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An Innovation to Transform Diabetes Care

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An Innovation to Transform Diabetes Care

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This is to certify that I have examined this
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And have found that it is complete and satisfactory in all respects,
and that any and all revisions required by
the final examining committee have been made.

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DEPARTMENT OF NURSING

This systems change project is dedicated to my DNP colleagues for their support and friendship during our DNP journey together.
To my husband Jeff and son Curtis for their infinite source of love and support
And to my sister Melissa for her support and encouragement.
To my colleagues at St. Joseph's Area Health Services
For their commitment to quality and
Evidence-based practice.

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Executive Summary

The prevalence of diabetes is on the rise and this demand for services challenges health care organizations to provide quality, cost-effective care. The current system and processes at St. Joseph's Area Health Services (SJAHS) needed redesigning to optimize quality diabetes care. This necessitated the need to move forward with a systems change project to transform diabetes care. The purpose of this study was to compare outcomes on glycemic control between current practice and a diabetes evidence-based practice toolkit by collecting retrospective data pre and post-toolkit implementation. The review of the literature from 2003-2011 endorsed the need to evaluate an innovation that incorporates a multidisciplinary, comprehensive, patient-focused approach to improve glycemic control. There is limited research on glycemic control for the hospitalized noncritical medical patient. The literature supported further research to generate additional scientific knowledge surrounding glycemic control in the hospital setting. The innovation was a toolkit composed of several tools to support the implementation of a comprehensive, multidisciplinary plan of care for the patient with diabetes. The toolkit provided the structure and processes to optimize diabetes care in the hospital setting. The study sample included 168 hospitalized adult patients with an age range of 20-95 and a mean age of 69.8, all with a diabetes diagnosis, and insulin therapy. The results indicated there was not a significant decrease in glycemic control from pre-toolkit to post-toolkit implementation timeframes. The findings suggested that the toolkit has not been adopted by all members of the health care team therefore glycemic control did not improve with toolkit implementation. Despite the results SJAHS has the elements to be successful with this innovation and based upon the knowledge we have gained we are on a journey to improve diabetes care. The findings will be utilized to determine next steps in regards to the toolkit as an innovation to improve diabetes care.

An Innovation to Transform Diabetes Care

Diabetes affects 25.8 million people in the United States, an increase of more than three million in approximately two years (Center for Disease Control and Prevention [CDC], 2011). This means that nearly eight percent of the U.S. population has a diabetes diagnosis. Diabetes is the seventh leading cause of death in the country and can cause serious health complications (CDC, 2008). People with diabetes are more likely to be hospitalized and to have longer hospital stays than those without diabetes (Moghissi et al., 2009). Nearly three million people with diabetes are hospitalized annually (Lange, 2010). It has been estimated that 22 percent of all inpatient days in 2008 were incurred by patients with diabetes at a cost of 87 billion dollars for expenses related to diabetes care. This accounts for half of the 174 billion dollars spent on medical treatment of diabetes (Moghissi et al., 2009). The readmission rate is also greater for patients with diabetes (American Association of Clinical Endocrinologists [AACE], 2011).

In addition to cost there is evidence linking hyperglycemia in hospitalized patients to adverse outcomes (Moghissi et al., 2009). In 2004, recommendations for the treatment of inpatient hyperglycemia were developed by the American College of Endocrinology (ACE) and the American Association of Clinical Endocrinologists (AACE) in collaboration with the American Diabetes Association (ADA). An updated consensus statement on inpatient glycemic management was developed by AACE and ADA in 2009 and reviewed by the ADA in 2010 (ADA, 2011). There is a growing health care movement promoting the management of inpatient hyperglycemia as a quality measure (Moghissi et al., 2009). According to the Institute for Health Care Improvement (IHI) (2010) innovative systems change initiatives are critical to address diabetes and its consequences. Health care organizations are beginning to realize that

there is a need to redesign systems and processes that will optimize diabetes care (Manchester, 2008).

Problem Statement

At St. Joseph's Area Health Services (SJAHS) the management of diabetes on the medical unit was physician dependent and varied greatly. The current system does not support a patient care process that is comprehensive, multidisciplinary, nor patient focused. Updated tools are needed utilizing current inpatient glycemic management evidence to support consistent medical and nursing practice. This necessitated a need to move forward with a systems change innovation to transform the management of diabetes care.

Key stakeholders at SJAHS recognized that there was a need to improve diabetes care. The key stakeholders were; nursing, physicians, certified diabetes educators, and pharmacy. The stakeholders mobilized commitment by organizing a multidisciplinary team to design and implement a systems change innovation to promote quality diabetes care. Patients have the right to receive quality evidence-based care (American Nurses Association [ANA], 2001). Professionals need to create an environment that is ethical and just within the health care system (ANA, 2001). From the nursing perspective nurses are obligated to provide quality diabetes care. Nursing is in the position to change the social structures such as a specific hospital setting that detracts from health and well-being (ANA, 2001). SJAHS is the social structure where there is a desire and obligation to improve the standard of care that is provided to patients with diabetes. Collaboration and "planning is required to ensure the availability and accessibility to quality health care services to all persons who have a need for health care" (Kalb, 2009, p.2.). Patients with diabetes at SJAHS are not receiving the level of care that they deserve; this is an example of a health care disparity. This has not been an intentional gap in quality. Our current

system lacks the structure and processes to provide quality diabetes care. In a complicated situation such as this, actions, reactions, and interactions matter greatly (Patton, 2011). The stakeholders at SJAHS had the opportunity to transform diabetes care at SJAHS.

Transformation requires leadership. A leader is key to create a moral environment and to promote social justice within the health care system (White et al., 2011). This innovation advocated for change that is ethical and adheres to the principle of justice by advocating for quality diabetes care and equal access to health care by all that receive care at SJAHS.

SJAHS is committed to excellence and identifies quality as one of its key pillars of strategic success in addition to people, stewardship, and growth. The provision of quality care is imperative in today's health care environment. In the United States it is estimated that 30-40 % of patients do not receive treatments of proven effectiveness (Halm, 2010). Implementing and evaluating a systems change innovation to improve diabetes management was needed at SJAHS. The innovation to transform care consisted of a diabetes management toolkit based upon evidence-based practice. Current best evidence is needed to make clinical decisions about patient care (Polit & Beck, 2008).

Project Objectives

1. Design and implement a Diabetes Evidence-Based Practice Toolkit for the hospitalized medical patient with diabetes.
2. Evaluate the outcomes of the toolkit to determine if the systems approach to patient care improved glycemic control.
3. Utilize the findings to further develop the Diabetes Evidence-Based Practice Toolkit to generate decision quality and to promote the achievement of safe, quality patient outcomes.

Research Questions

1. Among medical adult hospitalized patients, does an organizationally developed evidence-based diabetes care management toolkit in comparison to current practice at SJAHS improve glycemic control?
2. What are the effects of the toolkit on self-care goals and on patient satisfaction?
3. What is the protocol adherence for hypoglycemia management?
4. Does the toolkit decrease hospital readmissions?

Theoretical and Operational Definitions

Glycemic control is defined in the hospital setting for the noncritical care patient as pre-prandial blood glucose target <140 mg/dL and a random blood glucose target <180 mg/dL (Moghissi et al., 2009).

The toolkit was comprised of several evidence-based practice tools to support the implementation of a comprehensive, multidisciplinary plan of care for the patient with diabetes. The tools consisted of: subcutaneous insulin orders, hypoglycemia protocol, total parenteral nutrition (TPN) and enteral tube feeding blood glucose monitoring guidelines, diabetes plan of care, diabetes patient education/discharge instruction sheet that includes patient identified self-care goals, discharge planning checklist and guidelines for transition to outpatient care, an educational plan for physicians, nursing, and other healthcare professionals, and metrics (see Appendix A for a sampling of the components of the Diabetes Evidence-Based Practice Toolkit). The toolkit was a quality improvement strategy to provide the structure and processes to deliver comprehensive diabetes care to optimize glycemic control. "Optimal diabetes management requires an organized, systematic approach and involvement of a coordinated team of dedicated

health care professionals working in an environment where patient-centered high-quality care is a priority" (ADA, 2011, p. S48).

The toolkit was the innovational approach of this systems change project. The toolkit provided the structure and processes to optimize diabetes care management in the hospital setting for the medical patient with diabetes.

Theoretical Framework

This systems change innovation was guided by an organizational change model to optimize change effectiveness called the Change Acceleration Process (CAP) (General Electric Corporation [GEC], 2007), the Relationship-Based Care (RBC) model (Manthey, 2006) from the discipline of nursing, and philosophical elements from the quality improvement theoretical framework.

Change Acceleration Process Model

The CAP model provides structure to drive action plans and outcomes and a comprehensive set of tools to assist the change leader in every step of the process moving from current state to transition to an improved state. This enables the CAP leader to organize a team to change structures and systems (GEC, 2007). This model provided the structure to promote organizational change as the key stakeholders embarked on transforming diabetes care at SJAHS. The CAP model has the potential to guide nursing practice and influence system change. CAP provides a general framework for accelerating change that is determined by the work of the key stakeholders. There are seven concepts which are clearly defined and outlined in a clear simple diagram (see Appendix B for diagram of the CAP Model). The concepts are interrelated to guide and focus the change process, to launch, and implement a major change initiative (GEC, 2007). CAP provides the framework and direction for promoting change in a structured process.

In order for this process to be successful, there needs to be organizational administrative support and a champion who sponsors the change. The champion (change leader) facilitates a team who shapes the vision for a desired outcome. "The need for change must exceed its resistance" (GEC, 2007, p. 18) and "failed change efforts or an inability to change quickly costs

healthcare organizations millions of dollars annually" (GEC, 2007, p. 110). The stakeholders at SJAHS had the support of the administrative team to move forward with this systems change innovation.

The CAP model provides the structure for a transformational leader to produce change for a systems change innovation. For example, it provided the tools to facilitate change by mobilizing key stakeholders to determine our vision for excellence in care of the patient with diabetes in the hospital community. CAP provides structure from inception to implementation and to the establishment of indicators to measure success (GEC, 2007).

Relationship-Based Care (RBC) Model

This systems change innovation was built upon the foundation of a nursing theory, the RBC model. This model can be used to guide the transformation of nursing practice and to propel optimal health care outcomes (Stewart, 2011). According to Manthey (2006), when interpersonal relationships in a health care organization are healthy the quality of care improves. The RBC model is based upon the nurse's relationship with self, patients, patients' families, and colleagues; including all relationships within the health care system. These relationships are interdependent and together optimize health care. In order for these relationships to thrive there needs to be a caring, healing environment. The health care environment on the medical unit where the transformation of diabetes care was implemented exhibited these caring attributes, which supports the RBC philosophy. In RBC, there are six key elements that impact the healthcare environment: professional nursing, patient care delivery, teamwork, leadership, resources, and outcome measurement. These elements can be transformed to change practice. Transformation requires the leader to have a vision, competency, confidence, and commitment, as well as the ability to collaborate toward a common goal (Stewart, 2011). When these qualities

are present, there will be goal attainment such as the successful implementation of a systems change innovation.

