2015

Incorporating ADA Best Practice Guidelines in Electronic Medical Records to Improve Glycemic Management in Hospitals

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2015

Abstract

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

March 2015

Abstract

Aggressive management of diabetes using American Diabetes Association (ADA) best practice guidelines in hospitalized patients reduces morbidity and mortality. Inpatient electronic medical records systems improve care in chronic diseases by identifying care needs and improving the data available for decision-making and disease management. The purpose of this quality improvement project was to evaluate the impact of ADA best practice guidelines of glycemic management once they have been entered into the EMR of hospitalized diabetics. Kotter's organizational change process guided the project. The project question investigated whether nurses' use of ADA Best Practice Guidelines incorporated into the EMR improve glycemic management in hospitalized patients. A quality improvement pretest-posttest design evaluated the intervention to assess whether the program goals were met. A convenience sample of 8 nurses practicing in a subacute health care facility participated in the program with pretest–posttest data obtained from a convenience sampling of diabetic patients admitted to the facility (n =50). A1C, diabetes types, and hypo/hyperglycemic treatment event data were compared 30 days pre- and post-intervention. Outcome data calculated using descriptive statistics revealed improved documentation for A1C results (4% to 96%), the different types of diabetes (from 100% documented as Type 1 to 28% documented as Type 2), and increased corrective measures for abnormal glycemic events (increased 10% to 44%). EMR alerts and reminders provided timely information to health care practitioners, resulting in better management for the diabetic patient. Thus affecting social change of diabetes care.

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Dedication

This work is dedicated to Jesus Christ, and the Holy Spirit that provided the guidance, expertise, aptitude, and fortitude that was needed to complete this doctoral journey. I also dedicate this body of work to my husband Shaulassie Myers and my son Brent Matheson. They gave me unconditional love and support throughout this DNP process. Completion could not have been possible without their persistent patience and reassurance. Thank you both from the bottom of my heart.

Acknowledgments

The completion of this doctoral project was accomplished with the help and support of many family members, friends, and colleagues. I want to acknowledge Juliet Powell, from the West Indian Nurses Association (WINA), Joe Mendyka, and Claudia Mendyka. Claudia for her never ending support and prayers. Many friends have been lost, many tears have been shed, along with sleepless nights throughout this journey. My faithful friends provided encouraging words, which prodded me on toward the completion of this doctoral degree. I would also like to acknowledge Korrine Roth, MSN, and Tony Alatise, CEO, who served as my practicum preceptors. A special thank you to the staff of Hospital of Central Connecticut and Staffier Associates, Inc. in Massachusetts, who totally supported me in advancing my education. I would also like to acknowledge Dr. Patricia Schweickert, a phenomenal woman, an instrumental mentor, role model, and editor. Dr. Schweickert, provided me with the tools that I will use to lead fellow nurses and colleagues. Thank you so much for your candid feedback every step of the way. Your gentle, but stern, approaches helped me to grow; this growth has led to maturity in my professional career. The development of my scholarly work will help me to be more proficient in research and be able to translate research so as to provide cost effective quality care to patients. As a result, the nursing profession will be provided with more leverage to impact the current health care system.

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Section I: Introduction and Overview of the Evidence-Based Project

Introduction

Stakeholders in the United States are of the mindset that diabetes health care is insufficient (Fowler, 2009; Hendrickson et al., 2011; Magaji & Johnston, 2011; Santanta, 2013). As a result, inpatient glycemic management has become a priority in many hospitals. Many stakeholders have pushed for improved quality of diabetes care, but most health care facilities have remained suboptimal (Hendrickson et al., 2011). In 2004, the Center for Medicare and Medicaid Services(CMS) spent $17.4 billion on unplanned hospitalizations (Ahmann, 2004). Health care facilities have become more aware of the impact of untimely and poor treatment of diabetes on the nations' resources.

Manchester (2008) reported that between 1980 and 2003, the number of patients being discharged from an acute care setting with a diagnosis of diabetes reflected an increase from 2.2 to 5.1 million, a 132% increase in 23 years. In 2007, $116 billion was spent on medical payments for inpatient diabetes care. Poor glycemic management of hospitalized patients is associated with complications that lead to additional treatment time in the hospital (Fowler, 2009; Magaji & Johnston, 2011). Available studies have shown the need for improved diabetes care outcome. Nurses are considered to be the cement of the health care system and are privy to exchanges throughout the interdisciplinary team and must be responsible for enacting systems to produce cost-effective quality care outcomes for at-risk aggregates. The intent of this program

evaluation was to provide outcomes that led to implementation of systems to improve diabetes care.

Problem

An estimated 230 million adults are living with diabetes in the U.S. (American Diabetes Association [ADA], 2008; Greenfield, Gilles, Porter, Shaw, & Willis, 2011; Johnson & Raterink, 2009), and the prevalence continues to increase. The U.S. cost of diabetes care rose to $245 billion in 2012, an increase of $71 billion from $174 billion in 2007 (ADA, 2013). The ADA best practice guidelines for inpatient glycemic management recommended, in part, that (a) patients admitted to acute health care facilities have their diabetes status identified in the medical record, (b) the physician's order for blood glucose monitoring be included in the medical record, (c) the patient outcomes be available to all members of the interdisciplinary team, and (d) systems that prevent and treat hypo/hyperglycemic conditions be implemented (ADA, 2013; Connecticut Department of Public Health [CTDPH], 2006). Evidence has shown that targeted glucose control in the acute care setting reflected improved clinical outcomes (ADA, 2013).

Many hospitalized patients experience stress-induced hyperglycemia, which must be treated (Reed et al., 2012). Glycemic index is a numerical measurement of the degree of rise in blood sugar, a secondary response to carbohydrate consumption, stress, and certain medications (Magaji & Johnston, 2011; Reed et al., 2012). Left untreated, increased blood sugar can lead to blindness, loss of extremities, and kidney disease. The

incidence of diabetes is reaching epidemic magnitude; 12% of patients admitted to the acute care setting have been identified as having diabetes (ADA, 2008; Evans, 2010; Moghissi et al., 2009; Warrington et al., 2012). Coats and Marshall (2013) indicated that timely and aggressive management of glycemic index in hospitalized patients reduces morbidity and mortality. Satlin, Hoover, and Glesby (2011) noted the importance of glycemic control to prevent retinopathy, kidney damage (microvascular), coronary disease, cerebrovascular and peripheral (macrovascular) complications in diabetic patients.

The Centers for Disease Control and Prevention (CDC, 2011) indicated that reduction in A1C by one percentage point can reduce the risk of eye, kidney, and nerve diseases by 40%. Improvement of glycemic management is a change process that was initiated after electronic medical record (EMR) audits revealed that hospital stays for diabetics were 4.5–7 days longer than for nondiabetics (ADA, 2013). Some health care administrators have claimed that tracking the care of diabetes care using EMR would identify weakness and reflect patterns or trends (Coats & Marshall, 2013). The ADA (2013) endorsed Arnold (2010), who asserted that ADA best practice guidelines for inpatient diabetes care include in part, a program that would incorporate a multidisciplinary approach to care. Integral to this program would be documentation of staff education in diabetes management, identification in the medical record that reflects the type of diabetes, blood glucose monitoring protocols, the availability of blood glucose results to all team members, an individualized plan of care that coordinates insulin, meal

delivery systems that correlate with insulin administration, evaluation of hypo/hyperglycemic events, and patient education that indicates diabetes survival skills. Entering patient data into a standardized system, such as an EMR, would allow for easy extraction and analysis of the data. The data could be extracted through functions that allow customization of data fields (Plemmons, Lipton, Fong, & Acosta, 2013).

The use of inpatient EMR systems have shown improved care in some chronic clinical settings, such as diabetes care (O'Connor, 2003). The EMR is a collection of electronic patient health information that is accessed by approved users and allows for documenting and coordinating delivery of care (Institute of Medicine, 2003a). The EMR has been proposed as a sustainable solution for improving the quality of medical care and assisting in practitioners' decision-making (Topaz & Bowles, 2012). The two main challenges that affect the usefulness of the EMR are quality and completeness of the available data (Hoffman & Podgurski, 2011).

Electronic medical records are promptly accessible and exceedingly valued in diabetes care (Reed et al., 2012; Santana, 2013). The view of EMR-based health care and diabetes management range far beyond the notion of computerized charting (Santana, 2013). From specific clinical records, to population-based awareness, the EMR allows practitioners to cursorily and competently access and generate clinical information relating to individual patients. EMR-based clinical decision systems have the capacity to exponentially improve diabetes care through promotion of adherence to evidence-based guidelines. Providers reported that implementation and use of the EMR improved

essential outcomes of diabetes care, while providing practitioners with real-time clinical decision support (Chen, Garrido, Chock, Okawa, & Liang, 2009; Joos, Chen, Jirjis, & Johnson, 2006; Koopman et al., 2011). The EMRs that include clinical decision systems provide outstanding guidelines for diabetes disease management (Santana, 2013). Edwards (2013) indicated that the EMR supported improved care, increased patient empowerment and satisfaction, improved coordination of care, and timely access to clinical information. Edwards also noted that policy makers could use information collected from EMR to address health cost and patient needs. Therefore, this program evaluation addressed the ADA best practice guidelines that are incorporated into the EMR to support increased A1C documentation and decreased hyper/hypoglycemic incidence in hospitalized patients.

Purpose Statement

The purpose of this program was to determine whether ADA best practice guidelines incorporated into the EMR improved A1C documentation, identified the diabetes type, and improved hypo/hyperglycemic management during inpatient hospitalization. The goal of this program was to compare A1C results and the number of hypo/hyperglycemic episodes for 30 days before intervention of the ADA best practice guidelines and 30 days after the ADA best-practice intervention to identify whether A1C documentation, the identification of diabetes type, and the hypo/hyperglycemic events improved. Therefore, the question for this program evaluation concerned the use of the ADA best practice guidelines incorporated into the EMR and whether these best practice

guidelines would serve to improve A1C documentation, identify the type of diabetes, and improve hypo/hyperglycemic management in hospitalized patients.

Program Question

Does nurses' use of ADA Best Practice Guidelines incorporated into the Electronic Medical Records improve glycemic management in hospitals?

Significance of the Problem/Relevance to Practice

The last several decades have seen drastic changes in the delivery of health care in the United States. The pervasiveness of diabetes is epidemic and this widespread issue is obvious in the inpatient hospital setting (Fowler, 2009). Technology has provided improvement in many aspects of patient care. The EMR has been one benefit and health care facilities have used it to track (a) patient care, (b) compliance with professional standards, (c) staff behaviors and (d) facility practice (Al-Azmi, Al-Enezi, & Chowdury, 2009). There are high expectations for health care reform and the majority of stakeholders is that change must occur to curb the skyrocketing costs of patient care (Ridenour & Trautman, 2009).

The cost of diabetes care is no exception and falls under the recommendation put forth by the Institute of Medicine (IOM, 2010): Nurses should work in complete partnership with other health care practitioners to ensure better delivery of care. Stonham (2012) identified nursing as the largest group of health care professionals who generate and record health care information. Stonham further claimed that nurses must be proactive as health care leaders and practitioners and become involved in systems that

promote communication with other disciplines in the hospital. Edwards (2012) indicated that nurses should take the opportunity to be included in defining solutions that support patient care. The EMR can be the answer, but success of the EMR depends in part on how engaged nurses are in the design (Edwards, 2012; Stonham, 2012).

Diabetes care should be receptive to prevention and early intervention, mitigating the need for more expensive acute care (Ridenour & Trautman, 2009; Valen, Narayan & Wedeking, 2012). The goal of treating patients with Type 2 diabetes is to decrease related complications of peripheral vascular disease caused by poor glycemic management. But achieving this goal can be difficult at times in the acute setting (Rasekaba et al., 2012; Valen et al., 2012). As a result, the EMR has become an important system-based support in recognizing safety and quality concerns (O'Connor, 2003; Sujha et al., 2007). According to McCullough, Christianson, and Borwornson (2013), clinics that used EMRs achieved better diabetes care outcomes compared to clinics that used traditional paper charts. McCullough et al. also reported the belief that EMRs would improve coordination of care, promote treatment guidelines, simplify tracking of treatments and outcomes, and reduce clients' exposure to risk and unnecessary care. Collecting and analyzing diabetes data through uniform measures, such as the EMR, allows for consistent contributions to diabetes evaluation and improved outcome (Stonham, Heyes, Owen, & Povey, 2012).

Evidence-Based Significance of the Project

The CDC (2011) has reported that the prevalence of diabetes continues to rise in the United States, thus putting a larger population at risk for diabetes related complication

during hospitalization (ADA, 2013). As a result, health care practitioners must frequently assesses and make adjustments to glycemic management. Improved diabetes care outcome is correlated with identified parameters and the correct use of insulin during hospitalization. Health care facilities that use EMRs report improved patient tracking and better coordination of care (Santana, 2013). The eHealth initiatives were set forth by the Centers for Medicaid and Medicare Services (CMS) to assist health care providers in delivering quality care through use of simplified electronic standards (CMS, n.d.). Results from the eHealth initiative demonstrated that health care facilities that used the EMR reported diabetes care that was superior to those facilities that conduct care via paper record systems (eHealth, 2011).

As a result of EMR use, health care practitioners reported that they were able to identify trends, appraise treatment outcomes, track patient progress, and make informed decisions at the point of service (MacPhail, Neuwirth, & Bellows, 2009; Santana, 2013). Researchers found that among practitioners who used EMR to monitor outcome measures, such as blood sugars, 51% met the national standard of quality care compared to only 7% of practitioners who used paper charts (Cebul, Love, Jain, & Hebert, 2011; Santata, 2013). The use of EMRs has validated substantial benefits in the management of preventative medicine and the management of chronic diseases such as diabetes (Edwards, 2012). Integral to continued success are EMRs that will support health care practitioners in their day-to-day functions (Edwards, 2013).

Implications for Social Change in Practice

Shared information on current health care practice is significant to quality improvement (Mayfield et al., 1994). EMR systems are used to improved care through documentation, communication of clinical information, and measurement of productivity (O'Connor, 2003). The EMR has been used to provide prompts to health care practitioners regarding timeliness of A1C and indications of whether patients had achieved designated goals (Meigs et al., 2003; Montori & Smith, 2001; O'Connor, 2003). The EMR can be used to apply guidelines, such as staged diabetes management, and to suggest a clinical pathway for the identified patient (Bodenhumer, Wagner, & Grumbach, 2002). The use of EMRs can be an effective tool in providing patient education because of access to customized information (O'Connor et al., 2005).

In an ambulatory setting, the use of EMR has been recommended as a way to reduce cost and improve care (Crosson et al., 2007). With the possibility of increased incidence of diabetes over the next era, the care methods used in the past are unlikely to meet quality diabetes care standards (Bayless & Martin, 1998). Revised diabetes delivery care methods will allow timely glycemic management before the onset of complications. I believe that this contribution will prove to be of significant value to health care practitioners and researchers at the local, national, and international level in ensuring the highest practicable well-being of diabetics.

Healthy People 2020 goals for diabetes include the reduction of economic cost of the disease and improved quality of life for diabetic patients (Healthy People, 2020). Reduction in the death rate due to diabetes will occur secondary to improved glycemic

management. Keeping the A1C under 9% will decrease complications associated with diabetes, which will increase in quality of life for these patients. Thus, this project sought to ascertain whether staff' management of hypo/hyperglycemic events and patients' A1C results would improve as a result of ADA best practice guidelines education. The goal of the staff education is to support a decrease in the number of diabetics with an A1C greater than 9%.

Definitions of Terms

American Diabetes Association (ADA) Best Practice Guidelines: These best practice guidelines, given by the ADA, are standards that have been proven to reflect excellent results in the care of diabetic patients. The guidelines are the result of a complete review, conducted by a group of highly trained, diverse clinicians, of relevant literature, data from rigorous double-blind clinical trials and expert opinions. The recommendations were drafted, reviewed, and submitted for approval to the ADA Executive Committee, which then publishes them. The committee regularly revises the published information to ensure accuracy and currency (ADA, 2013).

Certified Diabetes Educator (CDE): A CDE is a certified health care professional with comprehensive knowledge and skills in pre-diabetes and diabetes prevention and management. The CDE is specialized and certified to teach people with diabetes and health care practitioners how to manage the condition. The credential is administered by the National Certification Board for Diabetes Educators (American Association of Diabetes Educators, 2012).

Convenience Sampling: This sampling method is a non-probability sampling procedure that involves the selection of the most readily available people for a study (Polit, 2010).

Diabetes: Diabetes is defined as a chronic disease process in which the body does not yield or utilize insulin correctly, thus causing an increase in blood sugar level or hyperglycemia (ADA, 2013).

Electronic Medical Record (EMR): The EMR is defined as a digital form of patient data that would customarily be found in the paper based record (Santata, 2013).

Evidence-Based Practice: Evidence-based practice is the practice of health care in which practitioners methodically locate, appraise, and utilize the most recent endorsed research discoveries as the basis for clinical resolution (New England Journal of Medicine, 2004).

Glycemic Management: Glycemic management is defined as the restitution of carbohydrate metabolism as close to normal as possible (ADA, 2013).

