individual would be an active consultant for all members of the interdisciplinary team, assessing the needs of all patients with diabetes mellitus, providing initial self-management education and training, and coordinating each component of the diabetes pathway from admission through discharge.

- This individual also would be a charter member a **multidisciplinary Diabetes Steering Committee**. Based upon the Johns Hopkins conceptual model of inpatient glucose management (Munoz et al., 2012), this organizational prototype would include individuals from the study's diabetes care coordination team who are representative of the inpatient medical campus, the transitional services discharge clinics, and the organization's Transitional Care Management program. This group would meet regularly to review current standards, policies, and order sets related to the care of patients with diabetes, ensure consistent implementation of the organization's DCCP, discuss and propose remedies for challenges and issues related to the processes of care coordination and transitions, and evaluate intervention effectiveness.
- Institute the implementation of **pockets cards** for all medical and advanced practice nursing personnel who have patient decision-making and prescriptive authority. These cards would reflect the ADA Standards of Medical Care in Diabetes (2015) to include current glycemic targets, pharmacotherapy, and a quality assurance checklist (prevention/management of hypertension; hyperlipidemia; smoking cessation; co-morbid cardiovascular and renal disease; and diabetic neuropathy, nephropathy, and retinopathy) for inclusion in every *After Visit Summary* note.
- Resurrect the **Diabetes Unit Champion (DUC)** committee for final development and implementation. Bedside nurses, nutritionists, pharmacists, and others from across the

medical campus would meet monthly with inpatient and outpatient CDEs to develop and disseminate DSME/T materials to individual care units. They also would serve as resources to bedside nursing staff, identify potential needs among patients with diabetes, and confirm that patients have received and mastered survival skills training prior to discharge.

- Print sufficient copies of *Diabetes 101: Caring for Your Diabetes – Basic Information to Help You Get Started* and stock each patient unit for provision to patients with newly diagnosed or uncontrolled diabetes mellitus. Spanish-language versions of this booklet also must be made available for provision to the institution's large Hispanic population.
- Upgrade the hospital's closed-circuit education collection with Spanish-language videos that demonstrate safe insulin usage and diabetes self-management. Posters advertising the video collection and instructions for use should be placed in all patient care units.
- Hardwire the healthcare system's EPIC EMR to trigger standard-of-care order entry and documentation.
- Update all diabetes-related policies and resources (system- and community-wide) on the health system's intranet.

### **Limitations**

The study was initially designed to enroll 36 subjects in each arm (intervention and control), but time constraints limited total enrollment to N=20 patients. This resulted in the alteration of this study from one with sufficient power (80%) to establish cause and effect to a pilot endeavor lacking adequate power to draw conclusions between the two groups. Not surprisingly, the small sample size resulted in a lack of statistical significance. Patients' multiple medical co-morbidities and psychosocial barriers to treatment could easily have confounded the

design's internal validity—the degree to which the researchers could infer that the APN and use of the DCCP rather than uncontrolled, extraneous factors were responsible for observed effects.

Additionally, the advanced practice nurse who coordinated and implemented the diabetes care pathway, was not an employee of the study institution and could not serve as the final decision-maker with regard to BG levels, pharmacotherapy, and discharge disposition; and therefore, could not always impact the final outcomes for these measures.

Despite these limitations, observational and descriptive aspects of the design allowed the researcher to probe secondary outcomes related to glycemic control and foundational components of care that were informative of patients' and providers' barriers to care and the challenges of translating innovative programs such as study institution's Transitional Care Management program into everyday practice. In essence, a gap analysis comparing the healthcare organization's current activities against potential performance was performed.

### **Implications for Medical and Nursing Practice and Research**

Occasionally the best solution isn't to simply push forward, but to take a step back, to collect and evaluate meaningful data about current processes, and to listen to real-world feedback from patients as well as from providers. Valuable lessons were learned during this research endeavor, and recommendations for practice improvements were made. The original stakeholders in this research now suggest the completion of Plan Do Study Act (PDSA) worksheets as developed by the Institute for Healthcare Improvement (2015) to test each recommendation as it is implemented.

Also of value, would be the collection of baseline data from bedside practitioners via questionnaires and/or focus groups of their knowledge and attitudes of providing diabetes care.