The premise of this theory is that relationships are the key to transforming practice; therefore, this theory has the potential to influence nursing actions and patient care. The RBC model provides the structure for a systems change innovation to transform care and promote safe quality patient care.

Quality Improvement Model

This systems change innovation used philosophical elements of continuous quality improvement as a framework to design, implement, and evaluate effectiveness of the diabetes evidence-based practice toolkit. There was a strategic focus to improve diabetes care. There was implementer involvement, the multi-disciplinary team. The patient with diabetes was the customer of focus to receive quality care. The entire system was viewed as providing a service and influencing an outcome of improved glycemic control. The team identified a solution, a diabetes EBP toolkit to guide and enhance overall system performance through process improvement and organizational learning. Outcomes were measured and the data analyzed to make improvement decisions (McLaughlin, 2004).

Theoretical Summary

Relationship-Based Care provided the theoretical underpinning of nursing practice for this systems change innovation; the Change Acceleration Process provided the model to propel change in the system using a structured approach, and the quality improvement theoretical framework provided the foundation for promoting continuous organizational quality improvement. Nursing ethics and social justice, components of all three models, served as ethical rudders. This foundation provided the theoretical support for a systems change

innovation. RBC provided the foundation for nursing practice by supporting the structure to transform practice through inspiration, infrastructure, education, and evidence. RBC also provided the leader with specific criteria to lead this transformation. RBC and CAP both require a vision to promote change and a leader with passion and commitment. The vision was shaped by the team and included ethics and social justice. RBC inspiration promoted movement and CAP mobilized team commitment. The RBC infrastructure allowed change to occur and the CAP team had the desire to make the change occur and last. The CAP team established indicators to measure success and to establish accountability. Evidence of success, according to RBC, is transformation of practice as evidenced by excellence in patient care outcomes (GEC, 2007; Stewart, 2011). This systems change innovation unfolded and transformed through the underpinnings and interrelationships of RBC, CAP, quality improvement, ethics, and social justice.

Literature Review

The review of the literature covered a nine year period from 2003-2011. The search included several bibliographical databases: MEDLINE, CINAHL, Cochrane Reviews, and JoAnna Briggs Institute. The search limiting parameters were: adult age group, English language, and publication type; research including, quasi-experimental, retrospective, and randomized controlled trials (RCTs). The following key words were used in the search: diabetes mellitus, hyperglycemia, glycemic control, inpatient management, diabetes care, practice guidelines, insulin therapy, protocols, multidisciplinary care team, quality health care, toolkit, and diffusion of innovation. A total of 40 abstracts were reviewed, of which nine met the inclusion criteria. The criteria for abstract review consisted of: noncritical care inpatients,

interventions focused on insulin protocols, strategies to augment practice changes, and outcomes related to glycemic control.

National practice guidelines are another source of evidence for establishing evidence-based care. The search for a guideline on diabetes care management in the hospital setting included two bibliographical databases, Cochrane Collaboration and National Guideline Clearinghouse (NGC). The following key words were used in the search: diabetes care, inpatient management, and practice guidelines. The standard of medical care in diabetes, diabetes care in the hospital was selected for content review from the NGC database because of the specific recommendations for the management of hospitalized patients with diabetes.

Of the studies reviewed, the purposes were consistent with the glycemic control research questions of this innovation. This confirmed that the study was a sensible one that needed further research. Baldwin et al. (2005) studied inpatient hyperglycemia without the use of sliding scale insulin (SSI), Johnston and VanHorn (2011) studied tighter glycemic control using subcutaneous insulin via basal-bolus method versus SSI, whereas others have studied the use of protocols or standardized order sets (Comi et al., 2009; DeSantis et al., 2006; Umpierrez et al., 2007) and two in conjunction with a team approach (Comi et al., 2009; DeSantis et al., 2006) or a multifaceted approach combining a protocol with clinical education and computerized order set (Schippner et al., 2009). They all had a purpose, to study an intervention to improve glycemic control or to manage inpatient hyperglycemia.

The interventions consisted of basal-bolus insulin regime (Umpierrez et al., 2007), comparison of SSI and basal-bolus (Johnston & VanHorn, 2011), insulin protocol guided by glucose management service (Comi et al., 2009; DeSantis et al., 2006), re-education of house officers, rounding, and a basal-bolus standard approach (Baldwin et al., 2005), and a

multifaceted approach with protocol, clinical education, and computerized order set (Schnipper et al., 2009). All interventions were designed for the specified study site; therefore, the exact nature of the intervention varied from site to site. This impeded the ability to compare results across studies or to generalize findings to other settings and populations.

The outcome measurements described in the studies consisted of glycemic control as evidenced by blood glucose within an identified range, specific glycemic targets, hyperglycemic events, hypoglycemic events, insulin patterns, process of care (increased use of the basal-bolus orders), and length of hospital stay. Each study clearly defined their outcome measurements. The control groups received current clinical care as noted per each organization and outcomes were compared to the intervention groups. The measures used consisted of blood glucose results, hemoglobin A1c (HbA1c), insulin doses, and length of stay (LOS). Each study described how the measures were obtained with some variation, but no major differences. The measurement period was consistent across all studies measuring blood glucoses during the subjects hospital stay.

The findings indicated significant improvement in glycemic control as noted in the studies using a protocol or order set (Baldwin et al., 2005; DeSantis et al., 2006; Umpierrez et al., 2007) to manage hyperglycemia in the hospital setting for the noncritical care patient with diabetes or hyperglycemia. Several of the studies also incorporated other strategies to support glycemic control in each of their respective setting such as: house officer rounding, a glucose management service, clinical education, and a computerized order set (Baldwin et al., 2005, Comi et al., 2009, DeSantis et al., 2006, Schnipper et al., 2009). No significant difference in the rate of hypoglycemia was noted. Schnipper et al. (2009) noted that no increase in hypoglycemic events is clinically significant as a patient safety outcome. Johnston andVanHorn (2011)

concluded that blood glucose control in their study was poor, noting insulin therapy needs to be adjusted and intensified more frequently to obtain better glycemic control. There was a clear pattern that unfolded from analyzing the studies; a standardized approach provides the opportunity to improve glycemic control.

Two of the research studies reviewed indirectly supported the relevance of the glycemic control research questions of this innovation (Dickerson et al., 2003; Finfer et al., 2009). Their findings offer utility in providing support for further research in regards to glycemic control. The Dickerson et al. (2003) study findings validated the need to move away from SSI to manage diabetes in the hospital setting to protocol development using basal-bolus regimes. The Finfer et al. (2009) study validated the need to consider the consequences of glycemic control related to hypoglycemia and its potential ramifications including mortality. This study also supported the need for further research beyond critical care where a majority of glycemic control research has occurred. A systematic review by Bloomgarden and Mechanick (2007) identified the need for additional research on glycemic control in the hospital setting especially for the noncritical care patient.

Synthesis of Findings

To date, there are few published studies that have researched how best to implement standardized insulin protocols based upon clinical guidelines to improve glycemic control in the hospital setting for the noncritical care patient. Of the nine studies critically analyzed in this literature review they all focused on glycemic control using protocols or standing orders in addition to innovative interventions to augment protocol implementation and thereby improving glycemic control. The evidence from these nine studies supports the creation of additional

studies to further advance the spirit of inquiry regarding inpatient glycemic control for the hospitalized noncritical care patient.

The analyses also conveyed evidence that glycemic control is an important outcome measure to research. There was evidence that the interventions were effective and clinically significant for several of the studies, whereas other study findings suggested additional research is indicated. This judgment is consistent with Manchester (2008) noting that healthcare organizations need to redesign processes that optimize diabetes care. SSI regimes need to be replaced with clinical guidelines using a standardized approach such as a protocol for subcutaneous insulin administration that was a component of the diabetes care management toolkit. The diabetes EBP toolkit was a multifaceted innovation similar to Schnipper et al. (2009), but the components were designed and implemented by the stakeholders at SJAHS in order to meet the needs of the organization and patients served. There are similarities and differences in each of the research designs, of which, of note helped to further refine the innovational study design and supported its value in moving forward with the research study.

Integrated Review

Bloomgarden and Meclanick (2007) concluded in their systematic review that it is no longer appropriate to ignore glucose measurement or to tolerate hyperglycemia in the hospital setting. Hyperglycemia is associated with adverse outcomes (Moghissi et al., 2009) and is linked with increased mortality and morbidity (Shogbon & Levy, 2010). Studies have shown the benefit of intensive glucose management in the critical care patient setting and other studies have shown equivocal or negative results. For example, the NICE-SUGAR study, a landmark RCT concluded that intensive glucose control, defined as a target blood glucose range of 81-108, increased mortality among adults in the ICU (Finfer et al., 2009). Despite the inconsistencies in

clinical trial results, good glucose management remains an important focus for the hospitalized patient with diabetes (Moghissi, 2010).

Hypoglycemia is a limiting factor in optimizing glycemic control (Bloomgarden & Mechanick, 2007). It is also paramount for clinicians to understand the importance of hypoglycemia management and to monitor patients closely. Glucose management involves vigilance against hypoglycemic events and attention to prevention and management is essential. This needs to be considered when redesigning systems and processes for diabetes management.

Inpatient glucose management has been researched more in the critical care setting; there is limited data on the noncritical care patient population (Shogbon & Levy, 2010). Only a few studies have been published on the effect of glycemic control on outcomes outside of critical care (Moghissi et. al., 2009). The complexity of inpatient glycemic control necessitates a systems approach that facilitates safe practice. To date there are few published studies that have researched glycemic control using a systems approach that includes a multidisciplinary, comprehensive approach to diabetes management in the hospital setting on a general medical unit (ADA, 2011). This is also supported by the literature review. The ADA guidelines (2011) on inpatient diabetes management as previously discussed is a source of evidence to be used in conjunction with other sources of evidence to provide the information for organizational implementation of a practice change. Guidelines have only a small impact on the quality of care provided to inpatients with diabetes (Wallymahmed et al., 2004), experienced and knowledgeable staff are essential (Modic, 2010; Moghissi et al., 2009; Wallymahmed et al. 2004) in addition to a multifaceted, comprehensive approach (Schnipper et al., 2009).