Glycemic Control: Glycemic control is defined as maintaining blood sugar to as normal range as possible (70-100mg/dL) (ADA, 2013).

Hemoglobin A1C: This test is used to determine how well diabetes is being controlled overtime. It provides an average of blood sugars over a six week period and is recommended to be done every three to six months (ADA, 2013).

Hyperglycemia: This condition is defined as blood sugar level above 200mg/dL. This can occur for reasons such as infection, some medication, stress or change in health status (ADA, 2013).

Hypoglycemia: This condition is defined as blood sugar level that is below 70mg/dL. This can occur due to the use of insulin or certain oral glycemic agents. Taking too much insulin or oral glycemic agents can cause blood sugar to drop (ADA, 2013).

Impact Evaluation: Impact evaluation is used to measure whether a program was effective, any changes that occurred, and the extent to which goals were reached (Gertler, Martinez, Premand, Rawlings, & Vermeersch, 2011).

Insulin: Insulin is defined as a protein pancreatic hormone secreted by the beta cells of the islet of Langerhans. The hormone changes sugars, starch, and other foods into energy needed to sustain life (ADA, 2013).

Intervention: The term intervention is defined as the action by health care practitioners in undertaking proceedings, with the intent of modifying the outcome or course of an illness, ailment or process to improve function or prevent harm (New England Journal of Medicine, 2004).

Logic Model: This model is a conceptual style to that describe activities of the program. This type of model is helpful to demonstrate the events that will bring about change and also determines the direction of the program (Hodges & Videto, 2011).

Pre-diabetes: This condition is defined by blood glucose levels that are higher than normal, but not high enough to be diagnosed as having diabetes. Health care

practitioners sometimes use the term pre-diabetes to refer to impaired glucose tolerance (IGT) or impaired fasting glucose (IFG). These terms are used depending on what test was conducted when the condition was identified. Pre-diabetes causes the patient to be at a higher risk for developing Type 2 diabetes and cardiovascular disease (ADA 2013).

Standard of Care: The standard of care is defined as an analytical treatment progression that health care practitioners should follow for an evident nature of illness, type of patient or clinical circumstance (New England Journal of Medicine, 2004).

Assumptions

This study made three assumptions. The first assumption was that license staff incorporating ADA best practice guidelines in the EMR would decrease blood glucose of patients in the inpatient setting. The second assumption was that licensed staff documentation of diabetic patient information would be accurate and timely, as would be expected from any professional staff. Lastly, it is assumed that the sample of documented data obtained in the specified period (30 days prior to implementation to 30 days postimplementation) provided a representative sample from which to generalize the results.

Scope and Delimitations

This program evaluation was limited in scope to data obtained from a single 120-bed subacute facility over a specified time period. This evaluation was delimited to data in the form of nurses' diabetes care documentation in the EMR obtained from the chosen facility 30 days prior to the program implementation date of April 1, 2014 to 30 days

postimplementation. In addition, the study was delimited to the use of a before and after, one-group design, without the benefit of a control group, limiting the ability to draw conclusions due to not accounting for confounding variables.

Limitations

This study was subject to five limitations, which included that (a) the differences in culture and language of the target population may have introduced unintended variables; (b) due to the nature of diabetes disease process, patient mix and comorbidities may have skewed the outcome in a negative manner; (c) the facility's financial hardship may also have impacted care outcome due to staff allocation patterns, as inputting data into the EMR can be time consuming and some end-users may have found the task difficult; (d) staff turnover rate and continuity of care may have affected the outcome, as low staffing ratio correlates with poor patient outcomes (Ahmann, 2004); (e) the testing of only one version of EMR software may have impacted the outcome because of variations in end-user utilization of the product. Other EMR systems may have components that more easily incorporate the delivery of diabetes care than the system used for this program.

Summary

Diabetes is a costly disease to treat and its prevalence is flourishing in the United States and is apparent in the inpatient hospital setting. Glycemic management has been the focus at many health care facilities, as a result of its economic impact and unfavorable outcomes. U.S citizens are at risk for diabetes-related complication during

hospitalization. Thus health care practitioners must frequently assesses and make adjustments regarding glycemic management. Aggressive management of diabetes using ADA best practice guidelines in hospitalized patients reduces morbidity and mortality, providing improved patient outcomes and reduced facility costs. Using best practice guidelines in health care facilities also decreases costs and provide quality care to ensure positive diabetes care outcomes. The ADA guidelines can be implemented and monitored using EMR to achieve improved glycemic management of diabetic patients.

The purpose of this project was to evaluate the impact of ADA best practice guidelines of glycemic management entered into the EMR of hospitalized diabetic patients. Kotter's organizational change process was used to guide the project. Using a pretest-posttest design, an intervention was to implemented to a sample of eight nurses in a subacute care facility and assessed as to whether the program goals were met for the associated sample of diabetic patients under their care. Documented data were compared 30 days pre- and post-intervention to reveal outcomes in terms of improvement in documentation for A1C results, the different types of diabetes and increased corrective measures for abnormal glycemic events. This program evaluation was expected to identify disparities in diabetes prevention, screening, care, and treatment and the use of the EMR to identify and implement changes to improve diabetes care.

Section 2: Review of the Scholarly Evidence

Introduction

According to Rasekaba et al. (2012), by the year 2025, 5.4% of the worldwide population will be burdened with diabetes. The DHHS (2009), Healthy People 2020 summary objectives included the reduction of new diabetes diagnoses by 2.5% (age range of 18–84). The Connecticut Department of Public Health (CTDPH, 2010) reported that, in Connecticut, the prevalence of diabetes varied with age, race, and ethnicity. Of the state's population, 18 years and older, 6.9% were diagnosed with diabetes from 2007 to 2009, in comparison with 8.6% across the nation. In addition, it was estimated that 93,000 adults were not diagnosed in Connecticut. A review of national data revealed that the prevalence of diabetes has shown a continuous increase beginning in the 1990s (CDC, 2010).

The literature search used the following two databases: CINAHL and MEDLINE. In addition, the search techniques included the use of the following keywords: *diabetes care, glycemic management, Healthy People 2020, EMR,* and *ADA.* Search strings include *EMR, EMR AND diabetes, diabetes, diabetes* OR *diabetic, hypoglycemia* OR *hyperglycemia*. A total of 85,000 articles were found and 91 articles were used for this study.

Specific Literature Review

In this part of the review, the specific problem of the identification and treatment of diabetes patients in the United States and more specifically, in Connecticut is explored

through the existing literature. This more focused section of the literature review includes a discussion of the literature related to the prevalence of diabetes, diagnosis of diabetes, and treatment of diabetes in the United States and Connecticut, the impact of the lack of timely and accurate diagnosis and treatment, hospitalizations for diabetic patients, the associated costs of care, the use of EMR to support more favorable diabetes care outcomes, and access to care for diabetic patients.

The incidence of diabetes in Connecticut and the United States will rise due to the growth of the elderly population and the rapid expansion of minority populations considered to be at a higher risk nationwide (CDC, 2010; CTDPH, 2005, 2006). Americans are demonstrating progressive overweight and inactivity (CDC, 2010; CTDPH, 2005, 2006). In Connecticut, diabetes is the seventh principal cause of death (CTDPH, 2006). Diabetes was the primary cause of death for 674 Connecticut residents in 2002, and the cause of death for 2771 residents in 2006 (CTDPH, 2002, 2006). National data has demonstrated that death as a result of diabetes was under reported (CDC, 2005).

In the 1990s, the age-adjusted death and pre-mortality rates secondary to diabetes significantly increased in Connecticut (Hynes, Mueller, Li, & Amadeo, 2005). This increase correlated with the national trend (CDC, 2010). Male residents in Connecticut exhibited higher incidence of diabetes-linked mortality than Connecticut females, which, again, mirrored the nation's data (Hynes et al., 2005). Among the different cultural groups in Connecticut, African American adults have higher occurrence of diabetes-

linked death than European American and Hispanic adults (CTDPH, 2005). Compared to European American males, African American males have 2.4 times the risk of death secondary to diabetes and twice the risk of diabetes related death (CTDPH, 2005). African American females have 2.9 times the risk of death relating to diabetes and 2.4 times the risk of diabetes-related death than European American females. The data for Hispanic and European American males' diabetes and deaths associated with diabetes-related risks were similar (CTDPH, 2005). Citizens in the low-income range were at a higher risk than those in higher income brackets (CTDPH, 2005).

Lack of timely medical intervention may contribute to complications of diabetes. The impact of the disease can continue for many years; therefore, timely intervention is critical (ADA, 2012; Crosson et al., 2007; Dorr et al., 2007). National data reflects that cardiovascular disease is significantly higher in diabetic patients (Agency for Healthcare Research and Quality [AHRQ], 2005). Women with diabetes are diagnosed with cardiovascular disease four times more than women without diabetes (AHRQ, 2005). Hospitalized women with diabetes are 28 times more likely to lose limbs than those who do not have the disease (AHRQ, 2005).

Multiple hospitalizations are common among people with diabetes. About one third of diabetics are hospitalized greater than two or more times per year due to complications associated with the disease. People in lower socioeconomic groups with diabetes are more likely to have multiple hospitalizations (ADA, 2012; Crosson et al., 2007; Dorr et al., 2007). Thirty percent of people with diabetes are re-hospitalized

annually (AHRQ, 2005; CTDPH, 2005). African American and Hispanic Connecticut residents experience higher rates of hospitalization for diabetes and extremities amputation than European Americans. African American residents have 3.8 times the rate of diabetes hospitalization compared with European Americans, while Hispanics have 2.5 times the rate of diabetes hospitalization and 3.2 times the rate of extremities amputations in comparison to European Americans (CTDPH, 2005; Hynes et al., 2005).

In 2003, the estimated costs of direct and indirect medical care for diabetes in Connecticut were estimated at $1.7 billion (Department of Health and Human Services, 2005). Connecticut Department of Health reported that in 2002, $77 million was paid for hospitalization in Connecticut secondary to diabetes as a primary diagnosis and about $39 million was allocated for hospitalization associated with diabetes lower limb amputation (CTDPH, 2005). Identified risk factors are modifiable and nonmodifiable. CTDPH, (2005) also indicated that non- modifiable factors include familial incidence, increase in age over 45, and gestational diabetes. Modifiable factors are noted to be overweight, blood pressure 140/90 or greater; HDL cholesterol of 35mg/dL, triglyceride levels of 250mg/dL or higher, and inactivity (CTDPH, 2005). Lower socioeconomic status has been linked to increased prevalence of Type 2 diabetes (Brancati, Whelton, Kuller, & Klag, 1996; Connolly, Unwin, Sherriff, Bilous, & Kelly, 2000; Hynes et al., 2005; Robbins, Vaccarino, Zhang, & Kasl, 2000). About 20% of Connecticut residents were identified as being overweight, 37% as obese, and 43% as being at desired weight (American Heart Association, n.d.; CTDPH, 2006).

Sperl-Hillen et al. (2010) found that EMR use promised favorable result regarding diabetes care. The study identified that with the utilization of EMR to track hemoglobin A1C, a significant improvement in blood sugar levels was realized in diabetic patients. According to Roshanow et al. (2011), 62.5% of facilities that used EMR to coordinate and provide diabetes care reported improvement in patient outcomes. Hendrickson et al.,(2011) identified the computer based glucose control programs as contributing to improved patient outcomes and reduced mortality. These improvements are not surprising given the tedious and challenging task of obtaining real time data with the use of paper charts (Reed et al., 2012).

Access to health care is integral to the prevention, treatment, and management of diabetes. Citizens without health insurance are less likely to access preventative care and receive appropriate medical management of their chronic illness (AHRQ, 2005; CTDPH, 2010). Between 2007 and 2009, 9% of Connecticut citizens 18 years and older did not have access to health insurance in comparison to 14% of the nation. African Americans and Hispanics are less likely to hold insurance than European Americans. In Connecticut, about 30% of Hispanic, 21% of African American, and 6% of European American adults are without health insurance. In comparison to the national statistics of 31% Hispanic, 21% African American, and 11% European American adults lacking insurance (CDC, 2010; CTDPH, 2010).

General Literature Review

In this part of the review, a general understanding of diabetes care in the United States will be covered. This will include quality of care and the use of ADA evidence-based guidelines to support diabetes care, the use of EMR and user satisfaction with EMR, hospitalization of diabetic patients and managing diabetes and hyperglycemia in the acute care setting.

The ADA evidence-based best practice guidelines facilitate a consistent approach to diabetes care (ADA, 2011). In spite of the presence of the ADA guidelines, diabetes care continues to be grossly inadequate. Less than 20% of diabetics in the United States are being managed according to the ADA's guidelines (Curry, 2010; O'Connor et al., 2011; Sperl-Hillen et al., 2010). Manchester (2008) reported that between 1980 and 2003, patients being discharged from acute care setting with a diagnosis of diabetes reflected an increase from 2.2 to 5.1 million, a 132% increase in 23 years. In 2007, $174 billion was spent on diabetes care, and of this, $116 billion was spent on medical payments for inpatient care. Health care facilities are becoming aware of the importance of glycemic management, the impact that diabetes care has on the system, and the need to redesign systems and processes that will optimize the delivery of diabetes care (Manchester, 2008). Satlin et al. (2011) identified the importance of controlling glycemic events during hospitalization to prevent retinopathy, kidney damage, and coronary disease, as well as cerebrovascular and peripheral complications.

According to Moghissi et al. (2009), the ADA best practice guidelines identified hyperglycemia as blood glucose > 140mg/dl and recommended treatment when glucose

levels are persistently > 140-180mg/dl. A1C is a laboratory test that must be ordered in non-diabetic patients and also diabetic patients whose results cannot be ascertained or dated. Patients with blood glucose of < 70mg/dl must have the hypoglycemia protocol initiated. Moghissi et al. (2009) further noted that the ADA recommends all blood glucose of < 50mg/dl to have a repeat blood sugar test and recheck 30 minutes after treatment. Blood glucose of < 40mg/dl must have a serum level drawn by the laboratory for verification.

ADA best practice guidelines also recommend licensed staff documentation of reason, treatment, and notification of the physician. Consultation with the certified diabetes educator is recommended for newly diagnosed patients, insulin pump patients, admitting diagnosis of diabetes ketoacidosis (DKA), hyperglycemic hyperosmolar non-ketotic coma (HHNK) or hypoglycemia reflected in the EMR. It is also recommended that the registered dietitian be consulted for A1C greater than 9%, patients with a new diagnosis of diabetes, and gestational diabetes (ADA, 2012; Arnold, 2010; ADA, 2013; Fowler, 2009; Moghissi et al., 2009).

Arnold (2010) reported that ADA inpatient diabetes standards recommended the following: program champion; documentation of staff education in diabetes management; and plan of care that coordinates insulin and meal delivery and systems to evaluate hypo/hyperglycemic events for reasons, trends, and patterns. Arnold further revealed that the ADA (2013) recommendations for standards for glycemic management involved blood glucose monitoring initiatives, sharing of blood glucose results with all team

members, making HbA1C results available to patients and responsible parties, individualized plan of care for hypo/hyperglycemia and ensuring patients are taught survival skills. A survival skill is the documented patient understanding of education for self-management of the disease (ADA, 2013; Arnold, 2010).

Quality of diabetes patient care lags behind evidence-based care recommendations (Weber et al., 2007; Mokdad et al., 2001) and strategies have been proposed to develop improved quality of care (Committee on Quality Health Care, 2001). Use of EMRs in the inpatient setting has been recommended as a mean of improving care and reducing cost (Crosson et al., 2007). The EMR has reflected an improvement in coordination of task among members of the health team. O'Connor (2003) and Bu et al. (2007) believed that detailed clinical decision support can be provided efficiently and effectively using EMRs.

End user satisfaction with regard to EMR include successful implementation, easy flow of task, ability to complete desired task, training on the system, ease in correcting errors, and logical flow of tasks. The EMR can provide quantifiable improvement and at the same time reflect high level of satisfaction to both practitioners and patients (O'Connor et al., 2011). Serl-Hillen et al. (2010) noted that after the time frame for incentives to use the EMR expired, practitioners continued to utilize it for more than 12 months due to satisfaction and positive patient outcomes. Improved effectiveness, streamlined reimbursement, and augmented communications are all results of the utilization of EMRs (Santana, 2013).

The ADA (2012) recommendations included diabetes care reflecting evidence-based guidelines and implementation of EMR (Al-Azmi et al., 2009; Dorr et al., 2007). Use of EMR improved ADA guideline adherence, documentation, appropriate screening, and treatment (Dorr et al., 2007). Protocol assessments and tests can be incorporated into EMR, improving value and meaningfulness (Montori & Smith, 2001). Benefits of adhering to the ADA guidelines include the opportunity for optimal management involving improved glycemic control, as well as appropriate prevention and treatment of diabetes complications (Evans, 2010).

The inclusion of laboratory reports in the EMR can lead to graphic visualization results. These graphs can be used to improve assessment of variability in glucose values, which supports the detection of hypo/hyperglycemia in a timely manner. The use of EMRs in the identification and monitoring of diabetic patient information have shown improvements in care (Oranzo et al., 2007). Over a 10-year period, diabetes computerized decision support saved $10.7 billion and integrated provider-patient system saved $16.9 billion (Bu et al., 2007). O'Connor et al. (2011) indicated that EMR-based diabetes clinical decisions significantly improved glucose control.