**Conclusion**

Practice-focused nurses understand the concept of translational research and its role in the development of the Essentials of Doctoral Education for Advanced Practice Nursing (ANCC, 2006). Real world implementation of evidence can be a difficult endeavor; nursing's definition of evidence-based practice integrates the best research evidence with clinical expertise, *and* patient values.

The Diabetes Care Coordination Pathway, which was developed and implemented for use in this study was deemed to be an effective tool for organizing and directing a multidisciplinary intervention for self-care knowledge and transitions of high-risk adult patients with T2DM and/or hyperglycemia from an inpatient to an outpatient environment. The study's delineation of roles and responsibilities for each member of the Diabetes Care Coordination Team were consistent with evidence-based recommendations that can be found in the recent healthcare literature.

Deficiencies in the institution's current processes of care and transitions of patients with T2DM and/or hyperglycemia were revealed, and the researchers were able to offer recommendations for improvements in accordance with Doctor of Nursing Practice essentials for advanced practice and quality patient outcomes.

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APPENDIX A  
 IRB Approval



Inova Human Research Protection Program (HRPP)  
 Claude Moore Health Education & Research Building – 3rd Floor  
 Inova Fairfax Hospital  
 3300 Gallows Road  
 Falls Church, Virginia 22042-3300  
 Tel: 703-776-3167  
 Fax: 703-776-6678

NOTICE OF APPROVAL FOR HUMAN SUBJECT RESEARCH

**DATE:** 11/11/2014  
**TO:** Kalwaney, Shirley, Medicine  
 Clement, Stephen, Medicine, Dunning, Elizabeth, MS, RN, AGACNP-BC, CNS-BC, Nursing, Escano, Alisha, PharmD, BCPS, Pharmacy, Sheridan, Michael, ScD, Green, Dana, MSW, LCSW, ACM, Administration, Verderese, John Paul, MD, FACP, Medicine, Washington, Casey, PharmD, Pharmacy  
**FROM:** Ngo, Phi, CIP, MS, IRB Coordinator, IRB Group A  
**PROTOCOL TITLE:** Implementation and Evaluation of an Interdisciplinary and Coordinated Process Focusing on the Transitional Care of High-Risk Adult Patients with Type 2 Diabetes Mellitus and/or Hyperglycemia.  
**FUNDING SOURCE:** NONE  
**PROTOCOL NUMBER:** 14-1659  
**APPROVAL PERIOD:** Approval Date: 11/11/2014 Expiration Date: 11/10/2015

The Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: Implementation and Evaluation of an Interdisciplinary and Coordinated Process Focusing on the Transitional Care of High-Risk Adult Patients with Type 2 Diabetes Mellitus and/or Hyperglycemia. The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Inova Health System's Federal Wide Assurance 00000573 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under Committee's Assurance, please do not hesitate to contact us. Please direct any questions about the IRB's actions on this project to the Inova IRB at 703-776-3167 or 703-776-3370 or Email: HRPP@inova.org

Miller, Laura C.

Protocol date: August 27, 2014, Consent version #1, November 10, 2014. Approved expedited categories 5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis). AND category 7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

**Approval Period:** 11/11/2014 through 11/10/2015  
**Review Type:** EXPEDITED  
**IRB Number:** IRB00002273



**DETERMINATION OF UVa AGENT FORM**

**INFORMATION ABOUT THIS FORM**

- This form is to determine if UVa personnel are or are not considered to be working as an Agent\* for UVa on this project.
- If it is determined that UVa personnel are considered to be working as an Agent\* for UVa the study team will be required to submit an additional submission to the IRB-HSR, unless the project is determined to not involve human subject research. See Determination of Human Subject Research Form

*\*Agent- all individuals (including students) performing institutionally designated activities or exercising institutionally delegated authority or responsibility.*

*Enter responses electronically. Email the completed form to [IRBHSR@virginia.edu](mailto:IRBHSR@virginia.edu) for pre-review.*