There are gaps in clinical knowledge related to inpatient glycemic control particularly for the noncritical care hospitalized patient as evidenced by the research. There are several areas

that need further investigation: patient outcomes related to a multifaceted approach to diabetes inpatient management, what are the benefits of a comprehensive approach, what are the results of an evidenced-based practice approach; establishment of inpatient glucose metrics for outcome measurement; and to investigate the innovation related to the clinical questions. ACE (2004) also identified other areas that need further investigation; the management of stress hyperglycemia, the causes of severe hypoglycemia, glycemic targets on noncritical care units, glycemic variability, and safety measures for glycemic control in the hospital system. There are endless possibilities related to diabetes management in the hospital setting.

All of the evidence reviewed and analyzed provides a solid foundation and together the evidence provided the strength to support additional outcomes research such as the innovation, an organizationally developed evidenced-based diabetes care management toolkit. In addition to evidence the innovation also needed to integrate the values of the organization, clinician expertise, and the patient's voice to improve the management of diabetes care in the hospital setting. The evidence also suggested that further research is a promising action to generate additional scientific knowledge surrounding glycemic control in the hospital setting.

Summary

Overall there was evidence to support this study using an innovative approach to improve glycemic control for the hospitalized medical patient with diabetes. There needs to be more research conducted on glycemic control using a systems approach that includes a multidisciplinary, comprehensive approach to diabetes care. The recommendation was to implement an organizationally developed toolkit that is based upon existing research-based knowledge and best evidence and to evaluate the outcomes of this innovation.

This toolkit was designed to improve clinical practice and the health outcomes of the medical patient with diabetes at SJAHS. The toolkit included the following: an insulin management protocol to achieve effective and safe glycemic targets, a hypoglycemia treatment protocol with a focus on prevention, patient education on diabetes in the hospital setting in an outline format, discharge planning checklist to ensure a safe transition from hospital to outpatient, educational objectives and course content for physician and nurse education, and metrics. Each tool was designed in paper format and became a component of the toolkit. All of these tools are important factors to promote optimal diabetes care through an organized systematic approach (ADA, 2011).

Organizations can no longer ignore inadequate glycemic control or tolerate hyperglycemia in the hospital setting (Bloomgarden & Mechanick, 2007). Glycemic control is a quality measure that needs further development and investigation to ensure safe quality care for the hospitalized patient with diabetes. This innovational study was supported in the literature and there was evidence to endorse this systems change project as an innovation to transform diabetes care.

Project Design and Methodology

This systems change innovation was designed to accept or reject the hypothesis that patients receiving diabetes care management using the toolkit will (1) have improved glycemic control during their hospital stay, (2) have identifiable self-care goals by discharge, (3) be satisfied with their diabetes care during their hospital stay, (4) have hypoglycemic episodes managed by nursing using a protocol, and (5) have a decrease in hospital readmissions related to diabetes within 30 days of discharge. A retrospective chart audit was the method used by the leader of this innovation to collect data pre-toolkit implementation; June 2010-November 2010 and post-toolkit implementation; June 2011-November 2011.

The chart audit sample was generated from coded data using International Statistical Classification of Diseases and Related Health Problems (ICD-9) diabetes codes within the SJAHS Meditech computerized database. All adult patients hospitalized on the medical unit who received insulin therapy for diabetes were included in the chart audit. The pediatric, critical care, obstetric, and surgical hospitalized patients were excluded from this study.

The goal was to audit 20 charts per month for a total of 120 for pre-toolkit implementation and 120 for post-toolkit implementation timeframes. This target was based upon prior evidence-based practice initiatives implemented at SJAHS. For June 2010-November 2010 a total of 120 patient charts were reviewed, 89 patient charts met inclusion criteria, and 31 were excluded. The excluded were; 23 surgical patients and 8 critical care patients. Among the 120 patient charts reviewed from June 2011-November 2011, 79 patient charts met inclusion criteria, and 41 were excluded. The excluded were; 29 surgical patients, 10 critical care patients, and 2 obstetric patients. According to Polit and Beck (2008) outcomes data should be collected over a sufficient time typically 6-12 months. This allows for a true test of a mature innovation.

The leader chose a six month period of time to collect data for both pre-toolkit and post-toolkit timeframes.

A data collection tool was used by the leader to extract data for outcomes research and formative evaluation. The data extracted included episodes of hyperglycemia > 180 mg/dL and episodes of hypoglycemia <50 mg/dL. This data was used to compare pre-tool kit glycemic control to post-toolkit glycemic control. Additional data was abstracted for the post-toolkit implementation timeframe to address research questions two and three which included self-care goals documented on discharge and protocol adherence for episodes of hypoglycemia <50 mg/dL. Study sample characteristics were also abstracted including: gender, ethnic group, type of diabetes, comorbidities, and length of stay (LOS). No patient identification information was noted on the data collection tool, a subject code was assigned to prevent patient identification (see Appendix C for the Data Collection Tool).

Outcomes research documents the quality and effectiveness of health care services (Polit & Beck, 2008). The three factors emphasized are structure, process, and outcomes. These factors were used to develop metrics for each of the research questions. Outcomes research terminology is also used by Catholic Health Initiatives (CHI) SJAHS parent company, to provide the structure for measuring quality improvement initiatives. CHI also includes a person-centered metric as a required element of the evaluation process. Since SJAHS is a market based organization of CHI, it is essential to use the same measurement language for metric evaluation. A metric was designed for each research question.

1. Among medical adult hospitalized patients, does an organizationally developed evidence-based diabetes care management toolkit in comparison to current practice at SJAHS improve glycemic control?

Outcome metrics: The rate of hyperglycemic episodes (>180 mg/dL) among patients who receive insulin any time during their hospital stay per 1000 patient days (ICSI, 2010). The rate of hypoglycemic episodes (<50 mg/dL) among patients who receive insulin any time during their hospital stay per 1000 patient days (ICSI, 2010). This metric was used to measure glycemic control pre and post-toolkit implementation.

2. What are the effects of the toolkit on self-care goals and on patient satisfaction? Person-centered metric: Percent of patients with self-management goals documented at the time of discharge and post discharge patient satisfaction interview questions. These metrics were used during the post-toolkit implementation phase.
3. What was the protocol adherence percentage by nursing for hypoglycemia management? Process metric: Was the hypoglycemia protocol adhered to when there was a hypoglycemic episode (<50mg/dL)? This metric was used during the post-toolkit implementation phase.
4. Does the toolkit decrease hospital readmissions? Outcome metric: Was there diabetes related readmissions within 30 days of discharge for the post-toolkit implementation phase?

From the data collection tool the data was then transferred into a computerized database, IBM Statistical Package for the Social Sciences 19 (SPSS), by the leader. The leader checked the original and transferred data sets to ensure that there were no data entry errors or other data integrity issues prior to data analysis. The data analysis was conducted in SPSS by a PhD prepared statistician from Bemidji State University.

Satisfaction with diabetes care was measured during the post-toolkit implementation phase of the study using a satisfaction questionnaire developed by the leader to obtain the

patients voice for formative evaluation (see Appendix D for the Patient Satisfaction Questionnaire). Participant feedback is a common approach for evaluating an innovation (Patton, 2011) and essential in order to understand and capture the human experience (Polit & Beck, 2008). Twelve patients hospitalized with diabetes were randomly selected to participate in a phone interview 1-2 weeks post discharge to collect patient satisfaction data. Patient consent was obtained; (see Appendix E for a sample of the Consent form). The leader was able to contact 11 of the 12 within two weeks post discharge to complete the questionnaire via phone. The twelfth participant was unreachable.

The hospital readmission rate data was obtained using the Meditech database at SJAHS during the post-toolkit implementation phase. Patients receiving care using the toolkit were screened on Meditech by the leader to see if they had been readmitted within 30 days of discharge.

Approval for this research study was obtained from the Institutional Review Board (IRB) of St. Catherine University prior to beginning the data collection of this systems change innovation. IRB approval was not required from SJAHS because of the quality improvement focus of this study to improve patient outcomes. However, administrative and medical staff support was obtained prior to toolkit development. SJAHS supported this systems change innovation with the goal to improve diabetes care from the initial inception. Our organizational commitment to quality, excellence, and evidence-based practice (EBP) gave us the opportunity to transform diabetes care at SJAHS. CHI also identifies EPB as a priority and supports the adoption of quality patient care initiatives throughout the entire system. This innovation supported our vision of a great place to work, a great place to receive health care, and a great place to practice.

Formative Evaluation

The hospital environment is a complicated system. Innovations need evaluation in order to support ongoing use and dissemination to scale (Patton, 2011). Formative evaluation was used in concert with outcomes research data to evaluate the toolkit and its impact on improving glycemic control. The design team established priority questions for evaluating the effectiveness of the toolkit like the following as described by Patton (2011): does it fit organizationally; is it transferable to other diabetes patient groups; is it feasible; how was it received; to what extent were the toolkit components of care followed; what implementation problems were encountered; how accepting were the other healthcare professionals of the toolkit; were the metrics selected appropriate; and did we address social justice needs of this population? Careful and conscientious attention to formative data will give the team the ability to fine tune the toolkit they have designed in order to workout implementation issues, enhance quality, determine efficacy, and effectiveness, and standardize the toolkit for summative evaluation (Patton, 2011).

Implementation Strategies

Timeline. In order to implement a successful systems change innovation the leader developed a comprehensive timeline that the organization, stakeholders, and staff supported. A timeline is needed to strategically guide effective transformation. There is an intense amount of time involved in a systems change innovation. As shown in Table 1, the timeframe for the diabetes EBP toolkit was from October 2010 to May, 2012.

Table 1

Diabetes Evidence-Based Practice Toolkit Timeline

Objectives	**Activities**	**Timeline**
Develop an evidence-based practice toolkit for the hospitalized medical patient with diabetes.	1. Interview stakeholders to identify gaps in the delivery of quality care to the patient with diabetes. 2. Literature review 3. Identify and conceptualize the problem. 4. Obtain administrative approval. 5. Invite key stakeholders to participate on the toolkit design team. 6. Submit systems change proposal. 7. Obtain IRB approval at SCU. 8. Present proposal to Patient and Family Advisory Council.	October 2010 November 2010 December 2010 May 2010
Implement the Diabetes EBP Toolkit for the hospitalized medical patient with diabetes.	Educate physicians Educate nursing staff and other health care disciplines. Set toolkit implementation go live date. Collect chart audit data.	April 2011 May 2011 June 2011 July 2011-December 2011
Evaluate the outcomes of the toolkit to determine if the systems approach to patient care improves glycemic control. Utilize the findings to adopt or adapt the toolkit at SJAHS.	Analyze data Write up innovation results, lessons learned and where do we go from here? Submit final manuscript Disseminate findings at SJAHS and SCU.	January 2012 January 2012 February 2012 May 2012

Resources. The application of economic principles is essential to ensure successful implementation of a systems change innovation. The allocation of resources needs to be done in the most efficient manner (Schafermyer, 2000). Morally and ethically there is the desire to serve all people, this is how it should be, however due to scarcity of resources this is not possible under the current United States (U.S.) health care system where market justice prevails (Budetti, 2008). However, we can do our very best to meet the needs of our community with the implementation of innovations to generate positive outcomes.