An increasing body of evidence has proposed that there are two hindrances to acceptable diabetes care: clinical inactivity and continued dependence on paper clinical record (Cebul et al., 2011; Santana, 2013; Samal, Lindr, Lipsitz, & Hicks, 2011; Sperl-Hillen et al., 2010). Evidence implies that clinical inactivity related to glycemic control and glucose management is a noteworthy issue that occurs in 30% of patients diagnosed

with diabetes (Sperl-Hillen et al., 2010). The reliance on paper clinical record compounds the problem of clinical inactivity. Paper clinical records are cumbersome and require costly storage space (Friedman, 2010). Tracking, analyzing, and charting medical information is difficult with paper records, as they cannot be easily searched (Roukema et al., 2011). Clinical entries input into the paper record must be manual. This presents the opportunities for missing data, misfiled data, incomplete or illegible data. Whenever one practitioner checks out a paper record it becomes unavailable to other practitioners on the health care team (Friedman, 2010). On the other hand, EMRs are readily available to multiple practitioners and can be viewed at the same time (Ciemins et al., 2009).

Current available data with regard to EMR use support that practitioners can assess diabetic patients through recommendation from the EMR. The EMR will indicate to practitioners those patients who have not achieved evidence-based goals. The information is usually delivered as reminder alerts. With the premise that EMRs will improve clinical outcomes, pressure from stakeholders including regulators to use EMRs have forced health care facilities to invest in the technology (Santana, 2013). Diabetes care in patients with hyperglycemia in the inpatient setting is very complex. Care coordination provides the means of assisting health care consumers with navigating effectively and safely through the fragmented health care system. Quality cost effective care is the result of a collaborative process of assessment, planning, facilitation, and advocacy for available resources (Rogers, 2008; Santana, 2013).

The Joint Commission (2008) joined with the ADA to cultivate goals and standards for inpatient hospital glycemic management. The identified goals included specific education for the facility staff; written protocol regarding blood glucose monitoring; individualized plan of care for the treatment of hyperglycemia/hypoglycemia; data collection on hypoglycemia incidences; patient diabetes education on self- management of the disease and program champions. If acute care facilities are able to meet these goals and standards, then hyperglycemic outcomes would be improved and patients would benefit by receiving excellent care (American College of Endocrinology, 2006; Joint Commission, 2008).

Hospitalization ought to be considered as an investment instead of a cost because it could help to avert other morbidities and hospitalizations and complications resulting from inadequate care, both of which incur increasing costs in diabetes care (American College of Endocrinology, 2006; Rogers, 2008). Thus, hospitalization creates the opportunity to assess and provide tools to improve diabetes care over time. The inpatient facility must provide coordinated care that ensures treatment that fully engages the patients (Rogers, 2008). Staff must be mindful of pertinent health history and elevated blood sugar in all hospitalized patients including those who do not have a diagnosis of diabetes. Undiagnosed hyperglycemia is common and can happen at any time during hospitalization as a result of illness, acute condition, or treatment. The care coordinator must work closely with the hospital diabetes educators to identify patients with hyperglycemia to ensure best practice (ADA, 2013; Rogers, 2008).

The interdisciplinary team must include physicians, nurses, diabetes educators, dieticians, case coordinators, dentists, pharmacists, and discharge planners. This team should be involved in the diabetes care during the in-patient continuum from the emergency room to critical care, to pre and post-operative care, and ultimately discharge (ADA, 2013; Joint Commission, 2008; Rogers, 2006). According to the Joint Commission (2008) and ADA (2013), lifestyle access to health care services, obtainable support, culture, health care literacy, knowledge of diabetes, treatment recommendations, and financial stability should be included in the patients' assessment. Financial stability means assessing the ability to pay for blood glucose supplies, medications, and healthy foods. The facility should adopt a patient centered approach and include the patient and responsible party in care. Ensuring and implementing protocols for blood glucose is crucial, especially in the intensive care setting (Rogers, 2008).

Managing diabetes and hyperglycemia during the acute care setting is essential for optimum clinical outcomes. Insulin is the best treatment for inpatient settings, but can pose challenges. The stress of illness and frequent diet changes can limit provided diabetes care (Lien, Cox, Feinglos, & Corsino, 2011). Knowledge and understanding of physiological insulin administration and the use of basal, mealtime and correctional insulin helps to achieve glucose goals and provide needed flexibility (Fowler, 2009; Magaji & Johnson, 2011; Rogers, 2008). The consensus initiated by the inpatient diabetes management task force of the American College of Endocrinology and the ADA identified the importance of patient participation with continuity of care between

inpatient and outpatient units. Uniformity in the plan of care, both in the hospital and when the patient is discharged from the facility, will foster and nurture empowerment (Lien et al., 2011; Rogers, 2008).

Summary and Conclusion

Hospitalization must be considered as an investment in place of cost because it would help to prevent other morbidities and complications due to hospitalizations as a result of inadequate care. Substandard care results I increased cost (American College of Endocrinology, 2006; Rogers, 2008). The inpatient facility must provide coordinated care that ensures treatment fully engages patients (Rogers, 2008). Staff must be aware of pertinent health history and elevated blood sugar in all hospitalized patients including those who do not have a diagnosis of diabetes. The Joint Commission (2008) joined with the ADA to cultivate goals and standards for inpatient glycemic management. Identified goals included specific education for facility staff; written protocol regarding blood glucose monitoring; individualized plan of care for the treatment of hyperglycemia/hypoglycemia; data collection on hypoglycemia incidences; patient diabetes education on self- management of the disease and program champions. If acute care facilities are able to meet these goals and standards, then hyperglycemic outcomes would be improved and patients would benefit by receiving excellent care (American College of Endocrinology, 2006; Joint Commission, 2008).

Conceptual Model and Framework

Organizational goals include the application of change that results in improvement (AHRQ, 2008; DHHS, 2011). Change management is an important strategic task for leaders of health care organizations. Change is a process that affects people differently (Bruhn, 2004). Theories are used to guide program planning (Hodges & Videto, 2011). Kotter's (1996) perception of contemporary change process reflected an eight-step linear model that assumed predictability and manageability during the progression. Contemporary views on leading change for translation of new knowledge to practice stresses the importance of reaction from people involved in the change process (White & Dudley-Brown, 2012). The eight steps include developing urgency, building a guiding team, creating a vision, communicating for buy-in, enabling action, creating short-term wins, don't let up, and making it stick, all of which include involvement of stakeholders (Kotter, 1996). This model was applied to this program evaluation to ensure positive outcomes because facility staff were actively involved, encouraged to buy in, and thus able to show ownership.

Deavenport et al. (2010) reported that a model should fit whatever is being measured or investigated. Kotter's (1996) model was used because of its organizational factor and because the project was an organizational change. Kotter's organizational change process ensured that the ADA guidance used within the EMR fostered change that was sequential and concluded in positive patient outcomes. The eight sequential stages of the model allowed the change agent to measure change at each step (Kotter,

1996). Utilization of this pattern assisted the change agent to lead the process without dissipation and poor outcomes, outcomes that would either lead to other avenues or down pathways instituting further change (Bruhn, 2004; Kotter, 1996). Thus, growth would be reflected and the next step would not be implemented without resolution of the prior step. Program process should ensure that stakeholders are included and addressed during the change process (Hallinan, 2010).

Needs Assessment

Kettner, Moroney, and Martin (2013) made recommendations regarding the responsibility of society in meeting the basic survival needs of its members. Performing a needs analysis is frequently done to estimate what training is required or to identify and find solutions to existing issues (Fayez, 2011). A needs assessment was done to ascertain staff perceptions of the use of EMR and ADA best practice guidelines. The needs analysis determined the educational and skill set requirements of practitioners and diabetic patients in the inpatient diabetes care setting. The needs analysis assessed whether the required knowledge is up to date to deliver safe and effective diabetes care. This assessment also ascertained whether knowledge and skills are in place to utilize the EMR in collaboration with the ADA best practice guidelines.

Summary and Conclusion

To conclude whether a need exists, one must evaluate the current condition against societal standards (Kettner et al., 2013). An estimated 17.5 million Citizens in the United States are living with a diagnosis of diabetes (ADA, 2008, 2011). The EMR has

been projected as a sustainable solution for improving the quality of medical care and assisting in practitioners' care decisions (Topaz & Bowles, 2012). The usefulness of EMRs are affected by the quality and completeness of the available data (Hoffman & Podgurski, 2011). Use of inpatient EMR systems have shown to support improved care in clinical settings, such as diabetes care (O'Connor, 2003).

Health care organizations utilize needs assessments in order to direct the pathway of needed interventions. Healthy People 2020 was developed with the intent of having citizens of the United States living extended, vigorous lives (DHHS, 2009). Sharma, Lanum, and Saurez-Balacazar (2000) reported that needs assessments identifies assets, so as to determine concerns being faced. Therefore, it is imperative that the program planner identifies strength and weakness of the target population (Hodges & Video, 2012). Canadian Diabetes Improved glycemic management can improve diabetes outcomes as well as reduced length of hospitalization. The increased incidence of diabetes coupled with the serious consequences of diabetes associated complications prompted the ADA(2008) to support that health care professionals must possess basic awareness of current diabetes clinical practice guidelines in order to provide safe, cost effective care (Clement et al., 2004).

The EMRs of all patients admitted to the facility were randomly reviewed to determine diabetes status, survival skills, staff adherence to ADA best practice, facility policies, procedures, and EMR meaningful use. One major concern was that cognitively impaired patients would not be able to participate in the data collection. Staff distrust and

the belief that collected data would be used to penalize them, resulted in reduced credibility of collected data; thus, validity and reliability may be questioned. The delivery of health care varies between communities and some communities may have unique health care needs (Griffis, Morrison, Beauvais, & Bellefountaine, 2007) that differ from the target population sampled. As a result, generalization based on findings should be limited to developing needs assessment related to EMR and diabetes management.

Section 3: Approach

Introduction

The purpose of this program evaluation was to determine whether ADA best practice guidelines incorporated into the EMR improved A1C documentation, identified type of diabetes type, and improved hypo/hyperglycemic management during inpatient hospitalization. The goal of this program was to compare A1C results and the number of hypo/hyperglycemic episodes for 30 days *before* ADA best practice guidelines intervention and 30 days *after* ADA best practice intervention to identify whether A1C documentation, identification of diabetes type, and hypo/hyperglycemic events improved. Therefore, the question for this program evaluation asked: Does nurses' use of ADA Best Practice Guidelines incorporated into the Electronic Medical Records improve glycemic management in hospitals?

Method and Program Design

The logical-step process was the program design. This process involved needs, priorities, goals, and objectives (Kettner et al., 2013), which was a good fit for Kotter's (1996) linear model. The rational use for this model included the use of data and gathered information to arrive at a conclusion that was beneficial to stakeholders. The planning process noted the needs assessment, initiation of goals, and objectives and linkage between identified resources with program needs (Kettner et al., 2013). Logical-step process was evaluated using the root cause analysis premise, which has been used in nursing to identify and solve problems. The intervention for this doctoral program

included the collection of documented patient data 30 days before and 30 days after the facility implemented ADA best practice guidelines into the EMR. Data collection included hypo/hyperglycemic events and treatment, identification of type of diabetes, and A1C results of diabetic patients on the subacute unit. The ADA best practice guidelines were already partially a part of the EMR diabetes software.

A1C results, identification of type of diabetes, and hypo/hyperglycemic treatment events were collected from the EMR. The data were compared to parts of the ADA best practice guidelines for A1C documentation, identification of diabetes type and hypo/hyperglycemic treatment events in order to assess compliance with the guidelines. The goal was to measure the number and treatment of hypo/hyperglycemic episodes, type of diabetes documentation, and A1C results 30 days before ADA best practice intervention and 30 days after the intervention. The data were compared using sum and percentage change to determine whether change occurred.

The certified diabetes educator (CDE) conducted the ADA best practice guidelines education. The CDE is a certified health care professional with comprehensive knowledge and skills in prediabetes and diabetes prevention and management. The CDE is specialized and certified to teach people with diabetes and other health care practitioners how to manage the condition (American Association of Diabetes Educators, 2012). ADA educational information was provided in the event CDEs were not available to teach facility staff. The program coordinator attended all ADA best practice education training sessions to ensure that staff received the same information. The program

coordinator collected all data on A1Cs, type of diabetes documentation, and hypo/hyperglycemic treatment events to ensure consistency.

Population and Sampling

The sample population was a convenience sample of licensed nursing staff who practiced at the facility. The qualifications included diploma, associate, bachelors, and masters prepared licensed nurses from different ethnic backgrounds. Licensed nurses were chosen regardless of gender, race/ethnicity, education level, and socio-economic background. There was no exclusion to the sample. The facility provided the program coordinator with staff participant data that included age, gender, and ethnicity and education level. Staff education prior to the implementation of the ADA best practice guidelines was provided by the facility. After staff education was completed and implemented ADA best practice incorporated in the EMR had been done for six weeks, the VPO provided the program coordinator with collected post staff education data.

The population assessed for outcome of the ADA best practice intervention data was obtained from convenience data sampling of diabetic patients between the ages of 50 to 84 years, admitted to the facility. The patient population was mixed and consisted of elderly, young, and middle aged patients. The facility was located in an inner city neighborhood with a diverse demographic population, which formed the bulk of admissions. This population was chosen because of the incidence of diabetes in the age range of 50-84 years. Connecticut adults aged 60 and over have the highest diabetes rates, compared with adults 18 to 29, who were identified as having the lowest incidence of

diabetes (CTDPH, 2006). Over time, age becomes an increased risk factor for diabetes due to complication of the disease secondary to poor glucose management.

The EMR data information were chosen regardless of gender, race/ethnicity, and socio-economic background and a diagnosis of diabetes. The exclusion criteria included hypoglycemic event within 24 hours of admission. The facility intake data demonstrated a rate of 25 to 40 diabetic events that were addressed monthly. The program coordinator used all patient data that fit within the program criteria. The sample size for the project included eight staff members.

Summary of the Education Provided to Facility Staff

A CDE provided an overview of (a) diabetes incidence at facility, state, and general levels; (b) criteria for diagnosis of diabetes; and (c) the definitions of pre-diabetes, Type 1, Type 2, gestational, and other types of diabetes (i.e., stress induced). Explanation of the importance of hemoglobin A1C in monitoring diabetics was provided. Staff were given blood sugar targets/goals for optimal glucose control for diabetes patients for in hospital and outpatient settings and were educated on the rationale for keeping glucose on target. Explanation of non–compliance and the negative outcomes of unmanaged glucose were discussed. Staff were educated on the challenges faced in the inpatient setting and the importance of using insulin in the inpatient setting. The importance of the management of blood sugar during hospitalization was stressed. Staff were provided with information regarding acute complications, hypo/hyperglycemic management of diabetes, and signs and symptoms of hyper/hypoglycemic events. The

15/15 rule was included, which relates to the procedure of consuming 15 grams of carbohydrates and rechecking blood sugar in 15 minutes. Finally, staff were provided information regarding nothing by mouth (NPO) status and its impact on blood sugar.

Data Collection

Primary permission to analyze the program was obtained from Walden University IRB (#06-06-14-0318293). Program-related procedures were not initiated until written IRB approval was received. The program coordinator did not have supervisory authority over facility staff. Participants were not coerced to take part in the program. After IRB approval, the program coordinator notified the facility of the date that the program data analysis would be implemented. The Vice President of Clinical Operations provided the program coordinator with de-identified pre- data from the EMR. All eight staff were invited to the informational session. The facility ensured that participants' written agreements were collected at the informational session.

The informational session included a description of ADA best practice education and guidelines that were already partially incorporated into the EMR. Information regarding risk and inconveniences of the program were provided to the staff. The staff were assured of confidentiality, privacy, voluntary participation, and withdrawal if they so choose. A signature on the informational session sign out documentation indicated that the staff consented to participate in the program. The program coordinator was provided de-identified documentation regarding A1C results, type of diabetes (1 or 2), and hypo/hyperglycemic treatment events serving as the preinvention data collected during

week one prior to the program implementation. The predata were collected March 1 through 30, 2014 and the post data were collected in May 6, through June 5, 2014. The VPO collected the deidentified EMR data by a review of EMR documentation. The collected data were placed on the preintervention data collection tool. The CDE taught the participants for 1 week using the outlined ADA curriculum.

The facility had already begun to use the EMR, but the ADA best practice guidelines incorporation was new to staff. The incorporation of the ADA best practice into the EMR was part of the facility's quality initiative regarding diabetes care. Staff already possessed basic computer knowledge and the EMR training was included in new employee orientation. When a practitioner answered yes to the first question (Is this patient a diabetic?), a window appeared that asked the practitioner to indicate the type of diabetes. The pathway further opened into different windows based on the outcome of the initial response. The EMR asked the user to document A1C result and if the result was not available, the user was prompted to request a physician's order to obtain blood draw for A1C result.