*An IRB staff member will reply with any changes to be made.*

Name of Individual to be Working on Project:	Elizabeth S. Dunning
Email:	esd9bg@virginia.edu
Phone:	703-930-4873
UVa Messenger Mail Box #	N/A
Project/Protocol Title if Known:	<input type="checkbox"/> <b>Unknown or</b> Title: Implementation and Evaluation of an Interdisciplinary and Coordinated Process Focusing on the Transitional Care of High-Risk Adult Patients with Type Two Diabetes Mellitus (T2DM) and/or Hyperglycemia.
Explain your role in the project: (200 words or less)	I am an investigator and the coordinator of a study to describe and evaluate the implementation of an interdisciplinary inpatient diabetes education and documentation process that optimizes coordinated care transitions and patients' self-care knowledge. The project features a prospective, randomized trial of a behavioral intervention, the Diabetes Care Coordination Pathway (DCCP), to improve inpatient-to-outpatient transitions of diabetes care. It is my responsibility, as an Advanced Practice Nurse, to oversee the application of the DCCP; 1) to identify and navigate high-risk adult patients with T2DM and/or hyperglycemia from the inpatient to the outpatient setting; 2) to coordinate literacy- and language-appropriate patient learning of diabetes self-management education and survival skills; 3) to identify patient barriers, and as needed, to consult appropriate members of an interdisciplinary (physicians, pharmacists, dieticians, social workers) Diabetes Care Coordination Team; 4) to facilitate a hospital discharge appointment and to observe and document patients' understanding of their post-discharge care; and, 5) to ensure completion of

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 Phone: 434-924-2620 Fax: 434-924-2932 Box 800483

	<p>the electronic Diabetes Care Coordination Note, which is inclusive of each patient's medication reconciliation and initial follow-up appointment. I currently have a contract between UVa SON and Inova which allows me to do my practicums and research at Inova even though I am no longer an employee.</p>
<p>Explain the reason for traveling to the outside institution.</p>	<p>Although currently a full-time Doctor of Nursing Practice student at the University of Virginia, I am a former Inova Health System employee. While at Inova I participated in several clinical studies and co-authored two publications related to glycemic control among cardiac surgical patients. It was my desire to maintain my association with Inova and to further develop, as a doctoral student, processes of care that I had initiated previously.</p>

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 Phone: 434-924-2620 Fax: 434-924-2932 Box 800483

**1. Answer the following questions:**

- Yes  No I was involved in the design of this research project.
- Yes  No A UVa IRB has approved this research. IRB-HSR # [REDACTED]
- Yes  No Funding to conduct this research will come from UVa.
- Yes  No The only reason I am traveling to this outside institution is to work on this research.
- Yes  No Working on this research is required for my degree program.

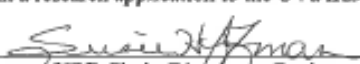
**2. I confirm that**

- Yes  No I am a student, employee and/or faculty member of the University of Virginia.
- Yes  No My work on this project will be overseen by the Principal Investigator and the IRB at the outside institution. This includes completing any training in human subject research protection as required by the outside IRB.
- Yes  No I will communicate with the IRB and the Contracts Office, to determine what approvals may be needed, prior to receiving any data from the outside institution.

**OR**

**3. I confirm that :**

- Yes  No I designed this research.
- Yes  No I am a student at UVa but am employed by another institution. *(see comment above)*
- Yes  No All subjects will be enrolled at this outside institution.
- Yes  No The research will be overseen by their IRB and, if applicable, their HIPAA Privacy Board. This includes completing any training in human subject research protections as required by the outside IRB.
- Yes  No There is no funding for this study or if there is funding, it will be handled by the institution at which I am employed.
- Yes  No I have notified the outside IRB that an UVa IRB will not be overseeing my work.  
ATTACH COPY OF OUTSIDE IRB APPROVAL.

FOR IRB-HSR OFFICE USE ONLY	
<input checked="" type="checkbox"/> UVa personnel are not considered to be working as an Agent for UVa on this project. No approvals from the UVa IRB-HSR are required.	
<input type="checkbox"/> UVa personnel are considered to be working as an Agent for UVa on this project. Submit a research application to the UVa IRB-HSR.	
<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div style="text-align: center;">             _____            Signature of IRB Chair, Director or Designee         </div> <div style="text-align: center;">           11-13-14            _____            Date         </div> </div>	