Based upon the prevalence of diabetes in the U.S. there is a demand for diabetes care in every community and the demand will increase in relation to the predicted increase in diabetes (CDC, 2011). According to ADA (2005) the prevalence of diabetes among hospitalized patients is 12%-25%. This was consistent with our estimate of 1-2 patients per day with a diabetes diagnosis at SJAHS.

An innovation needs to be supported with appropriate resources (Porter-O'Grady & Malloch, 2011). The resources needed to carry out this systems change innovation were people, time, and technology. The people resources included; a multidisciplinary team, nursing staff, medical staff, administration, and a transformational leader to lead this systems change innovation. The time resources included the time necessary for the people resources to design, implement, and evaluate the innovation. Technology resources included: word processing, power point development, and statistical analysis using SPSS.

There are costs associated with resources. SJAHS agreed to financially support this innovation. The total cost was calculated at $22, 503. This excluded the expenses donated by Novo Nordisk to cover physician education. This did include an in-kind donation of approximately $9600 by the leader which could be a cost savings to the organization of $9600.

Therefore an adjusted cost, excluding the in-kind donation could be $12,903. Table 2 shows the financial budget developed by the leader to develop, implement, monitor, and evaluate the toolkit.

Table 2

Finance Budget for Diabetes EBP Toolkit

Resource	**Activity**	**Amount of time**	**Number of People**	**Hourly Rate**	**Cash Expense**	**In-Kind Expense**	**Cost**
Toolkit Development November 2010-April 2011	Team Meetings Leader Time	12 hours 24 hours	9 1	48.00[a] 50.00[b]	$5184.00	 $1200.00	 $6384.00
Toolkit Implementation April 2011-May 2011	Materials Education Classes Food Educator Time Leader Time Physician Education	 2 hours 4 hours 10 hours 	 65 65 3 1 24	 36.00[c] 48.00[a] 50.00[b] 	$50.00 $2340.00 $195.00 $576.00 	 $500.00 In-kind donation by Novo Nordisk, amount unknown	 $3661.00
Toolkit Monitoring May 2011-December 2011	Team Meetings Leader Time	9 hours 18 hours	9 1	48.00[a] 50.00[b]	$3888.00	 $900.00	

							$4788.00
Toolkit Evaluation July 2011-January 2012	Leader Chart Audit Time SPSS Software Rental Statistician Consultation Services	150 hours 6 hours	1 1	50.00[b] 20.00[d]	 $50.00 $120.00	$7500.00	 $7670.00
Total Cost							$22,503

[a] Average hourly rate of team members plus benefits
[b] Hourly rate of leader plus benefits
[c] Average hourly rate of staff nurse plus benefits
[d] Hourly rate of statistician services

There are many costs and potential benefits to a systems change innovation and it is imperative to determine the costs and benefits as another strategy to foster successful implementation. As shown in Table 3, an outline of the costs and benefits of the toolkit and as shown in Table 4, an outline of a potential 25% return on investment analysis (ROI) of the toolkit.

Table 3

Table of Costs and Benefits

Costs	**Benefits**
Program Costs Diabetes Evidence-Based Practice Design Team meeting time Facilitator time Training of all staff	**Program Benefits** Quality improvement Staff satisfaction Social justice Patient satisfaction

Materials/Supplies Equipment/Software Consultation(statistical)	
Medical Condition Costs of Diabetes Higher rate of hospitalization (Moghissi et al., 2009) Chronic complications related to diabetes (AACE, 2011) Longer LOS (Lange, 2010) More infections (Johnston & Van Horn, 2011) Hypoglycemia treatment (Heaton, Martin & Breljet, 2003) Readmissions (AACE, 2011)	**Medical Condition Benefits** Improved glycemic control Cost avoided Prevent hypoglycemia Decrease LOS with improved management Decrease readmissions Accurate documentation, enhance coding, therefore billing opportunity

Table 4

ROI Analysis

Metric	**Considerations**	**Formula**
Costs		Total Cost: $22, 503.00
Benefits	Decrease episodes of hypoglycemia, the mean cost is $1186 per episode (Heaton, Martin & Breljet, 2003) Decrease LOS by one day on 10% of patients receiving care using the toolkit, average cost of care per day on the medical unit is $1162 (actual data from SJAHS)	16 episodes x 1186=$18,976 (16 episodes is the actual number from baseline data) 8 patients x 1162=$9296 Total Benefit: $28,272.00

ROI	$\frac{\text{Benefits-Costs}}{\text{Costs}} \times 100\%$	$\frac{28{,}272-22{,}503}{22503} \times 100\% = 25\%$

Adapted from "Finance for Nurse Managers: Return on Investment", by Patricia W. Stone, Jennifer A. Smith, and Kevin D. Frick, 2010, *American Nurse Today, 5* (3), 30-32.

Summary

To potentiate a successful systems change innovation the leader designed a comprehensive evaluation plan to capture data and information to make future decisions related to this innovation. A plan is essential when testing a new innovation that directly impacts patient care in a hospital system. The leader assessed the organizational culture at SJAHS and concluded that the diabetes EBP toolkit was consistent with the strategic plan to provide quality patient care that is evidence-based and outcome focused. Other factors included in the implementation plan included principles of economics and finances as illustrated by a budget and ROI analysis. All of these factors are critical to address when implementing systems change.

Data Analysis

This study sample included 168 hospitalized patients on the medical unit during the retrospective data collection time frames, each patient with a diabetes diagnosis and insulin therapy. As shown in Table 5, the characteristics of the sample are illustrated. Seventy-eight (46%) were female and 90 (54%) were male. The age range was 20-95, with a mean of 69.8 years. Figure 1, a histogram visually describes the age distribution. The majority of the patients were Caucasian 150, (89%) and 17, (10%) were Native American.

One-hundred-sixty (95%) subjects had a diagnosis of Diabetes Mellitus Type 2 and eight (5%) had a diagnosis of Diabetes Mellitus Type 1. Comorbidities are also noted in the table with hypertension being the most common at 67%. The mean length of stay (LOS) was 3.53 days, with a range of 1-16 days. Figure 2, a histogram visually describes the LOS distribution.

Table 5

Characteristics of Study Sample

Characteristics	N	%
Gender		
Female	78	(46)
Male	90	(54)
Ethnic Group		
Caucasian	150	(89)
Native American	17	(10)
Unknown	1	(0.5)
Diabetes Mellitus		
Type 1	8	(5)
Type 2	160	(95)
Co-morbidities		
Arrhythmia	15	(9)
Cardiovascular Disease	42	(25)
Chronic Renal Failure	30	(18)
Congestive Heart Failure	30	(18)
Coronary Artery Disease	37	(22)
Cerebral Vascular Accident	18	(11)
GERD	25	(15)
Hypercholesterolemia	8	(5)
Hyperlipidemia	43	(26)
Hypertension	113	(67)
Pulmonary Disease	47	(28)

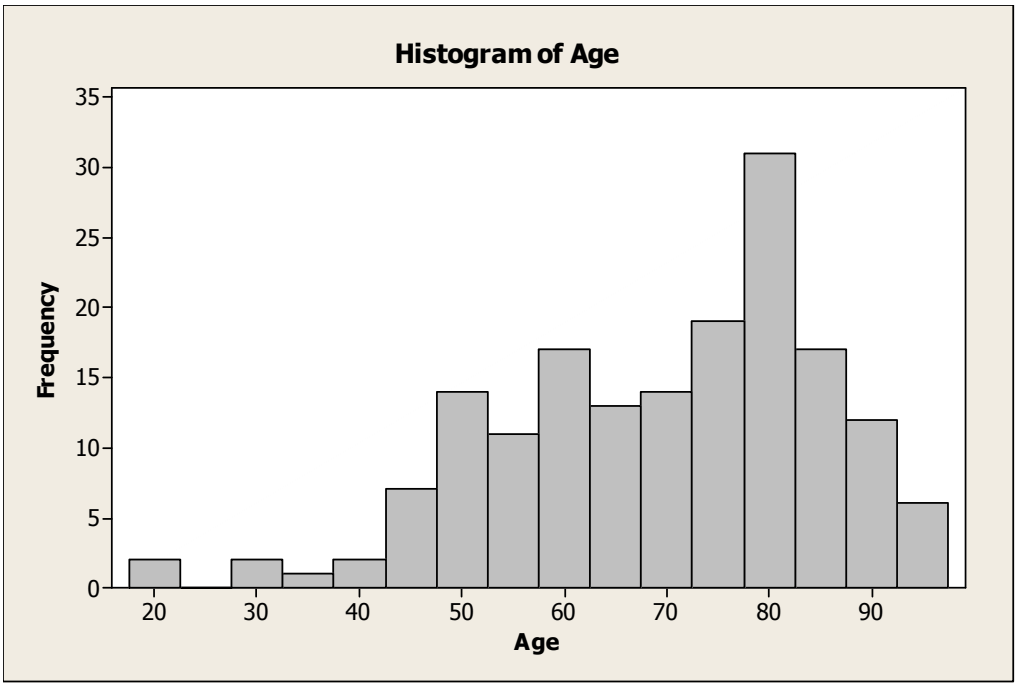

Figure 1. Histogram of age visually describes the age distribution.