Results from blood glucose monitoring were noted in the EMR and the EMR was able to produce a report. Prompts asked the end user about the protocol and timeliness of intervention of hypo/hyperglycemic events. The EMR also prompted the user to identify whether a treatment regimen was being followed. If blood sugars were noted at critical values, the pathway prompted for the adverse event pathway. The prompt included notification of the immediate supervisor and the attending physician. If the event

qualified as an adverse event (death or coma), the supervisor notified the director of nursing services and the administrator. The administrator notified the appropriate regulatory body.

In Week 2, the staff began to input data for a period of 10 weeks. At the end of week 10, the VPO generated deidentified EMR reports to include A1C results, types of diabetes, hypo/hyperglycemic events, treatment of hypo/hyperglycemic events, and post ADA best practice intervention. The data inclusion dates were May 6, 2014 to June 5, 2014. The data were provided to the program coordinator to be entered on the post ADA intervention tool. The VPO located the data in the EMR by entering a time frame (custom) and searching for A1C results, diagnosis, and glycemic events.

- All admissions to the facility in the time frame appeared on the screen.
- The vice president of operations collected the A1C, types of diabetes and hypo/hyperglycemic data.
- To collect hypo/hyperglycemic events, the vice president of operations entered a time frame (custom) and clicked on glucose monitoring laboratory test.
- The EMR displayed all patients with the criteria in the identified time frame.
- The VPO collected the A1C, types of diabetes, and hypo/hyperglycemic data; the data also identified whether hypo/hyperglycemic events were addressed timely.

The ADA best practice guidelines protocol directed, in part, the measurement of A1C and hypo/hyperglycemic events. It also included identification of type of diabetes (Type 1 or Type 2). The level of measurement was interval for A1C and hypo/hyperglycemic events. The before and after A1C, type of diabetes, and hypo/hyperglycemic events data were processed using sums and percentage change. The summarized findings were presented in the form of bar charts and graphs.

The forms were filed and secured in the program coordinator's computer and a locked file cabinet at the program coordinator's home. The VPO collected data from all patients who fit the criteria up to 30 days before ADA staff education, and then for a 30 days period post staff education and utilization of the ADA best practice education in the EMR. The VPO used the EMR system already in place.

Admission assessment questions included in the ADA best practice guideline EMR software included: type of diabetes, treatment, blood glucose monitoring, meal plan and history, hypo/hyperglycemic history, and history of diabetes education. For this study, only the A1C results, types of diabetes, and hypo/hyperglycemic event data were collected. Data were collected from all patients that fit the program criteria. The EMR system was set up so that the VPO was able to gather data using the specific dates that each patient's A1C result, types of diabetes, and hypo/hyperglycemic information were input into the system. The VPO was able to customize the EMR query, so as to extract the data.

ADA Intervention Information

Specific ADA best guidelines criteria include A1C results documented upon admission or 24 hours thereafter (baseline), identification of the type of diabetes, and identification of hypo/hyperglycemia events treatment. The collection parameters include: glycemic readings above 180 mg/dl or less than 70 mg/dl and whether hypoglycemic events were rechecked 30 minutes after treatment. The ADA best practice guidelines are included in the EMR software and populated as a result of answers to questions, which include: Is this patient a diabetic, what type of diabetes, what is the A1C result, is there hypoglycemic event, is there hyperglycemic event, was treatment initiated timely, and did practitioner adhere to facility protocol? The facility ensured written blood glucose monitoring protocols are in place. Plans for the treatment of hypoglycemia and hyperglycemia were included on patient's individualized plan of care.

Data collection of incidences of hypoglycemia were documented in the EMR. The facility identified a program champion and program champion team (ADA, 2013). The program champion monitored and provided support to staff regarding ADA best practice. Glucose levels were measured using the Accu-Chek® glucometer, which were used on each unit to test blood glucose range. The program participants input the data obtained from the AccuChek® into the EMR. Physicians and advanced nurse practitioners provided directives regarding blood glucose monitoring on each patient.

The use of the AccuChek® has been proven to be quick and simple. The test strip required a small amount of blood (1-2 microliters). The meter checked the expiration date

of the strip via the code chip and alerted the user whether the test strips were expired. The system indicated if the blood sample was inadequate, decreasing the chance for errors. The Accu-Chek® meter allowed rechecking the sample within 5 seconds. The machine allowed the user to store blood glucose values.

The Olympus AU480® advanced chemistry analyzer system was used to test hemoglobin A1C and blood glucose and the values entered into the EMR. The machine has the capability to perform 800 test per hour with ISE and simultaneous programming for up to 63 different analyses. The master curve reagents have a 2D barcode, which reduces the potential for laboratory errors. All A1C tests were done in a certified laboratory.

Protection of Human Subjects

Subjects participating in this program were exposed to minimal risk. The benefit to risk ratio for this project was identified as minimal risk with important benefits. Subjects were provided verbal consent at the information session. The program coordinator had no supervision over the participants in the program. The VPO extracted de-identified data of before and after A1C results, type of diabetes, and hypo/hyperglycemic event data from the EMR into a protected file.

Access to the EMR was password protected and identifiers were not used for each subject to ensure anonymity and confidentiality. All collected data were coded and entered into a secure file. Electronic copies were stored in a password protected flash drive. The data were securely deleted once data collection had been completed. During

data analysis, all collected data remained on a password-protected flash drive, which was stored in a locked cabinet at the program coordinator's home. This storage will last 5 years. Only the program coordinator had access to the collected data provided by the facility.

Instrument

The program coordinator developed and used before and after collection and demographic data audit tools to collect before and after hypo/hyperglycemic events, A1C results data, and type of diabetes of the patients, and staff participant demographic data. The tools were developed specifically for this program because the program coordinator was unable to locate existing applicable tools. A1C results, type of diabetes, and hypo/hyperglycemic events data were compared to specific aspects of the ADA best practice guidelines criteria. The goal was to evaluate the use of ADA best practice guidelines in part, in the EMR. The collected data was extracted from the EMR. Point Click Care (PCC) EMR is an integrated data system that provides health care facilities with comprehensive data review capabilities. It allowed practitioners to quickly collect, store, and access health care data and information readily.

Before and After ADA Best Guidelines Intervention Forms

These forms were used to collect demographic information from the EMR. The form also collected A1C results, types of diabetes and hypo/hyperglycemic event and treatment data from the EMR. The audit tool collected specific information regarding hypo/hyperglycemic events, to include number of events, duration of events, and timely

interventions, in addition to A1C results documentation and type of diabetes. Sums and percentages were used to process the data. The forms were developed specific for this program (Appendix A and D). The tools were used for data collection from the EMR to the calculation data base.

Demographic data form. This tool (Appendix G) was used to collect demographic data of staff such as age, gender, ethnicity, education level and years as a nurse. For this tool the measurement was summed and percentages were recorded and presented.

The ADA best practice guidelines identified in part. These guidelines **(**Appendix B and C) were used as a measurement tool. These guidelines are standards that have been proven to reflect excellent results in the care of diabetic patients (ADA, 2013). This tool measured the number of times hypo/hypoglycemic events were not addressed timely, as well as whether A1C results and type of diabetes were documented. This tool used sums and percentages as a form of measurement.

Validity

The pre- and post-ADA collection forms have not been used before; therefore, validity had not been ascertained. However the program coordinator verified that data gathered for the program were consistent and accurate. Thus, some degree of validity was ascertained, although not to the standard of a tool that had previously been validated. Diabetic status and treatment were determined based in part, on the ADA guidelines, which represent the professional standard for diabetes care.

The program had internal validity because staff were educated on the ADA best practice guidelines, which, in turn, could affect A1C result documentation, type of diabetes identification, and hypo/hyperglycemic treatment regimen. According the Burns and Grove (2009), internal validity reflects something that the researcher did that affected observed outcomes.

Reliability

This program proved reliability because it can be replicated under a comparable methodology in different health care settings.

Program Evaluation

Impact evaluation was used to evaluate the program. The goal of this type of evaluation was to assess whether the implemented program affected the outcome and to assess if program goals were reached. The de-identified data from the EMR were entered into a spreadsheet to calculate sums and percentages. ADA compliance was calculated by the number of occasions that A1C was documented versus not documented, how many times the type of diabetes was documented versus documentation of only the word diabetes; and hypo/hyperglycemic events addressed, timely or untimely compared to the total number of occasions not met timely or not addressed at all. Data were analyzed to identify sums and percentage change. The outcome data were reflected on bar charts and graphs. Comparison was to ascertain whether ADA best guidelines partially incorporated into the EMR improved documentation of A1C result, identified type of diabetes notation in the EMR and improve hypo/hypoglycemic treatment events in diabetes care.

Program Budget and Financial Analysis

The development of a budget was an integral task for this project management. Project stakeholders needed to establish the cost associated with the program in order to decide whether to advance or not (Zaccagnini & White, 2011). Consideration for expenses and incomes were evaluated so as to ascertain the success of the program (Hodges & Videto, 2011). The implementation of the ADA best practice guidelines in the EMR was dependent on the facility's financial status. The ability of nurse managed healthcare facilities to maintain fiscal stability reflects their true potential in an environment where payer resources are shrinking (McByrde-Foster, 2005**).** Change was challenging; however, with solid planning, change was successful (Zaccagnini & White, 2011). A cost benefit analysis (see Table 1) was used to promote the program to procure the investment of sponsors and stakeholders. The investment was financial, physical, and emotional.

Strategic investment was defined as larger gain in comparison to cost. Electronic medical record use was seen as an effective method for cost reduction (Hussain, 2011). The ADA (2012) reported a breakdown of costs associated with diabetes on a state-by-state basis. The report noted that the estimated cost of care for citizens' diagnosed diabetes in 2012 was $245 billion, including $176 billion in direct medical costs and $69 billion in reduced productivity.

Table 1

Estimate Cost Benefit Ratio Analysis

	Staff	Cost	Hours/ week	Week duration	Budget
NR staff	8	$28.00	40	12	$107,520.00
Unit manager	1	$30.00	40	12	$14,400.00
Diabetic educator	1	$30.00	20	12	$7,200.00
Champions	1	$28.00	20	12	$6,720.00
IT	1	$40.00	10	12	$4,800.00
Researcher (self)	1	$0.00	8	12	$0.00
Education material		$200.00			$200.00
Social media board		$500.00			$200.00
Miscellaneous		$500.00			$500.00
Total budget					$140,640.00
Number of staff	13		138		$140,640.00

Revenue Payer source	Projected no. clients/month	Cost per visit	Week duration	Total revenue
Medicaid	150	$75.00	12	$135,000.00
Privately	75	$125.00	12	$112,000.00
HMO	120	$105.00	12	$151,000.00
Total Revenue				$398,700.00
Net				$258,060.00
Ratio				2.83489761

Cost benefit analysis indicated that the program would be beneficial to the facility. This was the intended budget ratio analysis for the program. The budgetary amount was calculated based on salaries of the inter-disciplinary professionals who were included in the program. The revenue was calculated based on payer sources and reviewed patient needs.

Summary

Health care facilities have become more aware of the impact of untimely and poor treatment of diabetes on the nations' resources. Manchester (2008) reported that between 1980 and 2003, patients being discharged from acute care setting with a diagnosis of diabetes reflected a 132% increase. Stakeholders in the United States are of the mindset that diabetes health care is insufficient; thus, inpatient glycemic management has become a priority in some hospital settings. Many stakeholders have pushed for improved quality of diabetes care. The CMS spent billions on unplanned hospitalizations.

The EMR can provide practitioners with the ability to review real time data, identify patterns, trends, and effectively implement changes based on evidence. Data gathered from this type of program will provide possibilities to broaden the quality of diabetes care and assist policy makers to chart the delivery of diabetes care in the future. This program also identified that the ADA best practice guidelines incorporated into the EMR improved A1C documentation, identified the type of diabetes being treated, and supported timely interventions for hypo/hyperglycemic events. Pre- and post-ADA best practice guidelines intervention data were used without the benefit of a control group; this can pose a limitation to the program outcome.

Section 4: Findings, Discussion and Implication

Introduction

The purpose of this program was to determine whether ADA best practice guidelines incorporated into the EMR improved A1C documentation, identified diabetes type, and improved hypo/hyperglycemic management during inpatient hospitalization. Specific ADA best guidelines criteria, which were used as the intervention, included the following: the A1C results were documented upon admission or within 24 hours (baseline), identification of the type of diabetes, and identification of hypo/hyperglycemia events treatment. The collection parameters included: A1C documentation, type of diabetes recorded, treatment of abnormal blood sugar readings, glycemic readings above 180 mg/dl or less than 70 mg/dl and whether hypoglycemic events were rechecked 30 minutes after treatment. The program goal was to compare A1C results and the number of hypo/hyperglycemic episodes pre- and postimplementation of ADA best practice guidelines intervention and to identify whether A1C documentation, identification of diabetes type, and hypo/hyperglycemic events improved. Therefore, the question for this program evaluation concerned the use of the ADA best practice guidelines incorporated into the electronic medical record (EMR) and whether these best practice guidelines would serve to improve A1C documentation, identify the diabetes type, and improve hypo/hyperglycemic management in hospitalized patients.

This program evaluation was conducted to assess the impact of the ADA best practice guidelines incorporated into the EMR in a 120-bed subacute facility.

Implementation was initiated on April 1, 2014. Nurses' diabetes care documentation in the EMR was evaluated retrospectively for a period 30 days pre-implementation, and then for an additional 30 days post-implementation.

Summary of the Findings

Demographic Data

For the evaluation, demographic information on the nursing participants and the patient population within the evaluation period were collected. The nurse participant data collection included age, gender, ethnicity, and education level. Similarly, the patient data collected included age, gender, ethnicity, and type of diabetes. The data are presented in Tables 2 and 3.

Table 2

Nurse Demographic Data (*n* = 8)

Characteristic	Type	*n*	*%*
Age in years	Max	59	
	Min	30	
	Average	44.5	
	Median	48	
Gender	Male	2	25%
	Female	6	75%
Ethnicity	African American	2	25%
	European American	4	50%
	Hispanic	1	12.5%
	Other	1	12.5%
Education Level	Associate	3	37.5%
	BSN	3	37.5%
	MSN	1	12.5%
	Diploma	1	12.5%

Table 3

*Patient Demographic Pre- and PostImplementation Data (*n*=25)*

Characteristic	Type	Pre *n*	%	Post *n*	%
Age In Years	Max	81		87	
	Min	51		52	
	Average	63		67	
	Median	66		66	
Gender	Male	12	48	11	44
	Female	13	53	14	56
Ethnicity	African American	9	36	10	40
	European American	9	36	9	36
	Hispanic	5	20	5	20
	Other	2	8	0	0
	Missing Data	0	0	1	4
Diabetes	Type 1	0	0	6	24
	Type 2	25	100	18	72
	Other	0	0	1	4

Program Evaluation

The patient collected data were measured in part, in six areas according to the ADA best practice guidelines. The six identified areas were assessed as follows:

1. Type of diabetes
2. Measurement of blood sugar
3. A1C level
4. Hypoglycemic event
5. Hyperglycemic event

6. Adjustment therapy

The program evaluation question was: Does nurses' use of ADA Best Practice Guidelines incorporated into the electronic medical records improve glycemic management in hospitals?

To focus on this question, nurses' documentation were reviewed for 30 days, prior to the implementation of the program and 30 days after implementation. Data were extracted from the EMR for each of the identified areas and calculated by sums and percentages. The data were presented according to sum and percentage of staff documentation of patients' diabetes information for the pre- and postimplementation time frame.

Comparison between the Pre- and Post-Data

In this program, the use of the ADA best practice guidelines incorporated into the EMR correlated with improved management of care for diabetes patients. Data were collected and reviewed over a 3-month time frame, from March to June, 2014. Initial implementation of the ADA best practice incorporated into the EMR started in April 2014, which was considered the implementation month. Data were collected 30 days preimplementation and then 30 days postimplementation month. Nurses' preintervention data, collected March 2014, were presented using a bar graph (Figure 1). The preimplementation graph illustrates a predominance of documentation of diagnosis of Type 2 diabetes in the patient population (see Figure 1), but a general lack of documentation of A1C and low levels of documentation of both glycemic events as well

as intervention to events in the preimplementation time period. Data suggest poor documentation and overdiagnosis of undocumented Type 2 disease, suggesting the need for guidelines in the documentation and treatment of diabetes in the patient population.