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**APPENDIX B**

**Screening Criteria**

<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
Adult male or female; aged 18 years or older	Patients < 18 years of age
Known T2DM history/diagnosis: <ul style="list-style-type: none"> <li>• ICD-9</li> <li>• MD chart diagnosis</li> <li>• Prescribed medication for DM</li> </ul>	Patients with T1DM Patients with gestational diabetes
Clinical demonstration of hyperglycemia: <ul style="list-style-type: none"> <li>• Two or more random blood glucose values of &gt;180mg/dL</li> </ul>	
Eligibility for post-hospital care with TCM	Patients receiving dialysis Patients receiving hospice services Patients who reside at a skilled or long-term nursing facility
LACE index score of $\geq 5$	
	Patients that are pregnant
	Patients with psychological and/or behavioral issues that would prohibit participation
	Patients with decisional incapacity

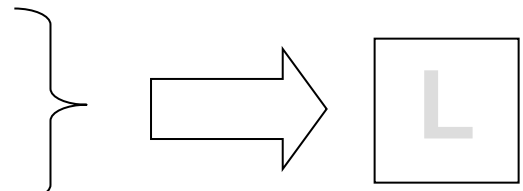
**APPENDIX C**

**LACE Index Scoring Tool**

**Step 1. Length of Stay**

Length of stay (including day of admission and discharge): \_\_\_\_\_ days

Length of stay (days)	Score (circle as appropriate)
1	1
2	2
3	3
4-6	4
7-13	5
14 or more	7



**Step 2. Acuity of Admission**

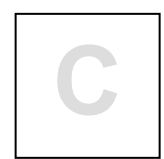
Was the patient admitted to hospital via the emergency department?  
If yes, enter "3" in Box A, otherwise enter "0" in Box A



**Step 3. Comorbidities**

Condition (definitions and notes on reverse)	Score (circle as appropriate)
Previous myocardial infarction	+1
Cerebrovascular disease	+1
Peripheral vascular disease	+1
Diabetes without complications	+1
Congestive heart failure	+2
Diabetes with end organ damage	+2
Chronic pulmonary disease	+2
Mild liver or renal disease	+2
Any tumor (including lymphoma or leukemia)	+2
Dementia	+3
Connective tissue disease	+3
AIDS	+4
Moderate or severe liver or renal disease	+4
Metastatic solid tumor	+6
<b>TOTAL</b>	

If the TOTAL score is between 0 and 3 enter the score into Box C.  
If the score is 4 or higher, enter 5 into Box C



**Step 4. Emergency department visits**

How many times has the patient visited an emergency department in the six months prior to admission (not including the emergency department visit immediately preceding the current admission)? \_\_\_\_\_  
Enter this number or 4 (whichever is smaller) in Box E



Add numbers in Box L, Box A, Box C, Box E to generate LACE score and enter into box below. If the patient has a LACE score is greater than or equal to 10 the patient can be referred to the virtual ward



**LACE Score Risk of Readmission: 0 - 4 Low, 5 - 9 Moderate, > 9 High Risk**

<b>Condition</b>	<b>Definition and/or notes</b>
Previous myocardial infarction	Any previous definite or probable myocardial infarction
Cerebrovascular disease	Any previous stroke or transient ischemic attack (TIA)
Peripheral vascular disease	Intermittent claudication, previous surgery or stenting, gangrene or acute ischemia, untreated abdominal or thoracic aortic aneurysm
Diabetes without microvascular complications	No retinopathy, nephropathy or neuropathy
Congestive heart failure	Any patient with symptomatic CHF whose symptoms have responded to appropriate medications
Diabetes with end organ damage	Diabetes with retinopathy, nephropathy or neuropathy
Chronic pulmonary disease	??
Mild liver or renal disease	Cirrhosis but no portal hypertension (i.e., no varices, no ascites) OR chronic hepatitis Chronic Renal Disease
Any tumor (including lymphoma or leukemia)	Solid tumors must have been treated within the last 5 years; includes chronic lymphocytic leukemia (CLL) and polycythemia vera (PV)
Dementia	Any cognitive deficit??
Connective tissue disease	Systemic lupus erythematosus (SLE), polymyositis, mixed connective tissue disease, moderate to severe rheumatoid arthritis, and polymyalgia rheumatica
AIDS	AIDS-defining opportunistic infection or CD4 < 200
Moderate or severe liver or renal disease	Cirrhosis with portal hypertension (e.g., ascites or variceal bleeding) Endstage Renal Disease, Hemodialysis or Peritoneal Dialysis
Metastatic solid tumor	Any metastatic tumour