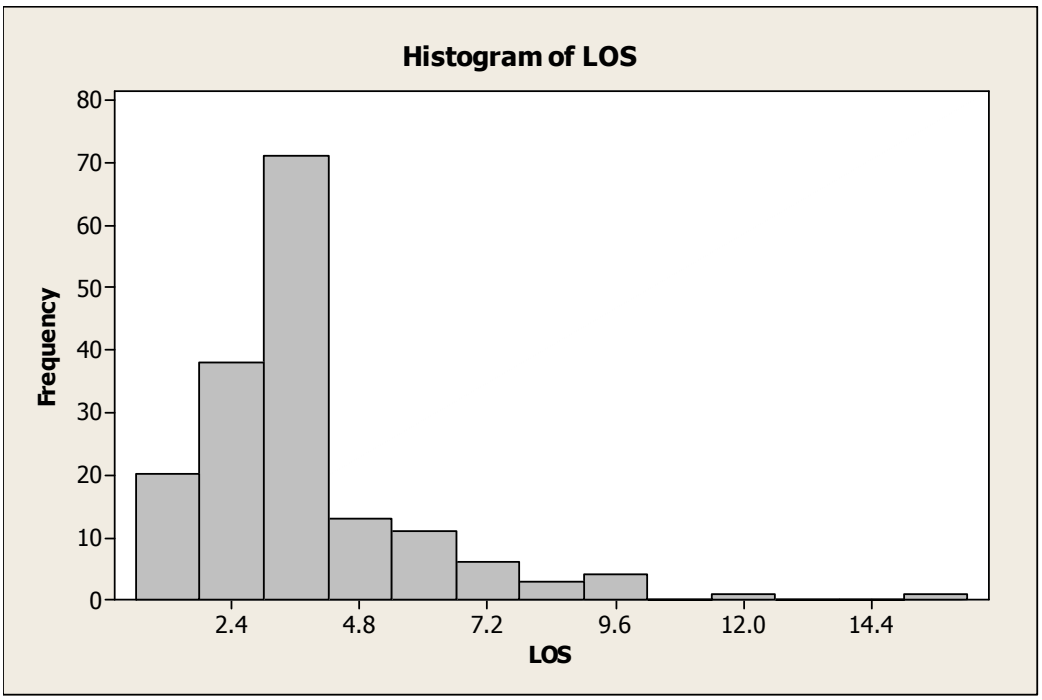

Figure 2. Histogram of LOS visually describes the LOS distribution.

Findings by Research Question

Research question 1. Among medical adult hospitalized patients, does an organizationally developed evidence-based diabetes care management toolkit in comparison to current practice at SJAHS improve glycemic control? A total of 508 episodes of hyperglycemia >180 mg/dL for 2010 and a total of 443 episodes of hyperglycemia >180 mg/dL for 2011 were recorded. An individual value plot graph of the number of episodes of hyperglycemia visually illustrates there was no obvious change in the episodes of hyperglycemia from 2010 to 2011. See Figure 3.

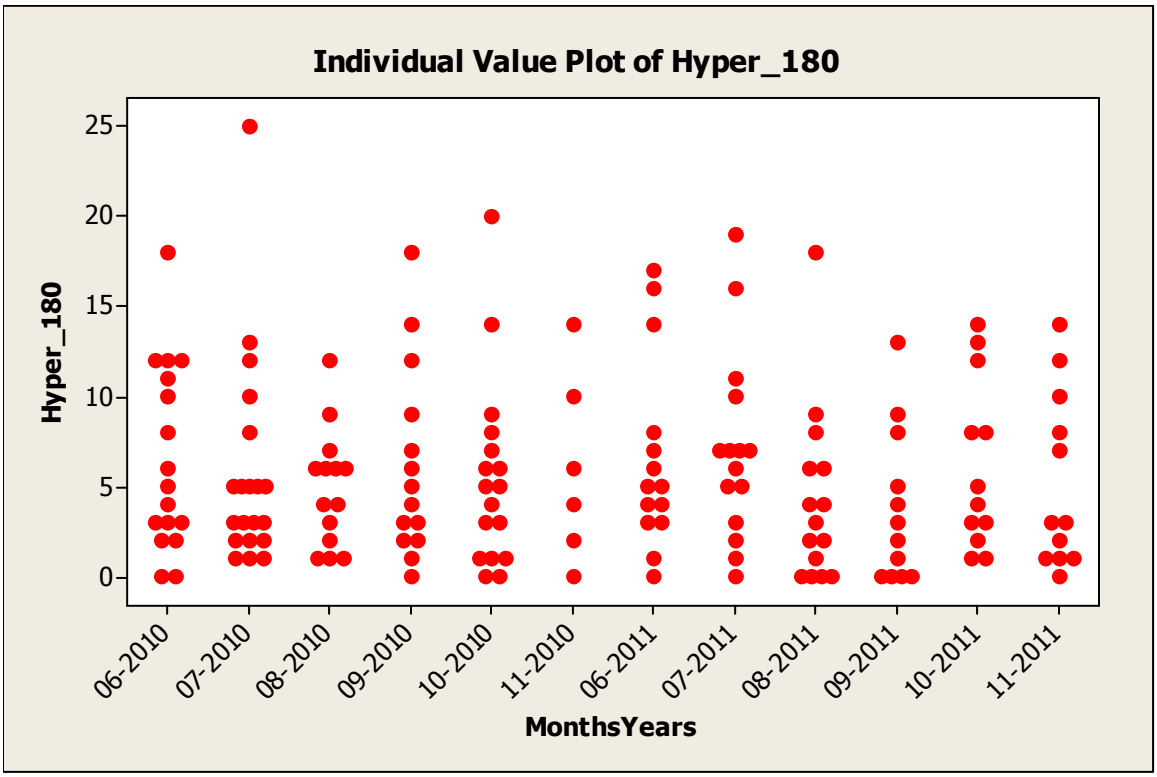

Figure 3. This individual plot diagram visually illustrates the total number of hyperglycemia episodes >180mg/dL for 2010 and 2011 timeframes.

A total of 16 episodes of hypoglycemia < 50 mg/dL for 2010 and a total of 9 episodes of hypoglycemia < 50 mg/dL for 2011 were recorded. An individual value plot of the number of episodes of hypoglycemia visually illustrates there was no obvious change in the episodes of hypoglycemia from 2010 to 2011, note that the patient data values of zero (0) episodes are also displayed on the graph. See Figure 4.

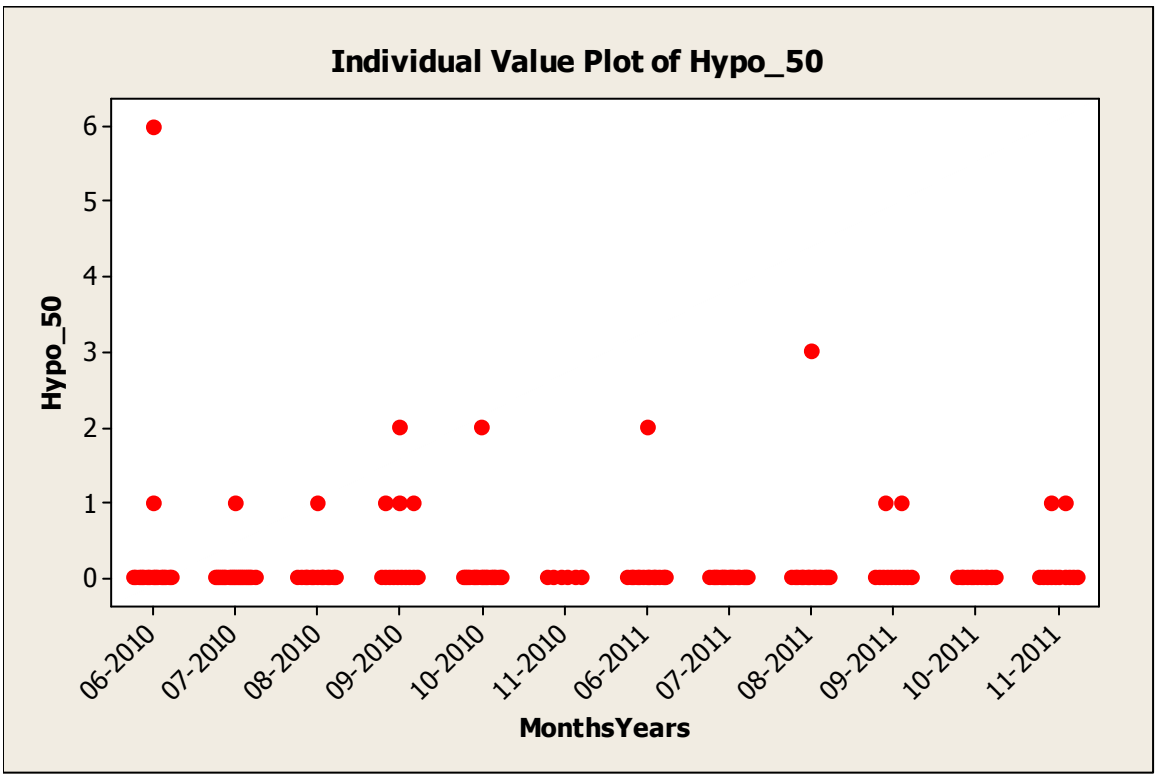

Figure 4. This individual plot diagram visually illustrates the total number of hypoglycemia episodes <50 mg/dL for 2010 and 2011 timeframes.

The outcome metric to measure glycemic control was the episodes of hyperglycemia > 180 mg/dL and the episodes of hypoglycemia <50 mg/dL per 1000 patient days. Patient day data is a typical method of data reporting for quality improvement initiatives in the hospital setting. As shown in Table 6, actual patient day data per month for SJAHS is used to calculate the rate of hyperglycemia and hypoglycemia.

Table 6

Data Summary of the Rate of Hyperglycemia and Hypoglycemia

Date	Episodes Hyper180	Episodes Hypo50	Patient Days	Episodes/Patient Days Hyper180[a]	Episodes/Patient Days Hypo50[b]
Jun-10	111	7	557	0.199281867	0.012567325
Jul-10	114	1	514	0.221789883	0.001945525
Aug-10	68	1	485	0.140206186	0.002061856
Sep-10	86	5	445	0.193258427	0.011235955
Oct-10	93	2	485	0.191752577	0.004123711
Nov-10	36	0	457	0.078774617	0
Jun-11	93	2	486	0.191358025	0.004115226
Jul-11	106	0	449	0.236080178	0
Aug-11	63	3	454	0.13876652	0.00660793
Sep-11	45	2	463	0.097192225	0.004319654
Oct-11	67	0	453	0.14790287	0
Nov-11	62	2	446.25	0.138935574	0.004481793

[a] $\frac{\text{Number of episodes of glucose greater than 180 mg/dL}}{\text{Number of patient days}}$

[b] $\frac{\text{Number of episodes of glucose less than 50 mg/dL}}{\text{Number of patient days}}$

Tests of normality were conducted on the two groups of data from 2010 and 2011 and for the episodes of hyperglycemia and hypoglycemia per actual patient days for each month. All four data sets passed the tests of normality so that a two-sample unequal variances *t* test could be used to test each hypothesis.

Hyperglycemia

The results indicated there was not a significant decrease in glycemic control from pre-toolkit implementation 2010 to post-toolkit implementation 2011. The toolkit did not improve

glycemic control as measured by episodes of hyperglycemia >180 mg/dL per 1000 patient days. A null hypothesis is supported by the data: P-Value = 0.339. See Table 7 for a summary of the data.