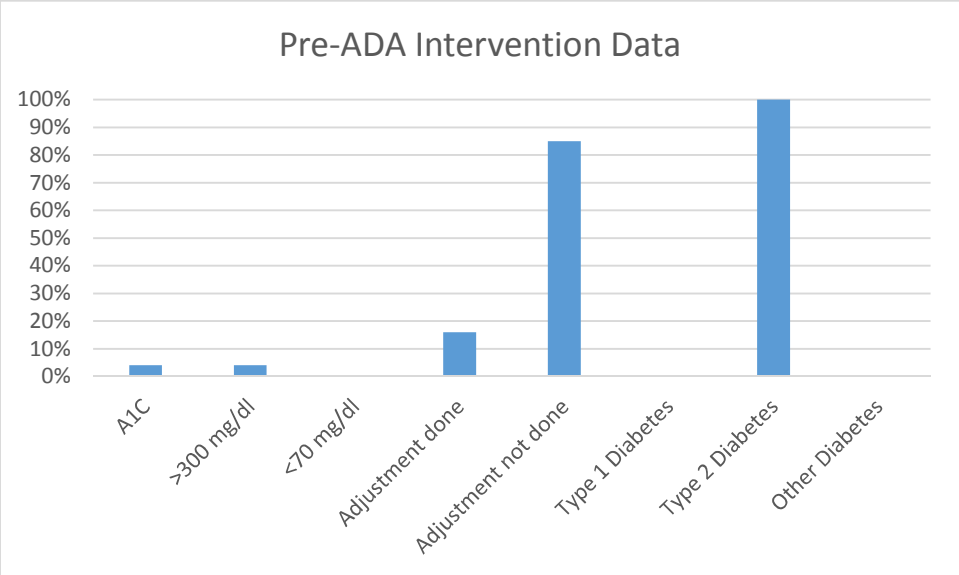

Figure 1. Pre-ADA intervention data.

Review of the post program data reflected improvement in the documentation of A1C, increased intervention to glycemic events, and more accurate diagnosis and documentation of diabetes type (Figure 2).

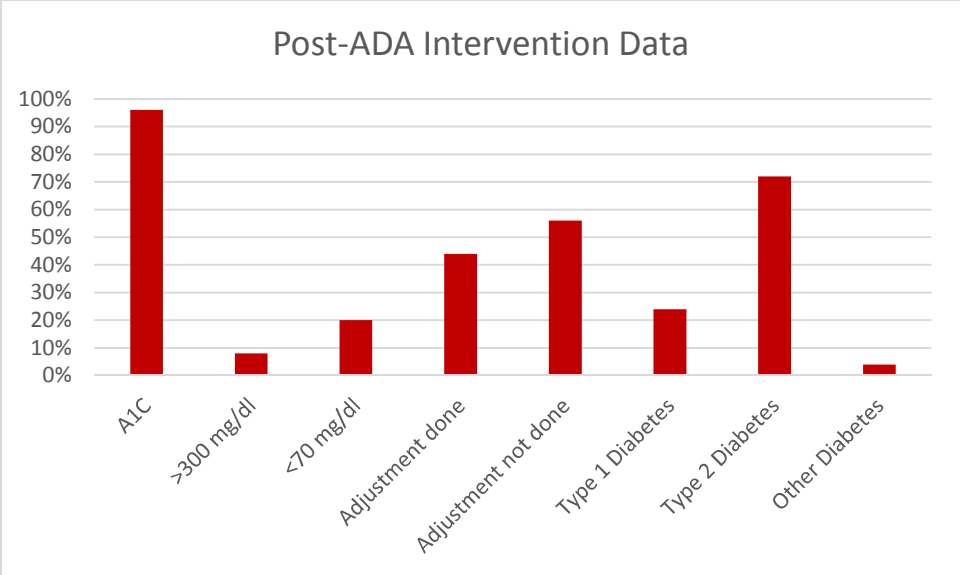

Figure 2. Post-ADA program data.

Figure 3 shows the pre- and post-data together on the same graph for comparison. From the graph, the substantial increase in documentation of A1C is most notable in addition to increases in adjustment therapy. Although an increase in adjustment is noted, the relatively low glycemic event data in the pre ADA intervention data limits the visible impact of the program in this regard. Diagnosis and documentation of the different types of diabetes also demonstrates improvement. Thus, significant improvement in A1C documentation, number of adjustments done, and more accurate diagnosis of Type 1 and 2 diabetes (preimplementation data show an abundance of Type 1 diabetes suggesting inaccurate diagnoses) can be seen in the chart comparison of the pre- and post-data collected related to the implementation of best practices intervention.

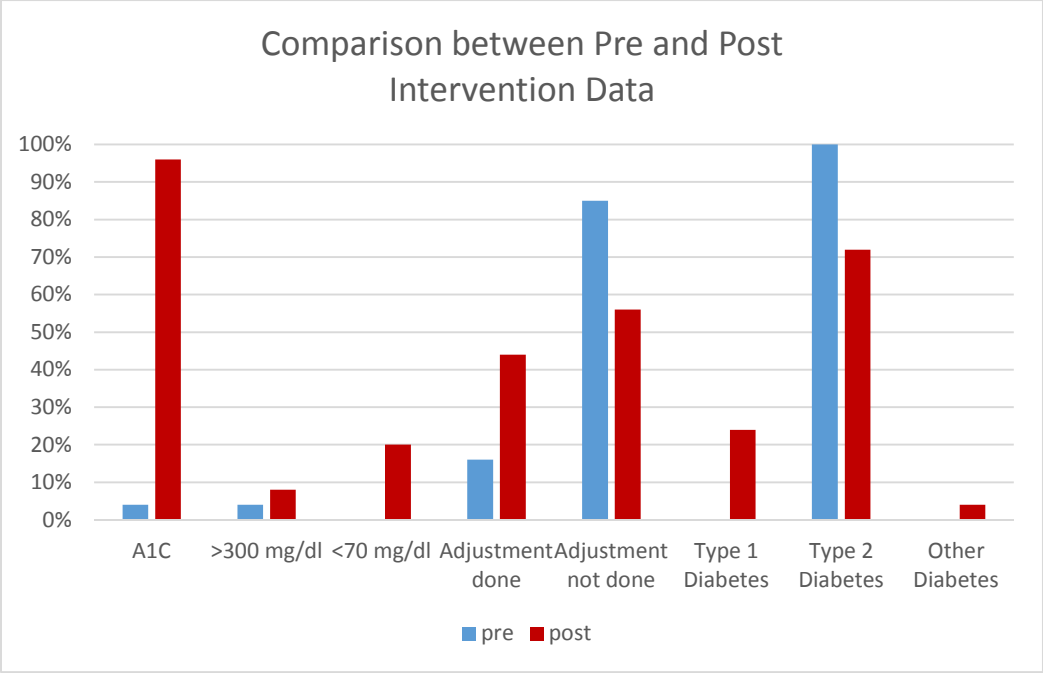

Figure 3. Comparison graph showing pre- and post-outcome data revealing increased A1C documentation, more accurate diabetes type diagnosis and documentation, and increased adjustments made.

Thus, from the data, the implementation of the ADA program has supported substantial gains in A1C documentation of glycemic events (moving from 4% to 96%, or a percent increase of 2300%) that support improved patient care in terms of monitoring and adjusting therapy as needed for diabetic patients (changing the frequency of adjustments done from 16–44%, a percent increase of 175%). Appropriate diagnosis and documentation of the different types of diabetes also showed improvement in the postimplementation period, moving from 100% of patients being documented as Type 2

diabetes to a more even distribution of 72% Type 2 and 24% Type 1 (a 28% decrease in Type 2 reporting).

Summary and Evaluation of Findings

The findings reflected that patients in the pre- and post-samples had similar age, gender, and ethnicity characteristics, supporting the assumption of relatively equivalent patient groups (pre and post) in this evaluation. Genders were close to evenly split in each group, ethnic differences were evident, but not outside normal diversity expectations, and age groups were within the expected range for the population of diabetic patients. Preimplementation patient outcome data supported a predominance of documentation of Type 2 diabetes diagnosis in the patient population (100%), as well as a general lack of documentation of A1C (4%) and low levels of reported glycemic events and intervention to events in the pre implementation time period, suggesting poor documentation and over-diagnosis of undocumented Type 2 disease. Comparatively, the postimplementation outcome data consisted of a more expected range of both Type 1 and 2 diabetic patients (28% decrease in Type 2 diagnosis documentation and an increase from 0 to 5 Type 1 diagnosis documentation), as well as improvement in A1C documentation (from 4% to 96%, a percent change of 2300%), reported events, and adjustments (from 16% to 44%, a percent change of 175%). The significant improvement in documentation of diabetes type in the postimplementation data suggests that nursing staff utilized the education regarding the EMR/ADA best practice guidelines to support accurate documentation of the patient's diabetes diagnosis.

Post implementation data also showed an increase in interventions to correct abnormal glycemic events (percent increase of 175%), which implied staff compliance with the implemented ADA/EMR system intervention and positive effects of the intervention. The results of the evaluation indicated improved documentation of patients' A1C (96%, compared to 4%). This improvement supported the increase in appropriate diagnosis and documentation of diabetes type, as noted previously. Documentation of hypoglycemic (BS < 70 mg/dl) and hyperglycemic (BS > 300 mg/dl) events also increased in the postimplementation period (from 0% to 12% and from 4% to 8% respectively) with increases in adjustment therapy (from 16% to 44%), and 56% not afforded adjustment therapy, compared to 84% pre-intervention. Results identified improved staff documentation of types of diabetes, showing a distribution of diagnosis of Type 2 (72%), diagnosis Type 1(24 %), and not Type 1 or Type 2 (4%).

Thus, with appropriate diagnosis and documentation, health care improvements were actualized through provision of appropriate care, such as providing adjustment therapy. These results indicated that the use of the ADA/EMR system supported improved diabetes care documentation. From these results, it can be inferred that adherence to the ADA/EMR system can provide improved patient care to those with diabetes. Given the significant population of diabetic patients, this finding is critical to supporting improvements in health care in general, as early identification and treatment of diabetes supports a reduction in other health complications.

Discussion of Findings in the Context of the Literature

McCullough et al. (2013) indicated that the EMR would facilitate coordination of care and improve treatment, decreasing patients' exposure to unnecessary complications. O'Connor (2010) identified that one of the major outcomes of EMR implementation is improvement of health care quality. Edwards (2013) supported O' Connor's conclusion and added that the use of specific features may predict improved quality. Collection and interpretation of patient data must be correct and comprehensive with set boundaries. The ADA best practice guidelines utilized in the EMR lends itself to Montori and Smith's (2001) criteria for systems that are productive under clinical pressure. Montori and Smith further revealed that linked data provide the best evidence to make timely informed clinical decisions. Timely clinical decision provides cost effective, quality health care.

The results of this program evaluation support the conclusions of Edwards (2013), O'Connor (2010), and Montori and Smith (2001), that EMR implementation can support improved health care quality, particularly when procedurally followed using ADA best practice guidelines. For care of diabetes patients, the use of ADA best practice intervention supported improved A1C documentation, accurate diabetes type diagnosis and treatment adjustment.

EMR systems can represent effective forms of informal audits. Healthcare practitioners can utilize the systems to audit collected diabetes data for peer review (Edwards, 2013). The collected data can be used to provide continuing professional development so as to provide specific feedback that will improve diabetes care. It is

logical to perceive the EMR as a promising tool with future use to improve diabetes care (Gill, 2009). Future diabetes practice guidelines can direct the EMR in organization of diabetes patient data. The organized data could include diagnose, test results, and pharmacological treatments to standardize the delivery of care (Gill, 2009; Montori & Smith, 2011; O'Connor, 2010).

According to the results of this evaluation, the EMR has the potential to improve diabetes care documentation, which may imply or lead to improved outcome. The ADA best practice guidelines, when incorporated into the EMR, reflected an improvement in staff documentation of diabetes care. Hypo/hyperglycemic events and treatment interventions were better monitored with the utilization of the EMR. McCullough et al. (2013) and the IOM (2003b) revealed that the EMR facilitated coordination of care, improved treatment and decreased patient exposure to unnecessary care. O'Connor (2010) further identified that one of the major outcomes of EMR implementation is improvement of health care quality. The ADA best practice guidelines incorporated into the EMR is needed in the current health care environment to foster patient autonomy regarding care and to support practitioners' use of standardized data. The use of the best practice guidelines, therefore, will decrease the cost of diabetes care and provide uniformity of care delivery and management to the hospitalized diabetic patient.

Implications

Implications for Practice

The ADA best practice guidelines incorporated into the EMR improved nurses' documentation regarding types of diabetes, A1C, and interventions for hypo/hyperglycemic events. McCullough et al. (2013) identified studies that utilized medical record data from a particular community and reported that EMR use correlated with improved diabetes care. The project outcomes aligned with the conclusions of Cebul et al. (2011), who reported that EMRs can have a positive impact on the outcome of diabetes care. O'Connor et al. (2005) also reported that diabetes care trails behind evidence based practice recommendations. Although the ADA best practice guidelines are well known in the health care community, a literature search failed to identify extensive use in EMRs.

The use of the ADA best practice guidelines /EMR evaluation reflected that diabetes care was improved. Practitioners had easy access to the collected data and trends reflected increased interventions to treat hypo/hyperglycemia events. An IOM (2003b) report revealed that some fundamental characteristic of the EMR can lead to improved care. O'Connor et al. (2005) identified that outpatient use of EMR showed patients were assessed and recommended test or screenings utilized. The EMR also identified patients who failed to reach evidence based practice clinical goals for glycemic control. The use of the ADA best practice guidelines in the EMR evaluation project proved that the IOM (2003b) and O'Connor et al. (2005) were on point regarding the role of EMRs in quality

care outcome of diabetic patients. Preventive measures, such as identification of A1C levels, allow health care practitioners to implement early interventions, thus retarding disastrous outcomes such as kidney failure, blindness, and missing limbs.

As soon as patients and health care providers recognize the benefits of the EMR, demands will be in full force. EMRs will improve health care practitioners' decisions and patients' outcomes. The U.S. government has provided the health care arena with opportunities that will transform diabetes outcome. The Health Information Technology for Economic and Clinical Health Act (HITECH) has incentive payments worth billions of dollars for health care practitioners and facilities that utilize EMRs in meaningful ways. Thus, it can be said that meaningful use of EMR is a major health care goal. Blumenthal and Tavenner (2010) believed that through HITECH legislation, it was expected that meaningful use would include health care practitioners' electronic reporting on quality of care through electronic data. Projects such as this present project, in which the ADA best practice guidelines were incorporated into the EMR, will set the pace and standards for EMR use in treatment of chronic disease such as diabetes.

Social Change

Nurses with specialized expertise in collection and analysis of data will have great influence bringing proficiency in computer and information science to the nursing profession. As a result, nurse leaders will be able to manage and communicate clinical data to enhance the delivery of care. Nurses who participated in the implemented ADA best practice EMR project had basic computer skills and were able to utilize the

incorporated ADA guidelines in the EMR to produce positive change in diabetes care. The potential benefits of EMR must be considered in treating chronic diseases such as diabetes, as evidenced by the outcome evaluation of the ADA best practice guidelines used in the EMR. The goal was to produce a system that would meet the expectations of health care practitioners as well as diabetic patients. Project outcomes such as this can support policy makers' decisions with regard to cost effective, quality care using the EMR.

In some health care settings, clinical documentation occurs on paper. As a result, patients are repeatedly asked to provide the same information to different practitioners. Diabetes is usually managed through a multi-disciplinary team approach and the use of the EMR will reduce redundancy of data collection and treatment. The evaluation and improvement of diabetes care can only occur if the data nursing collects for analysis is uniformed and consistent. One way to ensure uniform and consistent documentation is through the utilization of the EMR. According to Gill et al. (2012), nurses are the largest group of health data recorders and must use the opportunity to make changes regarding use of the EMR in patient care. The time has come for nurses to become more proactive as leaders and champions in the health care arena (Woods & Magyary, 2010). This project can set the stage for such championship.

Affordable Care Act (ACA) and Diabetes

The time has come for policymakers in the United States to actively engage in discussions regarding healthcare reform with serious intention to recreate a functional

healthcare system. The goal must be the revision of the health care system to increase access and improve quality, while decreasing cost and empowering consumers. The Affordable Care Act (ACA) health care law of 2010 incorporates numerous requirements that clearly address disparities in diabetes prevention, screening, care, and treatment. The stimulus to Better Diabetes Care Act of 2009, included in the Affordable Care Act, points the DHHS and CDC toward a focus on improving diabetes scrutiny and quality initiatives across the country. The ACA authorized the creation of the National Diabetes Prevention Program at the CDC in order to eliminate the preventable burden of diabetes (America's Health: Patient Protection and Affordable Care Act [HR 3590]). Projects, such as this current program evaluation, will enable health care practitioners and policy makers to standardize diabetes care, promoting improved quality and decreased societal financial stress.

The CDC, National Diabetes Prevention Program was designed to provide communities with evidence-based lifestyle change programs so as to prevent Type 2 diabetes (Ratner, 2011). The ADA best practice guidelines incorporated into the EMR provide support to evidence-based diabetes prevention programs in local communities. Currently, the CDC web site reflects that community-based organizations in 48 states are in various stages of achieving recognition for implemented diabetes prevention programs (Ratner, 2011).

Future Research

The ADA best practice guidelines incorporated into the EMR improves licensed staff management of diabetes and is a topic for further research. Research has shown that coordinated treatment guidelines can improve care of chronic disease such as diabetes. Appropriate systems and processes are requirements to organize and present data in such a way that reflects support for the diabetic patient. The EMR could provide the answer, but success will depend in part on the investment of nursing input in their design. The culture of the nursing workplace must be reviewed so as to include the effective use of EMR. Establishing a core set of health care documentation that is used in a consistent manner is necessary to the sharing of data and computerization.

Strengths and Limitations

Strengths

The program evaluation utilized existing data collected from the EMR over a period of 30 days. The strength of the program analysis included the utilization of uniform data retrieved from the EMR. Access to real-time data is a valuable resource for cost effective quality diabetes care outcomes. Another strength was the use of the ADA best practice guidelines, which was a standardized objective tool that highlighted specific areas in diabetes care to enact change.

Limitations

There were various factors that limited the interpretation of the analyzed data presented in this project. First, timeframe may have impacted outcome. The facility

compared data 30 days after the EMR/ADA implementation. Therefore only the near term effects of the EMR/ADA implementation were assessed. Secondly, the data represented information from a small convenience sample; thus, care must be used in generalization to a wider population. Finally, the data analysis was focused on only one chronic disease, one facility, in one geographical location and a low number of end users. Findings for other chronic diseases in other settings could differ.

Recommendations

The task of a program evaluation is not complete with the collection, analysis, and evaluation of data. As more health care facilities utilize EMRs and incorporate the ADA best practice guidelines into the systems, more results will be available for comparison. With the advent of health care reform, grants are available for health care facilities that would be interested in evidence-based research. Recommendations would include increasing the sample size of the staff participants and extend data collection over a longer period of time.

Analysis of Self

As Scholar

According to American Association of Colleges of Nursing (AACN, 2006), doctoral nursing education takes place within the context of societal needs and demands. As a doctoral graduate, it is my responsibility to use that knowledge to enhance the nursing profession. Walden University has provided the tools and the preparation to go forward as a part of interdisciplinary teams that will provide quality improvement in

health care to ensure patient safety. I entered the doctoral degree with the imposter syndrome. A sense of belonging was absent during my two first classes. With guidance and support, I have morphed into a person who is proficient in quality improvement strategies, meaningful use of EMR and scholarly products.

This program provided me with the skills and confidence not only to become actively involved in the numerous quality initiatives of my agency, but also to provide education and advice to enact cost effective changes at the organizational level. During one of the many steering committee meetings, the knowledge and confidence gained through my doctoral studies allowed me to interact with the agency deputy commissioner on her level. After several months of meetings without goals and objectives to the team's purpose, I was able to present to the group the importance of identifying issues and having goals and objectives in place for productive outcomes. Although the committee was not timely in accepting my presentation, I gained the trust of the deputy commissioner through confident interaction with the group. She praised my insight and was grateful for the information. This would not have occurred without the doctoral preparation I received. She enquired about my background and congratulated me on taking the step towards earning the doctoral degree. The AACN (2006) identified that doctoral nurses are competent in knowledge application activities and are able to generate evidence to guide practice.

As Practitioner

Nurse leaders have a very important role regarding the implementation of clinical guidelines, protocols, and interventions to at risk population (Scott, Rundall, Vogt, & Hsu, 2005; Woods & Magyary, 2010). The AACN (2006) revealed that, as a doctoral graduate in the workplace environment, I will be efficient in the translation and use of knowledge to benefit patient outcomes. In primary care, I will play my role in advocating the use of EMRs in capturing clinical data at the point of care and services. Continued education in informatics will provide the tools to implement clinical data systems, templates, and protocols to support evidence-based practice (Gill, 2012). This will give me autonomy regarding how and why diabetes data are captured and utilized, thus ensuring successful adoption of solutions that is specific to diabetes nursing care. Health care practitioners are being required to establish quality delivery of diabetes care and nurses including myself must engage with informatics to ensure nursing contribution is in place to improve care.

As Project Developer

Doctorally prepared nurses are able to obtain funding from governmental agencies through practice-based research networks. Contino (2004) argued that continuity of leadership contribute significantly to the success of an organization. The ability to mobilize human and material resources to accomplish organization goals is very powerful (Laschinger, 2009). Access to resources relates to the project developer's ability to access financial or other resources to enact change. My role as a change agent is significant in

this health care environment. This doctoral degree has prepared me to implement challenging undertakings in a fragmented health care environment. Resistance to change is a natural human reaction; however, commitment and clear plans with regard to implementation of change is one of the most valuable outcomes of this doctoral degree. Walden has helped me to identify my role as a doctoral leader and to continue post-graduation so as to foster and enact changes that will be beneficial to the nursing community and health care systems.

Summary and Conclusion

As health care practitioners continue to work together to improve the treatment of diabetes, researchers are discovering novel ways to combat this disorder. With over 230 million people living with diabetes (Greenfield et al., 2011; Johnson & Raterink, 2009) and the increased costs associated with diabetes care rising from $175 billion in 2007 to $245 billion in 2012 (ADA, 2013), this disease poses a serious threat to the wellness of American society and significantly impacts the health care system (ADA, 2013). This project provided health care practitioners with a safe, accessible alternative to improve the delivery of diabetes care in the form of EMR/ADA best practice guideline education and implementation practices supporting improved reporting, documentation, identification, and treatment.

Nurses with specialized expertise in data collection and analysis will have great influence bringing expertise in computer and information science to manage and communicate clinical data to enhance nursing. The evaluation and improvement of

diabetes care can only occur if nursing researchers collect and analyze uniform and consistent data. One way to ensure uniform and consistent documentation of this data is through the utilization of the EMR. The potential benefits of EMR must be considered in treating chronic diseases such as diabetes. The goal is to produce a system that can meet the expectations of health care practitioners as well as support policy makers to address cost and improve care outcome. Utilization of the EMR and adherence to the ADA best practices, as was implemented in this program, supports improved documentation and treatment for patients with diabetes toward providing exceptional care and management of care among the diabetic population.

References

The Affordable Care Act (ACA) health care law. (2010). Retrieved from http://www.hhs.gov/healthcare/rights/law/index.html

Agency for Healthcare Research and Quality. (2008). *Plan-do-study-act (PDSA) cycle*. Retrieved from https://www.innovations.ahrq.gov/content.aspx?id=2398

Agency for Health Care Research and Quality (2005). *Economic and health costs of diabetes: HCUP Highlight 1*. (Publication No. 05-0)

Ahmann, A. (2004). Reduction of hospital costs and length of stay by good control of blood glucose levels. *Endocrine Practice Journal*, *10*(2), 53-6. Retrieved from http://www.ncbi.nlm.nih

Al-Azmi, S., Al-Enezi, N., & Chowdhury, R. (2009). User's attitude to an electronic medical record system and its correlates: A multivariate analysis. *Health Information Management Journal*, *38*(2):33-40. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19546486

American Association of Colleges of Nursing. (2006). *Advancing higher education in nursing practice*. Washington, DC: Author. Retrieved from http://www.aanc.nche.edu/DNP/pdf/Esentials.pdf

American Association of Diabetes Educators. (2012a). Position statement: Diabetes inpatient management. *The Diabetes Educator*, *38*(1), 142-145. doi:10.1177/0145721711431929

American College of Endocrinology and American Diabetes Association. (2006). Consensus statement on inpatient diabetes and glycemic control. *Endocrine Practice Journal,* 12,458-468. Retrieved from http://www.keepthefaith1296.com/parkinsons/american-college-of-endocrinology-and-american-diabetes-association-consensus-statement-on-

American Diabetes Association. (2008). Economic costs of diabetes in the U.S. in 2007. *Diabetic Care*, *31*(3), 596-615. doi:10.233. 7/dc08-9017

American Diabetes Association. (2012). Standards of medical care in diabetes—2012. *Diabetes Care*, *30*(1) S11-S63. doi:10.2337/dc12-5011

American Diabetes Association. (2013). Diabetes care. *The Journal of Clinical and Applied Research and Education, 36*(1), (Suppl 1) s45-s50. Retrieved from https://www.Diabetes.org/DiabetesCare

American Heart Association. (n.d.). *Women, heart disease and stroke.* Retrieved from http://www.americanheart.org/presenter.jhtml?identifier=478

Arnold, P. (2010). *The Joint Commission inpatient diabetes certification*. Retrieved from http://www.bing.com/search?q=Pam+arnold+the+joint+commission+inpatient+di

Blumenthal, D., & Tavenner, M. (2010). The meaningful use of regulation for electronic health records. *New England Journal of Medicine*, *363*(6), 501-504. doi:10.1056/NEJMp1006114

Bodenhumer, T., Wagner, E., & Grumbach, K. (2002). Improving primary care for patients with chronic illness: The chronic care model, Part 2. *JAMA, 288*(15), 1909-14. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12377092

Brancati, F. L., Whelton, P. K., Kuller, L. H., & Klag, M. J. (1996). Diabetes mellitus, race, and socioeconomic status. A population-based study. *Annals of Epidemiology, 6*(1), 67-73.

Bu, D., Pan, E., Walker, J., Adler-Milstein, J., Kendrick, D., Hook, J. M., . . ., Middleton, B. (2007). Benefits of information technology-Enabled diabetes management. *Diabetes Care*, *30*(5), 1137-1142. doi: 10.2337/dco6-2101

Burns, N., & Grove, S. (2009). *The practice of nursing research*. St. Louis, MO: Saunders.

Cebul, R. D., Love, T. E., Jain, A. K., & Hebert, C. J. (2011). Electronic health records and quality of diabetes care. *New England Journal of Medicine, 365*(9), 825-833. doi:10.1056/NEJMsa1102519

Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System (BRFSS) Program. (2010). 2009 United States BRFSS Data. Atlanta, GA: Author. Retrieved from http://www.cdc.gov/brfss

Centers for Disease Control and Prevention. (2011). National diabetes fact sheet. Retrieved from http://www.cdc.gov/diabetes

Center for Disease Control and Prevention. (2012). *Program evalua*tion. Retrieved from http://www.cdc.gov/eval/framework/index.htm

Center for Medicare & Medicaid Services. (n.d.). *eHealth initiatives*. Retrieved from http://www.cms.gov/eHealth/downloads/eHealth-Fact-Sheet.pdf

Clement, S., Braithwaite, S., et al. (2004). American Diabetes in hospitals writing committee. *Management of Diabetes and Hyperglycemia in Hospitals, 27*, 533-591. doi:10.2337/dc13-S011

Coats, A., & Marshall, D. (2013). Inpatient hypoglycemia: A study of nursing management. *Nursing Praxis in New Zealand*, 29(2), 15-24.

Connecticut Department of Public Health. (2005). *Diabetes Prevalence in Connecticut, 2002-2004*. Retrieved from http://www.dph.state.ct.us/PB/HISR/BRFSS_Diabetes_prev.pdf

Connecticut Department of Public Health. (2006). *The burden of diabetes in Connecticut: 2006 surveillance report.* Retrieved from http: //www.ct.gov/dph/lib/dph/hisr/pdf/Diabetes_surveillance_2006CT. pdf

Connecticut Department of Public Health, Behavioral Risk Factor Surveillance System (BRFSS) Program. (2010). *2007-2009 BRFSS Survey Data*. Retrieved from http://www.ahrq.gov/data/hcup/highlight1/high1.pdf

Connolly, V., N., Unwin, P., Sherriff, R., Bilous, & Kelly, W. (2000). Diabetes prevalence and socioeconomic status: A population based study showing increased prevalence of type 2 diabetes mellitus in deprived areas. *Journal of Epidemiology and Community Health* 54(3), 173-177. Doi:10.1136/jech.54.3.173

Crosson, J., Ohman-Strickland, P., Hahn, K. A., DiCicco-Bloom, B., Shaw, E., Orzano, A. J., & Crabtree, B. I. (2007). Electronic medical record and diabetes quality of care. Results from a sample of family medical practices. *Annals of Family Medicine*; 5(3), 209-215. doi:10.1370/afn.696

Down, S. (2013). Pattern management for glucose control. *Practice Nurse*, *43*(3), 28-31. Retrieved from http://ehis.ebscohost.com.ezp.waldenlibrary.org/ehost/delivery?sid=9a68ad63-

Dorr, D., Bonner, L. M., Cohen, A. N., Shoai, R. S., Perrin, R., Chaney, E., & Young, A. S. (2007). Information systems to promote improved care for chronic illness: A literature review. *Journal of American Medical Informatics*, *14*, 156-163. doi:10.1197/jamia.M2255

Edwards, C. (2012). Nursing leaders serving as a foundation for the Electronic Medical Record. *Journal of Trauma Nursing*, *19*(2), 111-116. doi:10.1097/JTN.0b013e31825629db

Edwards, E. (2013). Electronic record-keeping: Potential benefits and reasons for caution. *British Journal of Neuroscience Nursing*, *9*(5), 252-253.

eHealth. (2011). New report shows care coordination model positively impacts people living with type 2 diabetes and heart disease (Press Release eHealth Initiative US.GLA.11.05.263). Retrieved from www.ehealthinitiative.org

Evans, M. (2010). Evidence based practice protocol to improve glucose control in individuals with type 2 diabetes mellitus. *MEDSURG Nursing*, *19*(5):317-322. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/21337987

Fayez, S. (2011). Needs chain model. American Evaluation Association. Retrieved from http://comm.eval.org/resources/viewdocument/?DocumentKey=86d43b5d-f260-

Fowler, M. (2009). Inpatient diabetes management. *Clinical Diabetes*, *27*(3), 119-122. doi:10.2337/diaclin.12.3.119

Gertler, P., Martinez, S., Premand, P., Rawlings, L. B., & Vermeersch, C. M. J. (2011). *Impact evaluation in practice*. Washington, DC: The World Bank. Retrieved from http://document.worldbank.org/curated/en/2010/01/13871146/evaluation-practice

Greenfield, C., Gilles, M., Porter, C., Shaw, P., & Willis, K. (2011). It's not just about the HbA1c, Doc! Understanding the psychosocial is also important in managing diabetes? *Australian Journal of Rural Health*, *19*, 15-19. doi:10.1111/j.1440-1584.2010.01171.x

Griffis, S., Morrison, N., Beauvais, C., & Bellefountaine, M. (2007). Identifying the continuing diabetes education needed in acute care nurses in Northern Ontario. *Canadian Journal of Diabetes*, *31*(4), 37. Retrieved from http://www.diabetes.ca/Files/NMorrison--Nov302007.pdf1-377

Hallinan, C. M. (2010). Program logic: A framework for health program design and evaluation—the Pap nurse in general practice program. *Australian Journal of Primary Health*, *16*(4), 319–325.

Healthy People 2020. *Diabetes.* Retrieved from http://www.healthypeople.gov/2020/topicsobjectives2020/nationaldata.aspx?

Hendrickson, K., Bozzo, J., Zimkus, J., Scorel, K., Maerz, L., Balcezak, T., & Inzucchi, S. (2011). Evaluating inpatient glycemic management: The quality hyperglycemia score. *Diabetes Technology & Therapeutics, 13*(7), 753-758. doi:10.1089/dia.2010.0252

Hodges, B., & Videto, D. (2011). *Assessment and planning in health programs.* Sudbury, MA: .Jones& Bartlett Learning.

Hoffman S., & Podgurski, A. (2011). Improving health care outcomes through personalized comparison of treatment effectiveness based on electronic health record. *Journal of Law, Medicine & Ethics*, *39*(3), 425-436. doi:10.1111/j.1748-720x.2011.00612.x

Hussain, A. (2011). Meaningful use of information: A local perspective. *American College of Physicians*, *154*(10), 690-692. Retrieved from http://annals.org/article.aspx?articleid=474761

Hynes, M. M., Mueller, L. M., Li, H., & Amadeo, F. (2005). *Mortality and its risk factors in Connecticut, 1989-1998.* Hartford, CT: Connecticut Department of Public Health. Retrieved from http://www.dph.state.ct.us/OPPE/Mortality/mortalityriskfactors

Institute of Medicine. (2003a). *Patient safety achieving a new standard of care*. Retrieved from http://www.bing.com/search?q=institute+of+medicine+2003&form=

Institute of Medicine. (2003b). *Key capabilities of an Electronic Health Record system: Letter Report*. Washington, DC: Author. Retrieved from http://www.nap.edu,2003:31

Institute of Medicine. (2010). *Future of nursing: Leading change, advancing health*. Retrieved from http://www.iom.edu/~/media/Files/Report%20Files/2010/The-Future-of-Nursing/Future%20of%20Nursing%202010%20Recommendations.pdf

Joos, D., Chen, Q., Jirjis, J., & Johnson, K. B. (2006). An electronic medical record in primary care: Impact on satisfaction, work efficiency and clinic processes. *AMIA 2006 Symposium Proceedings*, 394-398. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1839545

Koopman, R. J., Kochendorfer, K. M., Moore, J. L., Mehr, D. R., Wakefield, D. S., Yadamsuren, B., . . . , Belden, J. L. (2011). A diabetes dashboard and physician efficiency and accuracy in accessing data needed for high-quality diabetes care. *Annals of Family Medicine*, *9*(5), 398-405.

Kotter, J. (1996). *Leading the change*. Boston, MA: Harvard Business Press.

Laschinger, H. (2009). The impact of unit leadership and empowerment on nurses' organizational commitment. *The Journal of Nursing Administration*, *39*(50), 228-235. doi:10.1097/NNA.0b013e3181a23d2b

Lien, L., Cox, M., Feinglos, M., & Corsino, L. (2011). Glycemic control in the hospitalized patient. New York: Springer Science +Business Media.