Table 7

Hyperglycemia per 1000 patient days

Group	**N_a**	**Mean**	**StDev**
2010	6	0.1708	0.0525
2011	6	0.1584	0.0485

[a] N is the composite of data for 6 months from Table 6 for each time frame

Hypoglycemia

The results indicated there was not a significant decrease in glycemic control from pre-toolkit implementation 2010 to post-toolkit implementation 2011. The toolkit did not improve glycemic control as measured by episodes of hypoglycemia < 50 mg/dL per 1000 patient days. A null hypothesis is supported by the data: P-Value = 0.210. See Table 8 for a summary of the data.

Table 8

Hypoglycemia per 1000 patient days

Group	**N_a**	**Mean**	**StDev**
2010	6	0.00532	0.00528
2011	6	0.00325	0.00268

[a] N is the composite of data for 6 months from Table 6 for each timeframe

Research question 2. What are the effects of the toolkit on self-care goals and on patient satisfaction? Descriptive statistics using percentage calculation illustrated if self-care goals were

identified at the time of discharge or not, see Table 9. The results indicated that only 14% of the study sample had self-care goals identified at the time of discharge. 34% were not applicable because those patients needed ongoing care management of their diabetes at a long term care (LTC) facility and a process had not been established to develop a self-care goal with the patient and the staff from the LTC facility.

Table 9

Self-Care Goals

Characteristics	**N**	**%**
Completed	11	(14)
Not completed	41	(52)
Not applicable	27	(34)

Descriptive statistics were also used to analyze patient satisfaction data. The study sample was 11 (for question 5, only 7 responded with a ranking to the patient satisfaction question). The responses were ranked on an ordinal scale. 1= very dissatisfied, 2=dissatisfied, 3=satisfied, and 4= very satisfied. The results indicated satisfaction, with mean scores for each question of 3.0 or greater. See Table 10 for a summary of the data.

Table 10

Patient Satisfaction

Patient Satisfaction Question	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Question 1	11	3.00	4.00	3.3636	0.5045
Question 2	11	3.00	4.00	3.4545	0.5222
Question 3	11	2.00	4.00	3.0909	0.7006
Question 4	11	3.00	4.00	3.6364	0.5045
Question 5	7	2.00	4.00	3.0000	0.5773

Research question 3. What was the protocol adherence for hypoglycemia management during the post-toolkit implementation phase? The toolkit included a new hypoglycemia treatment protocol. Of the nine episodes of hypoglycemia < 50 mg/dL, seven episodes (78%) were managed following the protocol. Two episodes (22%) were noted not to follow the protocol. There was no documentation in the chart to offer an explanation.

Research question 4. Does the toolkit decrease hospital readmissions? Of the 79 patients that received diabetes care management using the toolkit, zero were readmitted within 30 days from their date of discharge specifically for diabetes care. Thirteen patients were readmitted within 30 days from their date of discharge for other medical reasons with diabetes noted as a comorbidity.

Formative Evaluation

The diabetes EBP toolkit design team evaluated the toolkit during implementation with the following conclusions noted. The toolkit was a good fit for the organization with its focus on quality and evidence-based care. The toolkit was designed to ensure that all medical patients received the same level of care for supporting our ministry of social justice. The design team felt that the toolkit was feasible for implementation with the vision to improve care. The toolkit study was well received by administration, the physicians, and the staff. Now that we have study results the design team will now have the opportunity to further evaluate using formative evaluation. Further evaluation is needed to determine the following; to what extent were the toolkit components of care followed; what problems were encountered; how accepting was the health care team; and were the metrics appropriate?

Discussion, Conclusions, and Recommendations

Discussion

Findings for each research question are discussed and practice implications described.

Research question 1. Despite an evidence-based diabetes management toolkit, multidisciplinary team involvement, and educational sessions for physicians and nurses the results suggest that the toolkit did not improve glycemic control as evidenced by an insignificant decrease in the episodes of hyperglycemia and hypoglycemia for the hospitalized medical patient with diabetes. There are several factors that could have contributed to this finding; unclear roles, communication barriers, and assumptions in regard to glycemic management between the multidisciplinary team members. However, this systems change innovation was important for the provision and promotion of quality care and clinically relevant in regards to establishing a system and processes to support evidence-based care to improve patient outcomes. Organizations need to improve glycemic control in the hospital setting and there is limited research on what is the best approach.

The findings suggest a variety of practice implications for diabetes management at SJAHS. Standardized orders for subcutaneous insulin therapy are a component of the toolkit. This improves the ease of ordering insulin therapy and guides the physician to include all three components; basal, prandial, and correction. However, the physicians still need to prescribe the insulin therapy and adjust daily (Magaji & Johnston, 2011). The findings indicate improvement is needed in daily adjustments to insulin regimens. This leader assumed that this would occur. The toolkit order set was used on every patient in the study upon admission to the unit, but daily modification did not occur on most of the patients. According to Modic (2010) there is often no therapeutic adjustment in the insulin regimen throughout the patients' hospital stay. A daily

adjustment is a change in practice and requires multidisciplinary collaboration between nursing, physicians, and the certified diabetes educator (CDE). This collaboration will promote the prescription of basal, prandial, and correction insulin therapy to improve glycemic control. The role of each team member at SJAHS may also be unclear in regards to who is responsible for what aspect of the patients' goal for glycemic control. Trending the effects of insulin therapy on glycemic control and communicating those findings to the physician is a critical component of nursing care (Modic, 2010). At SJAHS nursing needs to improve the process of communicating blood sugar measurements and trends to the physicians. There appears to be an assumption by nursing that the physicians are aware of the blood sugar measurements because of their involvement in the plan of care. Communication and collaboration are essential for the achievement of quality systems and patient outcomes (Tymkow, 2011). The study findings are consistent with Johnston and VanHorn (2011) whereas glycemic control in a select group is in need of improving the frequency of adjusting insulin therapy to improve glycemic control and ultimately improve outcomes for the hospitalized patient with diabetes.

Research question 2. One of the most problematic findings was the poor documentation of a self-care goal at the time of discharge, only 14% of the study sample had a goal noted. A patient education/discharge instruction sheet was a component of the toolkit. This instruction sheet was designed using the American Association of Diabetes Educators (AADE) (2004) self-care key teaching points; healthy eating, being active, glucose monitoring, taking insulin, problem solving, healthy coping, reducing risk, and identification of a self-care goal. This instruction sheet was designed to be given on admission and reviewed collaboratively between patient, family, and nurse at the time of discharge. Patient education is critical for the patient to gain knowledge and skill to modify behavior to successfully manage their diabetes (AACE,

2009). This was also a new process and may not yet be a mature process with the nursing staff or nurses may feel unskilled to provide diabetes self-care patient education (Modic, 2010). Nursing education was a component of the toolkit and included; an overview of diabetes, an overview of patient education on diabetes self-care teaching points, and an overview of the toolkit. One hundred percent of the nursing staff attended mandatory education, a two hour didactic seminar in May of 2011 prior to toolkit implementation however this may require ongoing intervention to promote competency in diabetes education. This finding warrants further discussion with the nursing staff.

The patients appear to be satisfied with their diabetes care but due to the small sample size one cannot make that assumption. In regards to question three, "how satisfied were you with the treatment of your blood sugars" several of the patients offered a comment in response to this question stating they were dissatisfied because they felt their blood sugars were too high. In regards to question five, "upon discharge you set a diabetes self-care goal; how satisfied are you with achieving this goal" several patients were unable to even respond to this question because they did not set a goal upon discharge. This study question was designed to provide the patients' with a voice for formative evaluation. This information requires further discussion with the stakeholders.

Research question 3. Another potentially problematic finding relates to hypoglycemia protocol adherence. In essence, the protocol is a physician order for nursing to follow when a patient develops hypoglycemia. In this study 22% of the hypoglycemia episodes indicated that the protocol was not adhered to. Upon chart review there was no order noted to support this non-adherence or any documentation in the nursing notes explaining the variation from the protocol. Hypoglycemia is a safety concern and it is very important to treat the hypoglycemic patient per

protocol. Interestingly this finding is not unique to SJAHS. According to Modic (2010), in two studies with 484 episodes of hypoglycemia not one episode was treated according to pre-established protocols. This necessitates a need for further investigation related to nursing practice and patient safety.

Research question 4. Of the 79 patients in the study who received care using the toolkit zero were readmitted for diabetes within 30 days. Discharge planning was a key component of the toolkit. However, one cannot assume this is solely related to the toolkit. There is no baseline data to compare with. According to Brown (2009) 20% of all Medicare beneficiaries discharged from the hospital are readmitted within 30 days. Patients are often readmitted with problems that could have been prevented with adequate discharge planning, patient education, and with a post-hospital patient monitoring plan. Is this an intervention that has generated a readmission reduction for patients with diabetes and other co-morbidities? This data may provide a starting point for determining what an effective transitional plan is when a patient is discharged to home. This is data that will need to be monitored and trended overtime. This will be an important metric to continue to gather data on because of its relevance to healthcare reform. Beginning in October of 2012 Medicare payments may be reduced by certain percentages for preventable readmissions. (Kaiser Family Foundation, 2011).

Study Limitations

Subjects most likely had variation in severity of diabetes, a variety of admission diagnoses, pre-existing co-morbidities, physiological stressors, and variation in LOS which could have affected glycemic control. Glycemic control may also have been impeded by inattention to daily insulin therapy adjustments by the health care team, physician practice patterns, and non-adherence to the hypoglycemic treatment protocol.

The focus of this study was the noncritical care medical patient so the ability to generalize to other patient populations is a limitation. The toolkit was also designed specifically to improve diabetes care at SJAHS therefore generalizability is limited to other organizations. The toolkit incorporated EBP, organizational values, and patient preferences for diabetes care at SJAHS.

There was a design deficiency in regards to research question 2. What are the effects of the toolkit on self-care goals? The metric really measured a person-centered process, whether or not there was a self-care goal noted in the chart at the time of discharge? This reflects patient education and discharge planning by the nurses not the effect of the toolkit on self-care.

The sample size selected for the patient satisfaction survey was too small. The survey was developed by the leader and there was a desire to establish construct validity. According to Polit and Beck (2008) ten respondents per item is the number most often recommended in the literature. This would equate to a sample size of 50 for the patient satisfaction survey.

In regards to a systems change innovation, was the study limited by lack of maturity? Does there need to be a period of time for the systems change innovation to mature before measuring outcomes? Essentially in this study, the data collection began simultaneously with implementation. In retrospect maybe outcomes research and metric measurements should have started 3- 6 months after implementation? What is an appropriate timeframe? Should one collect data at multiple time points to determine maturity? This is another area that needs further investigation. However, we do have data to discuss, implications to ponder, and recommendations to consider before making a decision in regards to the fate of the toolkit.

Implications for Nursing Practice, Patient Care, Organizational Change, and EBP

The findings have implications for nursing practice, patient care, and organizational change when implementing evidence-based practice. The practice implications and research opportunities are endless for diabetes management of the hospitalized medical patient. For this innovation, the implications identified are:

1. Nurses need to monitor and assess the patterns of hyperglycemia and inform the physician so that they can make insulin therapy adjustments in a timely manner.
2. It is paramount for nursing to understand the importance of hypoglycemia management (Ng et al., 2010). This also needs further investigation as to why nurses opt not to follow an evidence-based hypoglycemia management protocol.
3. Nurses need to promote patient education on diabetes self-care and assist the patient to identify a self-care goal at the time of discharge.
4. Nursing needs to be involved in the discharge planning process and collaborate with the discharge planner to ensure a safe transition to home with patient self-care knowledge and skill to promote successful diabetes management and prevent readmissions.
5. The diabetes health care team needs to determine the most effective and efficient way to communicate episodes or patterns of hyperglycemia and hypoglycemia to improve glycemic control. Nursing is a key member of this team and can contribute significantly to its success by coordinating care and advocating for quality patient care. There needs to be a focus on prescribing, monitoring, and improving communication practices in conjunction with the use of the toolkit by all members of the health care team.
6. Patients have the right to receive quality evidence-based care. Patients also have the right to receive equitable care at SJAHS. Nursing is responsible and accountable to protect the

health, safety, and rights of the patient (Kalb, 2009). The toolkit was designed to provide equitable, quality, safe, evidence-based patient care. The multidisciplinary team is obligated to evaluate this toolkit and adapt the toolkit to ensure quality diabetes care is provided at SJAHS.

7. According to Moghissi et al., (2009) inpatient diabetes management involves a systems approach, is based upon evidence, is multidisciplinary, and includes patient education and discharge planning. The toolkit and implementation plan was designed to encompass these elements for diabetes management. The toolkit was also supported by the organization, had multidisciplinary commitment, a vision, goals, strategic planning, and an action plan for implementation. However, the findings suggest improvements or adaptations are needed to support ongoing use of this innovation.

Melnyk and Fineout-Overholt (2011) note that persistence and patience are needed in order for an innovative change to be successful. Projects are often terminated too early because of the lack of persistence or patience. This innovation is currently in transition and moving from a current state of practice to an improved state of practice. From the challenges of implementation we can apply these learning's by implementing the identified practice implications with persistence and patience on the quest for improved glycemic control. Further research is also needed on implementing change or evidence-based practice in the health care system.

Leadership Implications

As the leader of this innovation, self-reflection occurred during all phases of this project but particularly during the evaluation phase with data analyses. From a leadership perspective there appears to be some staff and physician resistance to systems change and despite potential benefits for patient care this innovation has had some difficulty with adoption by all members of the health care team. This was a complex innovation involving interplay between systems and new processes including communication and decision making by members of the health care team. This leader needs to provide feedback in regards to the study findings and implications so that responsibilities of the health care team can be shared and decisions can be made for toolkit adaptation (Melnyk & Fineout-Overholt, 2011). Additional effort is needed for diffusion of the innovation to occur (Sanson-Fischer, 2004).

Evidence-based practice is a new concept and this leader needs to facilitate the paradigm shift to an EBP culture at SJAHS and include the nursing staff and physician providers in this transformation. There is current support from administration, managers, and leaders for EBP. When nursing and physicians adopt EBP they will realize the significance of an innovation to promote quality patient care. EBP leads to the highest quality of care and best outcomes (Melnyk & Fineout-Overholt, 2011).

Conclusion

The findings of this study suggest that the toolkit has not been adopted by all members of the health care team and glycemic control did not improve with use of the toolkit during the June 2011-November 2011 timeframe. Insulin therapy needs adjusting, education on self-care and goal setting needs improvement, and the hypoglycemia protocol needs to be adhered to in order to obtain improved glycemic control. The toolkit usage needs to be optimized and ultimately this

will improve glycemic control for the hospitalized medical patient with diabetes. Organizations can no longer ignore inadequate glycemic control or tolerate hyperglycemia and hypoglycemia in the hospital setting. Glycemic control is a quality measure that needs further development and investigation to ensure, safe, quality care for the hospitalized patient with diabetes.

Despite the results we have implemented a diabetes EBP toolkit that has the potential to improve glycemic control. We have the elements to be successful; administrative support; an organization that supports quality, safety, and EBP; a health care team that is committed to quality diabetes care; a vision to provide this care; and an ethical and social justice conscientiousness to do the right thing for the patient. Based upon the knowledge we have gained from this innovation we are on a journey to improve diabetes care.

Recommendations

This transformational leader and future Doctor of Nursing Practice (DNP) nurse will:

1. Disseminate the research findings and key learning's in a meaningful way to the stakeholders, staff, physicians, and administrators at SJAHS. This leader will seek input and feedback through dialogue and discussions to determine next steps in regards to the toolkit.
2. Utilize a dashboard to report outcomes of the innovation to all staff at SJAHS. Dashboards provide a summary of the care provided and a summary of our performance.
3. Complete formative and summative evaluation of the toolkit with the stakeholders; include patient satisfaction data to capture the patient's perspective of diabetes care using the toolkit.
4. Determine decision quality; adopt, adapt, or retire the toolkit.

5. Disseminate research findings and key leanings through a journal publication, podium or poster presentation.
6. Continue to transform the model of nursing care at SJAHS to incorporate a culture that embraces EBP and systems change. Leading change is one of the most important roles of a leader (Stichler, 2011).
7. Utilize transformational leadership attributes including idealized influence, inspirational motivation, intellectual stimulation, and individual consideration (Northouse, 2010).

DNP Transformation

This systems change project has provided this leader with an opportunity to learn the key concepts and essential components of implementing systems change in a health care setting. This study has helped this leader to understand the phenomena of EBP, systems change, and the importance of leadership. As a future DNP this leader has built a new foundation of knowledge for the future of health care leadership. This leader has expanded her wisdom, knowledge, and abilities to be a more effective leader to transform nursing practice and patient care. As leaders we will be faced with many new challenges as the landscape of health care changes. As a future DNP I possess the essential knowledge and skill to generate new approaches to nursing practice, patient care and the ability to effectively transform organizational systems change. We can accomplish great things for the patients, the nursing profession, the communities we serve, and the greater world with DNP leadership.

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Appendix A

Diabetes Evidence-Base Practice Toolkit a Sampling of the Components

Subcutaneous Insulin Orders

Hypoglycemia Protocol

Plan of Care

Page 4 of the Patient Education/Discharge Instruction Sheet

Discharge Planning Checklist

Outpatient Diabetes Education

Subcutaneous Insulin Orders

Blood Glucose Monitoring

□ QID – (AC & HS) □ Other _____

Blood glucose level goals: □140 mg/dL or less □Other _____mg/dL

Subcutaneous Insulin Orders

□ Basal insulin

□ Levemir (Detemir) _____ units subq @ _____ hours

□ Levemir (Detemir) _____ units twice daily subq @ _____ and _____

□ Other _____

□ Prandial insulin (mealtime) (Hold if NPO or if BG < 60 mg/dL)

□ NovoLog (Aspart) give immediately with a meal

_____ units subq 3 times daily with meals, **OR**

_____ units subq per 1 carbohydrate (one carb = 15 grams)

□ Correction insulin (in addition to prandial dose above)

□ NovoLog (Aspart) □ Other _____

Glucose Level	□ Low	□ Med	□ High	□ Individual
Less than 120 mg/dL	0 units	0 units	0 units	0 units
120-149 mg/dL	0 units	1 units	2 units	____ units
150-199 mg/dL	1 units	2 units	3 units	____ units
200-249 mg/dL	2 units	3 units	4 units	____ units
250-299 mg/dL	3 units	5 units	7 units	____ units
300-349 mg/dL	4 units	7 units	10 units	____ units
350 or greater & call MD	5 units	8 units	12 units	____ units

□ Bedtime (If blood glucose is less than 200 mg/dL, do not give correction dose;

if greater than 200 mg/dL, give 50% of correction dose.

**DO NOT HOLD BASAL INSULIN UNLESS ORDERED BY THE MD.

** PRANDIAL dose can be administered once the patient completes 50% of their meal or within 30 minutes after meal.

** If patient eats less than 50% of meal, hold the PRANDIAL dose. Do give the HYPERglycemia correction insulin dose if indicated.

**If a hypoglycemic event occurs, implement the HYPO glycemia Protocol.

**If patient status changes to NPO, call MD for new orders.

Hypoglycemia Protocol

1. Obtain stat Accu-Chek for s/s of hypoglycemia. If < 70 mg/dL proceed with the

following:

If conscious and able to swallow:	**If unconscious or unable or unwilling to orally take carbohydrate:**
1. Give 15 grams of carbohydrate • 4 oz of any juice • 4 oz regular soda • 15 gm of glucose gel • 8 oz skim milk 2. Closely monitor patient's response 3. Recheck blood glucose in 15 minutes 4. If less than 70 mg/dL, repeat 15 grams of carbohydrate 5. May repeat this sequence 3 times 6. Notify physician if blood glucose remains less than 70 mg/dL Recheck blood glucose 1 hour after blood glucose has returned to a level greater than 70 mg/dL.	1. Give one amp of D50 (50 mls) IV x 1 2. If no IV access, give Glucagon 1 mg IM 3. Call covering physician.