MacPhail, L. H., Neuwirth, E. B., & Bellows, J. (2009). Coordination of diabetes care in four delivery models using an electronic health record. *Medical Care*, *47*(9), 993-999. doi:10.1097/MLR.0b013e31819e1ffe

Manchester, C. (2008). Diabetes education in the hospital: Establishing professional competency. *Diabetes Spectrum*, 21(40), 268-271. doi:10.2337/diaspect.21.4.268.

Mayfield, J. A., Rith-Najarean, S. J., Acton, K. J., Schraer, C. D., Stahn, R. M., Johnson, M. H., & Gohdes, D. (1994). Assessment of diabetes care by medical record review: The Indian Health Service model. *Diabetes Care, 17*(8), 918-923. doi:10.2337/diacare.17.8.918

McBryde-Foster, M. J. (2005). Break-even analysis in a nurse-managed center. *Nursing Economics*, *23*(1), 31–34.

McCullough, J., Christianson, J., & Borwornson, L. (2013). Do electronic medical records improve diabetes quality in physician practices? *American Journal of Managed Care*, *19*(20), 144-149.

Meigs, J. B., Cagliero, E., Dubey, A., Murphy-Sheehy, P., Gildesgame, C., Chueh, H., . . . , Nathan, D. M. (2003).A controlled trial of web based diabetes disease management: The MGH diabetes primary care improvement project. *Diabetes Care*, *26*(3), 750-757. doi:10.2337/diacare.26.3.750

Moghissi, E., Korytkowski, M. T., DiNardo, M., Einhorn, D., Hellman, R., Hirsch, I. B., . . . , Umpierrez, G. E. (2009). American Association of Clinical Endocrinologist

and American Diabetes Association consensus statement on inpatient glycemic control. *Diabetes Care, 32*(6), 1119-1131. doi:10.2337/dc09-9029

Montori, S., & Smith, A. (2009). A treatment decision aid may increase patient trust in the diabetes specialist. *Health Expectation, 12*(1), 38-44. doi:10.1111/j.1369-7625.2008.00521.x

New England Journal of Medicine. (2004). Medical definitions. Retrieved from http://www.medterms.com/script/main/art.asp?articlekey=33263

O'Connor, P. (2003). Electronic medical records and diabetes care improvement. *Diabetes Care*, *26*(3), 942-943. doi:10.2337/diacare.26.3.942

O'Connor, P. J., Crain, A. L., Rush, W. A., Sperl-Hillen, J. M., Gutenkauf, J. J., & Duncan, J. E. (2005). Impact of an electronic medical record on diabetes quality of care. *The Annals of Family Medicine, 3*(4), 300-306. doi:10.1370/afm.327

O'Connor, P. (2010). Using electronic health records to improve outpatient diabetes care. *Diabetes Spectrum, 23*(3), 146-148. doi:10.2337/diaspect.23.3.146

O'Connor, P. J., Speri- Hillen, J. M., Rush, W. A., Johnson, P. E., Amundson, G. H., Asche, S. E., . . . , Gilmer, T. P. (2011). Impact of EHR clinical decision support in diabetes care: A randomized trial. *Annals of Family Medicine*, *9*(1), 12-21. doi:10.1370/afm.1196

Orzano, J., Ohman-Strickland, P., Tallia, A. F., Hudson, S., Balasubramanian, B., Nutting, P. A., & Crabtree, B. F. (2007). Improving outcomes for high risk

diabetes care using information system. *Journal of American Board of Family Medicine*, *20*(30), 245-251. doi:10:3122/jabfm.2007.0

Plemmons, S., Lipton, B., Fong, Y., & Acosta, N. (2012). Measurable outcomes from standard nursing documentation in an electronic health record. *American Nursing Informatics Association*. Retrieved from http://omahasystemmn.org/data.php

Polit, D. (2010). *Statistics and data analysis for nursing research* (2nd ed.). Upper Paddle River, NJ: Pearson Education Inc.

Rasekaba, T. M., Graco, M., Risteski, C., Jasper, A., Berlowitz, D. J., Hawthorne, G., & Hutchinson, A. (2012). Impact of diabetes disease management program on diabetes control and patient quality of life. *Population Health Management, 15*(1), 12-19. doi:10.10.1089/pop.2011.0002

Reed, C., Richa, J. M., Berndt, A. E., Beadle, R. D., Gerhardt, S. D., Stewart, R. & Corneille, M. (2012). Improving glycemic control with the adjunct use of data management software programs. *American Association of Critical Care Nurses*, *23*(4), 362-369. doi:10.1097/NCI.0b013e31825d5dc8

Robbins, J. M., Vaccarino, V., Zhang, H., & Kasl, S. V. (2000). Excess type 2 diabetes in African American women and men aged 40-74 and socioeconomic status: Evidence from the Third National Health and Nutrition Examination Survey. *Journal of Epidemiology and Community Health, 54*(11), 839-845. Doi:10.1136/jech.54.11.839

Rogers, S. (2008). Inpatient care coordination for patients with diabetes. *Diabetes Spectrum*, *21*(4), 272-275. doi:10.2337/diaspect.21.4.272

Santanta, S. (2013). Diabetes population management with an electronic health record. *Online Journal of Nursing Informatics*, *17*(1). Retrieved from htpp://ojni.org/issues/?p=2378

Satlin, M., Hoover, D., & Glesby, M. (2011). Glycemic control in HIV- Infected patients with diabetes mellitus and rates of meeting American Diabetes association management guidelines. *AIDS Patients Care and STDs*, *25*(1). doi:10.1089/apc.2010.0237

Scott, J. T., Rundall, T. G., Vogt, T. M., & Hsu, J. (2005). Kaiser Permanente's experience of implementing an electronic medical record: A qualitative study. *British Medical Journal, 331*(7528), 1313-1316. doi:10.1136/bmj.38638.497477.68

Sharma, A., Lanum, M., & Suarez-Balcazar, Y. (2000). *A community needs assessment guide*. Retrieved from http://www.docstoc com/docs/11855157/A-Community-Needs-Assessment-Guide

Sperl-Hillen, J. M., Averbeck, B., Palattao, K., Amundson, J., Ekstrom, H., Rush, B., & O'Connor, P. (2010). Outpatient EHR-based diabetes clinical decision support that works: Lessons learned from implementing diabetes wizard. *Diabetes Spectrum, 23*(3), 150-154. doi: 10.2337/diaspect.23.3.150

Stonham, G. (2012). Measuring the nursing contribution using electronic records. *Nursing Management, 19*(8), 28-32. Retrieved from http://dx.doi.org/10.7748/nm202.19.8.2869447

Topaz, M., & Bowles, K. H. (2012). Electronic health record and quality of care: Mixed results and emerging debates. *Online Journal of Nursing Informatics*, *16*(1). Retrieved from http://ojni.org/issues/?p=1262

U. S. Department of Health and Human Services. (2009). *Healthy People 2020 framework.* Retrieved from http://www.healthypeople.gov/hp2020/Objectives/framework.aspx

Valen, M. S.**,** Narayan, S., & Wedeking, L. (2012). An innovative approach to diabetes education for a Hispanic population utilizing community health workers. *Journal of Cultural Diversity, 19*(1), 10-7.

Warrington, L., Ayers, P., Baldwin, A. M., Wallace, V., Riche, K. D., Saulters, R., . . ., Butler, K. (2012). Implementation of a pharmacist-led, multidisciplinary diabetes management team. *American Journal of Health-System Pharmacy, 69*(14), 1240-1245. doi:10.2146/ajhp110297

Woods, N., & Magyary, D. (2010). Translational research: Why nursing's interdisciplinary collaboration is essential. *Research and Theory for Nursing Practice: An International Journal*, *24*(1), 9-24. doi:10.1891/1541-6577.24.1.9

Zaccagnini, M. E., & White, K. W. (2011). *The doctor of nursing practice essentials: A new model for advanced practice nursing.* Sudbury, MA: Jones & Barlett Publishers.

Section 5: Scholarly Product Project Dissemination

Incorporating ADA Best Practice Guidelines in Electronic Medical Record to Improve Glycemic Management in Hospitals

Manuscript

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Abstract

Aggressive management of diabetes using ADA best practice guidelines in hospitalized patients reduces morbidity and mortality. Inpatient electronic medical records systems improve care in chronic diseases by identifying care needs and improving the data available for decision-making and disease management. The purpose of this project was to evaluate the impact of ADA best practice guidelines of glycemic management once they have been entered into the EMR of hospitalized diabetics. Kotter's organizational change process guided the project. The project question was as follows: Does nurses' use of ADA Best Practice Guidelines incorporated into the EMR improve glycemic management in hospitalized patients? A pretest-posttest design evaluated the intervention to assess whether the program goals were met. A convenience sample of eight nurses practicing in a subacute health care facility participated in the program with pretest–posttest data obtained from a convenience sampling of diabetic patients admitted to the facility. Comparison of A1C, diabetes types, and hypo/hyperglycemic treatment event data were compared 30 days pre- and post-intervention. Outcome data revealed significantly improved documentation for A1C results, the different types of diabetes and increased corrective measures for abnormal glycemic events. EMR alerts and reminders provided timely information to health care practitioners, resulting in better management for the diabetic patient. Like the Affordable Care Act, this project is expected to identify disparities in diabetes prevention, screening, care, and treatment. Social change includes use of the EMR to identify and implement changes to improve diabetes care.

Introduction

Stakeholders in the United States are of the mindset that diabetes health care is insufficient (Fowler, 2009; Hendrickson et al., 2011; Magaji & Johnston, 2011; Santanta, 2013). As a result, inpatient glycemic management has become a priority in many hospitals. Many stakeholders have pushed for improved quality of diabetes care, but most health care facilities have remained suboptimal (Hendrickson et al., 2011). In 2004, the CMS spent $17.4 billion on unplanned hospitalizations (Ahmann, 2004). Health care facilities have become more aware of the impact of untimely and poor treatment of diabetes on the nations' resources. Manchester (2008) reported that between 1980 and 2003, patients being discharged from acute care setting with a diagnosis of diabetes reflected an increase from 2.2 to 5.1 million, a 132% increase in 23 years. In 2007, $116 billion was spent on medical payments for inpatient diabetes care. Poor glycemic management of hospitalized patients is associated with complications that lead to additional treatment time in the hospital (Fowler, 2009; Magaji & Johnston, 2011).

The prevalence of diabetes continues to increase in the U.S., with an estimated 230 million adults living with diabetes (ADA, 2008; Greenfield, Gilles, Porter, Shaw, & Willis, 2011; Johnson & Raterink, 2009). The U.S. cost of diabetes care has risen to $245 billion in 2012, an increased from $174 in 2007 (ADA, 2013). The ADA (2013) best practice guidelines for inpatient glycemic management recommended, in part, that patients admitted to acute health care facilities have diabetes status identified in the medical record, physician's order for blood glucose monitoring, the outcomes available

to all members of the interdisciplinary team, and implementation of systems that prevent and treat hypo/hyperglycemic conditions in admitted patients (ADA, 2013; Connecticut Department of Public Health [CTDPH], 2006). Evidence has shown that targeted glucose control in the acute care setting reflected improved clinical outcomes (ADA, 2013).

The ADA (2013) endorsed Arnold (2010), who asserted that ADA best practice guidelines for inpatient diabetes care standards include in part, a program that incorporates a multidisciplinary approach to care. Integral to this program is documentation of staff education in diabetes management, identification in the medical record that reflects the type of diabetes, blood glucose monitoring protocols, availability of blood glucose results to all team members, individualized plan of care that coordinates insulin, meal delivery systems that correlates with insulin administration, evaluation of hypo/hyperglycemic events and patient education that indicates diabetes survival skills. Entering patient data into a standardized system such as an EMR allows for easy extraction and analysis of the data. The data can be extracted through functions that allow customization of data fields (Plemmons, Lipton, Fong, & Acosta, 2013).

Utilization of inpatient EMR systems have shown improved care in some chronic clinical settings such as diabetes care (O'Connor, 2003). The Electronic Medical Record (EMR) is a collection of electronic patient health information that is accessed by approved users and provides provision for documenting and coordinating delivery of care (Institute of Medicine, 2003[a]). The EMR has been projected as a sustainable solution for improving the quality of medical care and assisting in practitioners' decision-making

(Topaz & Bowles, 2012). Two main challenges that affect the usefulness of the EMR are quality and completeness of available data (Hoffman & Podgurski, 2011).

Electronic medical records are promptly accessible and exceedingly valued in diabetes care (Reed et al., 2012; Santana, 2013). The view of EMR based health care and diabetes management range way beyond the notion of computerized charting (Santana, 2013). From specific clinical records, to population based awareness, the EMR allows practitioners to cursorily and competently access and generate clinical information relating to individual patients. EMR-based clinical decision systems have the capacity to exponentially improve diabetes care through promotion of adherence to evidence based guidelines. Providers reported that implementation and use of the EMR improved essential outcomes of diabetes care, while providing practitioners with real time clinical decision support (Chen, Garrido, Chock, Okawa, & Liang, 2009; Joos, Chen, Jirjis, & Johnson, 2006; Koopman et al., 2011).

EMRs that are fixed with clinical decision systems provide outstanding setups in diabetes disease management (Santana, 2013). Edwards (2013) indicated that the EMR supported improved care, increased patient empowerment and satisfaction, improved coordination of care, and timely access to clinical information. Edwards also noted that policy makers could use information collected from EMR to address health cost and patient needs. Therefore, this program evaluation addressed ADA best practice guidelines incorporated into the EMR to reflect increased A1C result documentation and decrease hyper/hypoglycemic incidence in hospitalized patients.

According to McCullough, Christianson, and Borwornson (2013), clinics that used EMRs achieved better diabetes care outcomes compared to clinics that used traditional paper charts. McCullough et al. also reported the belief that EMRs would improve coordination of care, promote treatment guidelines, simplify tracking of treatments and outcomes, and reduce clients' exposure to risk and unnecessary care. Collecting and analyzing diabetes data through uniform measures, such as the EMR, allows for consistent contribution to diabetes evaluation and improvement outcome (Stonham, Heyes, Owen, & Povey, 2012). The focus of this evaluation was to evaluate the impact of the ADA best practice guidelines incorporated into the EMR to management diabetes care.

Method

The program evaluation was designed to assess whether incorporation of the ADA best practice guidelines in the EMR in a sub -acute setting improved process of care for diabetic patients. Thus, this project aims to ascertain whether staff' management of hypo/hyperglycemic events and patients' A1C results would improve as a result of ADA best practice guidelines education. Data collection included hypo/hyperglycemic events and treatment, identification of type of diabetes, and A1C results 30 days prior and 30 days after the facility implemented ADA best practice guidelines incorporation into the EMR.

Program Evaluation Setting

The program evaluation was conducted at a sub-acute health care facility in Connecticut that provided care to 120 adults. The program evaluation was designed to take advantage of the facility's ADA best practice guidelines incorporated into the EMR by comparing pre- and post-intervention data. The ADA best practice guidelines were already partially a part of the EMR diabetes software. Certified Diabetes Educator (CDE) conducted the ADA best practice guidelines education. Certified Diabetes Educator (CDE) is a certified health care professional with comprehensive knowledge and skills in pre-diabetes and diabetes prevention and management. The CDE is specialized and certified to teach people with diabetes and other health care practitioners how to manage the condition (American Association of Diabetes Educators, 2012). ADA educational information was provided in the event CDEs were not available to provide the education to facility staff. The program coordinator attended all ADA best practice education training sessions to ensure that staff received the same information. The VPO provided the program coordinator collected data on A1Cs, type of diabetes documentation, and hypo/hyperglycemic treatment events to ensure data consistency.

A1C results, identification of type of diabetes, and hypo/hyperglycemic treatment events were collected from the EMR. The data were compared to parts of the ADA best practice guidelines for A1C documentation, identification of diabetes type and hypo/hyperglycemic treatment events in order to assess compliance with ADA best practice guidelines. The goal was to measure the number and treatment of hypo/hyperglycemic episodes, type of diabetes documentation, and A1C results 30 days

before ADA best practice intervention and 30 days after ADA best practice intervention. The data were compared using sum and percentage to determine whether change occurred.

Population

The sample population was a convenience sample of licensed nursing staff who practiced at the facility. The qualifications included diploma, associate, bachelors, and masters prepared licensed nurses from different ethnic backgrounds. Licensed nurses were chosen regardless of gender, race/ethnicity, education level, and socio-economic background. There was no exclusion to the sample. The facility provided the program coordinator with staff participant data that included age, gender, and ethnicity and education level. Staff education prior to the implementation of the ADA best practice guidelines was provided by the facility. After staff education was completed and implemented ADA best practice incorporated in the EMR had been done for six weeks, the VPO provided the program coordinator with collected post staff education data.

The population assessed for outcome of the ADA best practice intervention data was obtained from convenience data sampling of diabetic patients between the ages of 50 to 84 years, admitted to the facility. The patient population was mixed and consisted of elderly, young, and middle aged patients. The facility was located in an inner city neighborhood with a diverse demographic population, which formed the bulk of admissions. This population was chosen because of the incidence of diabetes in the age range 50-84 years. Connecticut adults aged 60 and over have the highest diabetes rates,

compared with adults 18 to 29, who were identified as having the lowest incidence of diabetes (CTDPH, 2006). Over time, age becomes an increased risk factor for diabetes due to complication of the disease secondary to poor glucose management.