Date: _____ Time: _____ Provider Signature: _____

CATHOLIC HEALTH INITIATIVES
St. Joseph's Area Health Services
600 Pleasant Avenue
Phone: 218-732-3311
www.sjahs.org
Park Rapids, MN 56470
1-800-566-3311

PLAN OF CARE

Problem # _____

<u>Blood Glucose Level Abnormal – risk of/actual</u> – State in which a person blood glucose level is outside normal parameters

Related to:_____

<u>Goal/Outcome</u>

By discharge, the patient will:

- Blood glucose levels within established parameters
- Verbalizes knowledge of:
  - Type of diabetes
  - Healthy eating
  - Physical activity
  - Glucose monitoring
  - Prescribed medication management
  - Problem solving
  - Healthy coping
  - Reducing risk factor
  - Important of post-discharge follow-up care
- Describe priority life-styles changes he/she plans to implement
- Self-care goal established
- _____

<u>Nursing Interventions</u>

- Assess for signs and symptoms of hyperglycemia
- Assess for signs and symptoms of hypoglycemia
- Communication/referral as appropriate:
  - Dietitian/CDE
  - Pharmacist
  - Discharge Planner
  - Social Services
  - _____
- Assess learning needs
- Implement teaching plan
- Provide education and printed materials from eClinical Reference Solutions/Mosby's
- Provide patient education on post-discharge follow-up care and signs/symptoms to report

Initiated by: _____ RN Date: _____

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Sample of page 4 of the Patient Education/Discharge Instruction Sheet

	A. Discharge 2. Symptoms to Report to Provider: a. If your hands or feet are puffy b. Blood sugars over 250 for 2-3 days or blood sugars are below 70 more than 3 times in one week c. Symptoms of high blood sugar, blurred vision, increased thirst, increased hunger, increased urination d. Your blood sugar target should be _____. 3. Keep Follow-up appointments as scheduled.	□	_____	_____	_____
	4. What is your Diabetes Self-Care Goal? Please write below: _____ _____				

DISCHARGE PLANNING CHECKLIST – DIABETIC PATIENT

Name _____

Last hospital admission _____

Reason for admission _____

FOLLOW UP CARE/NEEDS:

Home Care referral

CDE Outpatient referral

Follow-up MD appointment

BARRIERS TO FOLLOW UP CARE AND/OR COMPLIANCE:

Payor source

Transportation

Financial

Ability to learn

Coping with lifestyle changes

Support – family/friends

RESOURCES:

Social Service consult

Support group information

Insulin assistance programs

Food Shelf

Online Resources

Transportation assistance

OTHER:

OUTPATIENT DIABETES EDUCATION

ORDER FORM

5. Diagnosis (select one)

- ☐ Type 1 – uncontrolled (250.03)
- ☐ Type 1 – controlled (250.01)
- ☐ Type 2 – uncontrolled (250.02)
- ☐ Type 2 – controlled (250.00)
- ☐ Other _____

2. Special Needs: (select only if applicable)

- ☐ Vision impaired
- ☐ Hearing impaired
- ☐ Physical limitations
- ☐ Cognitive impairment
- ☐ Language limitations _____
- ☐ Other _____

6. Orders for Diabetes Self-Management Training (DSMT) (select one)

☐ Comprehensive Education – Nurse Educator and Dietitian (10 hours Initial for Medicare)

☐ Follow up Education – Nurse Educator and Dietitian (2 hours for Medicare)

☐ Initiation of Insulin Therapy/Byetta

Orders _____

☐ Additional Insulin Training: ____Pen ____Syringe ____ Pump

☐ May refill Insulin Rx's and diabetic supplies. (Monitoring strips, syringes, etc.)

☐ Continuous Blood Glucose Monitoring (CGMS)

☐ Provide Glucose Monitoring Device

7. Diabetes Self-Management Training (DSMT) Content to include:

☐ All 10 content areas, as appropriate: Monitoring diabetes; diabetes as a disease process; psychological adjustment; physical activity; medical nutrition therapy; goal setting and problem solving; medications; acute and chronic complication: prevention, detection and treatment; preconception/pregnancy management/gestational diabetes management.

Other orders or information: _____

Date/Time: _____

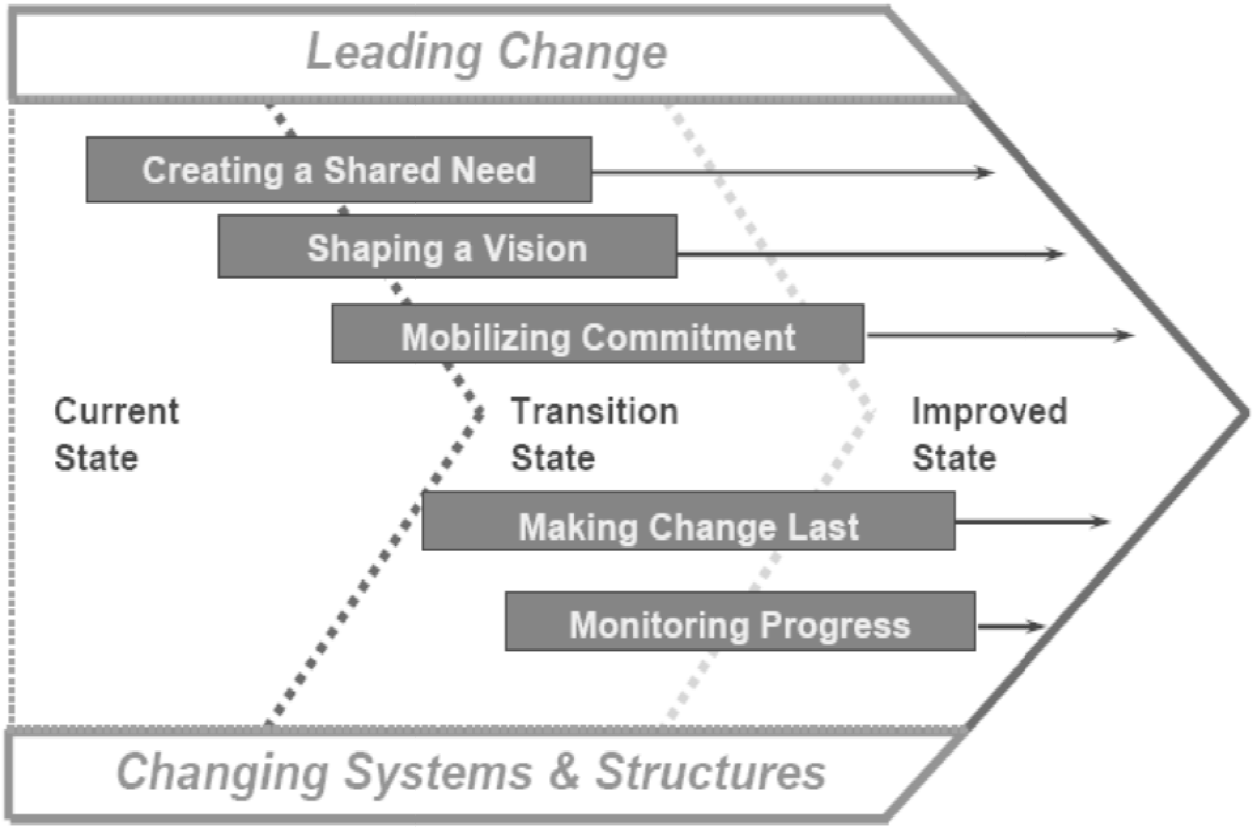
Provider Signature: _____

Appointment Date: _____ Time: _____ Location: _____

Send or Fax orders to: Essentia Park Rapids Medical Records 218-732-2874.

Appendix B

CAP Model



Adopted from General Electric Company, 2007 and Catholic Health Initiatives, 2009.

Appendix C

Chart Audit Data Collection Tool									☐ Baseline ☐ Post	
Date	Subject Code	M F	Ethnic Group	Age	DM1 DM2	Co-morbidities	Episodes of Hyperglycemia >180	Episodes of Hypoglycemia <50	Hypoglycemia protocol followed Y-N-NA	Self-care goal identified Y-N

Appendix D

Patient Satisfaction

Interview Questions

1. How satisfied were you with the care you received for your diabetes during your last hospital stay?

1. Very dissatisfied 2. Dissatisfied 3. Satisfied 4. Very satisfied

2. How satisfied were you with the monitoring of your blood sugars?

1. Very dissatisfied 2. Dissatisfied 3. Satisfied 4. Very satisfied

3. How satisfied were you with the treatment of your blood sugars?

1. Very dissatisfied 2. Dissatisfied 3. Satisfied 4. Very satisfied

4. How satisfied were you with the staff's knowledge of your diabetes treatment plan?

1. Very dissatisfied 2. Dissatisfied 3. Satisfied 4. Very satisfied

5. Upon discharge you set a diabetes self-care goal; how satisfied are you with achieving this goal?

1. Very dissatisfied 2. Dissatisfied 3. Satisfied 4. Very satisfied

6. Describe your discharge instructions. Did you receive information on your follow-up appointment with a certified diabetes educator or your primary care provider or both? Who is it with and when?

7. Feel free to comment on your diabetes care at St. Joseph's Area Health Services. Your feedback is important.

Appendix E

Consent

An Innovation to Transform Diabetes Care

RESEARCH INFORMATION AND CONSENT FORM

Introduction:

You are invited to participate in a research study to evaluate diabetes care. This study is being conducted by Sonda Tolle RN, MS, and student in the Doctor of Nursing Practice Graduate Program at St. Catherine University. You were selected as a possible participant in this research because you have a diagnosis of diabetes and are hospitalized at St. Joseph's Area Health Services. Please read this form and ask questions before you decide whether to participate in the study.

Background Information:

The purpose of this study is to determine if an organizationally developed toolkit for the management of diabetes improves blood sugar control in the hospital setting for the medical patient with diabetes. Approximately 12 people are expected to participate in this research.

Procedures:

If you decide to participate, you will be asked to answer several questions related to your care while hospitalized by phone 1-2 weeks post discharge. This study will take approximately 15 minutes of your time.

Risks and Benefits:

The study has minimal risk; possible invasion of your privacy.

The benefits to participation are satisfaction that the information you provide may help others with diabetes and hopefully improve diabetes care.

Confidentiality:

Any information obtained in connection with this research study that could identify you will be kept confidential. In any written reports or publications, no one will be identified or identifiable and only group data will be presented.

I will keep the research results in a password protected computer and/or a locked file cabinet in my office and only I and my advisor will have access to the records while I work on this project. I will finish analyzing the data by June 2012. I will then destroy all original reports and identifying information that can be linked back to you

Voluntary nature of the study:

Participation in this research study is voluntary. Your decision whether or not to participate will not affect your future relations with St. Joseph's Area Health Services or St. Catherine University in any way. During the interview process you may refuse to answer any question if you choose. If you decide to

participate, you are free to stop at any time without affecting these relationships, and no further data will be collected.

Contacts and questions:

If you have any questions, please feel free to contact me, Sonda Tolle at 218-255-2051. You may ask questions now, or if you have any additional questions later, the faculty advisor, Corjena Cheung PhD, RN at 651-690-6040, will be happy to answer them. If you have other questions or concerns regarding the study and would like to talk to someone other than the researcher, you may also contact John Schmitt, PhD, Chair of the St. Catherine University Institutional Review Board, at (651) 690-7739.

You may keep a copy of this form for your records.

Statement of Consent:

You are making a decision whether or not to participate. Your signature indicates that you have read this information and your questions have been answered. Even after signing this form, please know that you may withdraw from the study at any time and no further data will be collected.

_____

I consent to participate in the study.

_____

Signature of Participant Date

_____

Signature of Researcher Date