The EMR data information were chosen regardless of gender, race/ethnicity, and socio-economic background and a diagnosis of diabetes. The exclusion criteria included hypoglycemic event within 24 hours of admission. The facility intake data demonstrated a rate of 25 to 40 diabetic events that were addressed monthly. The program coordinator used all patient data that fit within the program criteria. The sample size for the project included eight staff members.

Instrument

The program coordinator developed and provided the facility with before and after collection and demographic data audit tools to collect before and after hypo/hyperglycemic events, A1C results data, and type of diabetes of the patients, and staff participant demographic data. The tools were developed specifically for this program because the program coordinator was unable to locate existing applicable tools. A1C results, type of diabetes, and hypo/hyperglycemic events data were compared to specific aspects of the ADA best practice guidelines criteria. The goal was to evaluate the use of ADA best practice guidelines in part, in the EMR. The collected data was extracted from the EMR. Point Click Care (PCC) EMR is an integrated data system that provides health care facilities with comprehensive data review capabilities. It allowed practitioners to quickly collect, store, and access health care data and information readily.

Before and after ADA best guidelines intervention forms. The facility used these forms to collect demographic information from the EMR. The form also collected A1C results, types of diabetes and hypo/hyperglycemic event and treatment data from the EMR. The audit tool collected specific information regarding hypo/hyperglycemic events, to include number of events, duration of events, and timely interventions, in addition to A1C results documentation and type of diabetes. Sums and percentages were used to process the data. The forms were developed specific for this program (Appendix A and D). The tools were used for data collection from the EMR to the calculation data base.

Demographic data form. This tool (Appendix G) was used to collect demographic data of staff such as age, gender, ethnicity, education level and years as a nurse. For this tool the measurement was summed and percentages were recorded and presented.

Human Subject Protection

Primary permission to analyze the program was obtained from Walden University IRB (IRB#06-06-14-0318293). Program related procedures were not initiated until written IRB approval was received. The program coordinator did not have supervisory authority over facility staff. Participants were not coerced to take part in the program.

Findings

The purpose of this program was to determine whether ADA best practice guidelines incorporated into the EMR improved A1C documentation, identified type of

diabetes type and improved hypo/hyperglycemic management during inpatient hospitalization. Specific ADA best guidelines criteria, which were used as the intervention, include A1C results documented upon admission or 24 hours thereafter (baseline), identification of the type of diabetes, and identification of hypo/hyperglycemia events treatment. The collection parameters included: A1C documentation, type of diabetes recorded, treatment of abnormal blood sugar readings, glycemic readings above 180 mg/dl or less than 70 mg/dl and whether hypoglycemic events were rechecked 30 minutes after treatment.

The program goal was to compare A1C results and the number of hypo/hyperglycemic episodes pre- and postimplementation of ADA best practice guidelines intervention and to identify whether A1C documentation, identification of diabetes type, and hypo/hyperglycemic events improved. Therefore, the question for this program evaluation concerned the use of the ADA best practice guidelines incorporated into the electronic medical record (EMR) and whether these best practice guidelines would serve to improve A1C documentation, identify diabetes type, and improve hypo/hyperglycemic management in hospitalized patients?

This program evaluation was conducted to assess the impact of the ADA best practice guidelines incorporated into the EMR in a 120 bed sub-acute facility. The implementation was conducted over a three month period. Nurses' diabetes care documentation in the EMR was evaluated 30 days pre implementation, and 30 days post implementation.

Demographic Data

For the evaluation, demographic information on the nursing participants and the patient population within the evaluation period were collected. The nurse participant data collection included age, gender, ethnicity, and education level. Similarly, the patient data collected included age, gender, ethnicity, and type of diabetes. The data are presented in Tables 2 and 3

Table 4

Nurse Demographic Data (n = 8)

Characteristic	Type	*n*	Percentage (%)
Age in years	Max	59	
	Min	30	
	Average	44.5	
	Median	48	
Gender	Male	2	25%
	Female	6	75%
Ethnicity	African	2	25%
	American	4	50%
	European	1	12.5%
	American	1	12.5%
	Hispanic		
	Other		
Education Level	Associate	3	37.5%
	BSN	3	37.5%
	MSN	1	12.5%
	Diploma	1	12.5%

Table 5
Patient Demographic PreImplementation Data (n=25)

Characteristic	Type	*n*	Percentage (%)
Age In Years	Max	81	
	Min	51	
	Average	63	
	Median	66	
Gender	Male	12	48%
	Female	13	53%
Ethnicity	African American	9	36%
	European	9	36%
	American	5	20%
	Hispanic	2	8%
	Other	0	0%
	Missing Data		
Diabetes	Type 1	0	0%
	Type 2	25	100%
	Other	0	0%

Table 6

Patient Demographic PostImplementation Data (n=25)

Characteristic	Type	*n*	Percentage (%)
Age In Years	Max	87	
	Min	52	
	Average	67	
	Median	66	
Gender	Male	11	44%
	Female	14	56%
Ethnicity	African American	10	40%
	European	9	36%
	American	5	20%
	Hispanic	0	0%
	Other	1	4%
	Missing Data		

Characteristic	Type	*n*	Percentage (%)
Diabetes	Type 1	6	24%
	Type 2	18	72%
	Other	1	4%

Summary of the Findings

The patient collected data were measured in part, in six areas according to the ADA best practice guidelines. The six identified areas were assessed as follows:

1. Type of diabetes
2. Measurement of blood sugar
3. A1C level
4. Hypoglycemic event
5. Hyperglycemic event
6. Adjustment therapy

The research question for this program evaluation was: Does nurses' use of ADA Best Practice Guidelines Incorporated into the Electronic Medical Records Improve Glycemic Management in Hospitals?

To focus on this question, nurses' documentation were reviewed for 30 days, prior to the implementation of the program and 30 days after implementation. Data were extracted from the EMR for each of the identified areas and calculated by sums and percentages. The data were presented according to sum and percentage of staff

documentation of patients' diabetes information for the pre- and postimplementation time frame.

Comparison between the Pre- and post-Data

In this program, the use of the ADA best practice guidelines incorporated into the EMR correlated with improved management of care for diabetes patients. Data were collected and reviewed over a three month time frame from March 2014 to June 2014. Initial implementation of the ADA best practice incorporated into the EMR started in April 2014. This was considered the conversion month. Data were collected 30 days pre and 30 days post implementation month. Nurses' pre intervention data, collected March 2014, were presented using a bar graph (Figure 1). The graph illustrates a predominance of diagnosis of Type 2 diabetes in the patient population, but a general lack of documentation of A1C and low levels of both glycemic events as well as intervention to events in the pre implementation time period. Data suggest poor documentation and over-diagnosis of undocumented Type 2 disease.

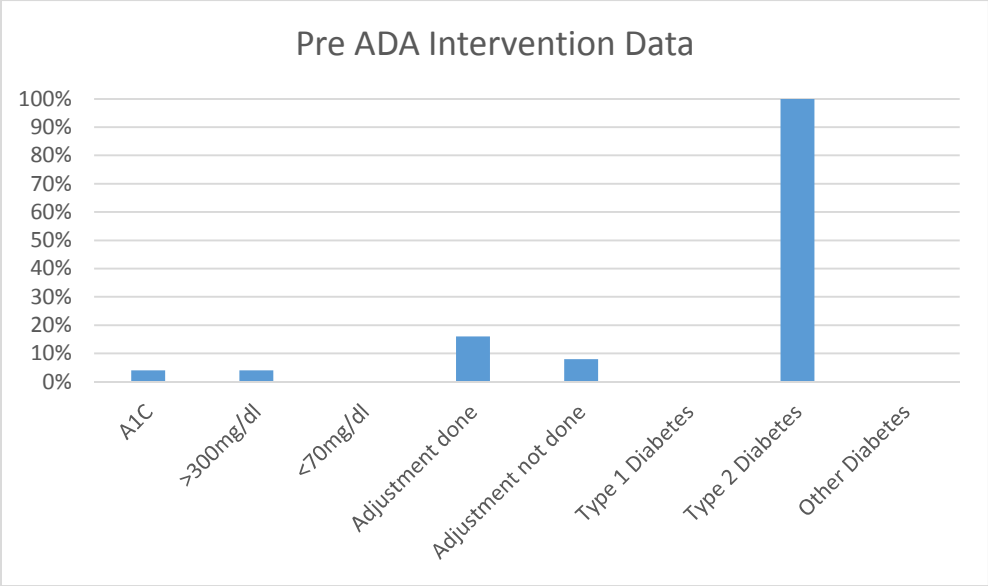

Figure 4. Pre ADA Intervention Data

Review of the post program data reflected improvement in the documentation of A1C, increased intervention to glycemic events, and more accurate diagnosis and documentation of diabetes type (Figure 2).

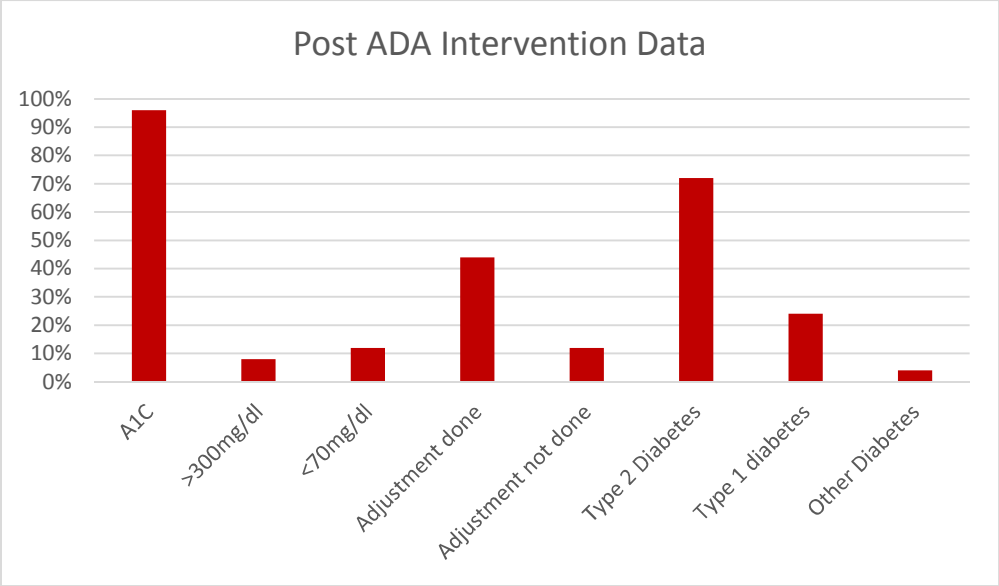

Figure 5 Post ADA program data

Figure 3 shows the pre- and post-data together on the same graph for comparison. From the graph, the substantial increase in documentation of A1C is most notable in addition to increases in adjustment therapy. Although an increase in adjustment is noted, the relatively low glycemic event data in the pre ADA intervention data limits the visible impact of the program in this regard. Diagnosis and documentation of the different types of diabetes also demonstrates improvement.

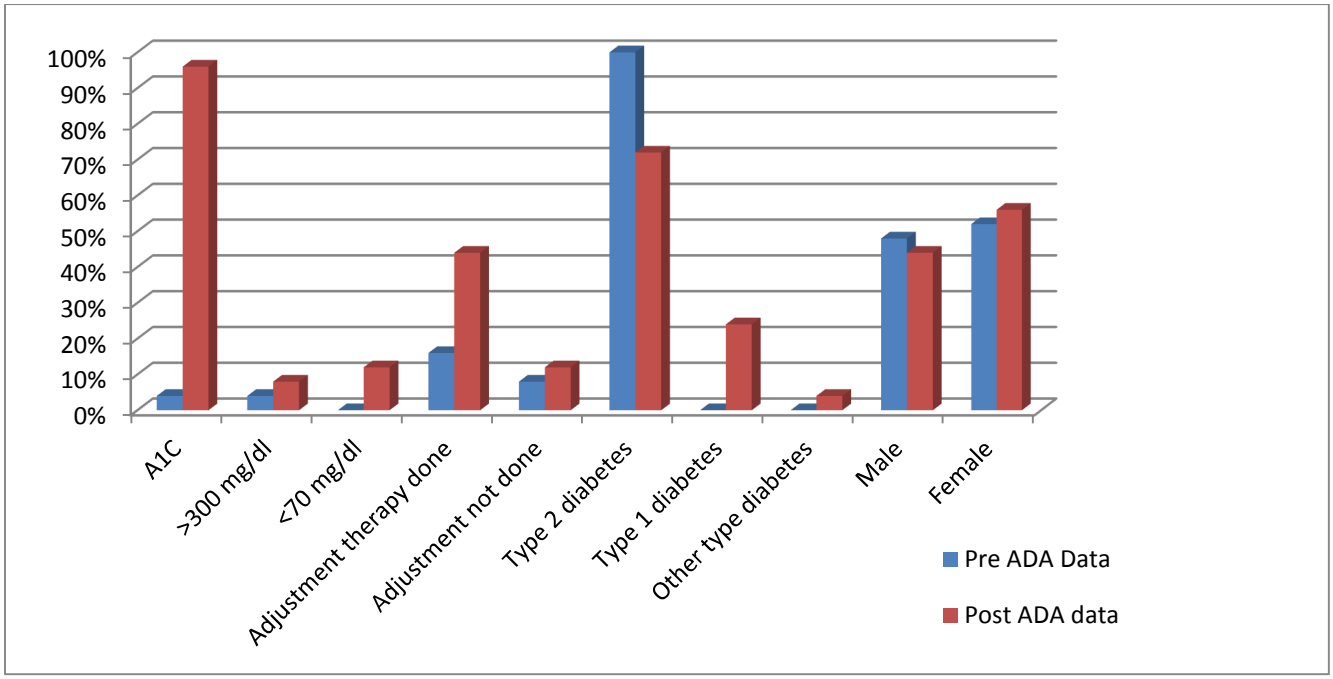

Figure 6 Comparison graph showing pre- and post-outcome data.

Thus, from the data, the implementation of the ADA program has supported substantial gains in A1C documentation of glycemic events that support improved patient care in terms of monitoring and adjusting therapy as needed for diabetic patients. Appropriate diagnosis and documentation of the different types of diabetes also showed improvement in the postimplementation period.

Implications

The findings reflected that study patients in the pre- and post-samples had similar age and gender characteristics. Further review indicated that the preimplementation patient outcome data were collected from patients that were all identified with Type 1

diabetes, compared to the postimplementation outcome data, which consisted of data collected from patients who were diagnosed with different types of diabetes. The post outcome data revealed significantly improved documentation for the different types of diabetes. This could mean that staff utilized the education regarding the EMR/ADA best practice guidelines, which suggested accurate documentation of the patient's diabetes diagnosis. Post implementation data showed an increase in interventions to correct abnormal glycemic events, which implied staff compliance with the implemented ADA/EMR system. The results of the evaluation further indicated improved documentation of patients' A1C (96%). This improvement may have supported the increase in appropriate diagnosis and documentation of diabetes type. Hypoglycemic (BS < 70 mg/dl) and hyperglycemic (BS > 300 mg/dl) events also increased in the postimplementation period with increases in adjustment therapy: blood sugar >300mg/dl range (8 %), and adjustment therapy (44%), with 12 % not afforded adjustment therapy and <70 mg/dl range (12%). A breakdown of the data identified improved staff documentation of types of diabetes, diagnosis of Type 2 (72%), diagnosis Type 1(24 %), and not Type 1 or Type 2 (4%). With appropriate diagnosis and documentation, health care improvements were actualized through provision of appropriate care, such as providing adjustment therapy. These results support that the use of the ADA/EMR system supported improved diabetes care documentation.

According to the results of this evaluation, the EMR has the potential to improve diabetes care documentation, which may imply or lead to improved outcome. The ADA

best practice guidelines, when incorporated into the EMR, reflected an improvement in staff documentation of diabetes care. Hypo/hyperglycemic events and treatment interventions were better monitored with the utilization of the EMR. McCullough et al. (2013) and the IOM (2003b) revealed that the EMR facilitated coordination of care, improved treatment and decreased patient exposure to unnecessary care. O'Connor (2010) further identified that one of the major outcomes of EMR implementation is improvement of health care quality. The ADA best practice guidelines incorporated into the EMR is needed in the current health care environment to foster patient autonomy regarding care and to support practitioners' use of standardized data. The use of the best practice guidelines, therefore, will decrease the cost of diabetes care and provide uniformity.

Shared information on current health care practice is significant to quality improvement pursuit (Mayfield et al., 1994). Electronic medical record systems are used to improved care through documentation, communication of clinical information, and measurement of productivity (O'Connor, 2003). The EMR has been used to provide prompts to health care practitioners regarding timeliness of A1C and indication whether the patients had achieved designated goals (Meigs et al., 2003; Montori & Smith, 2001; O'Connor, 2003). The EMR can be used to apply guidelines, such as staged diabetes management, and to suggest a clinical pathway for the identified patient (Bodenhumer, Wagner, & Grumbach, 2002). The use of EMRs can be an effective tool in providing patient education because of access to customized information (O'Connor et al., 2005).

Healthy People 2020 goals for diabetes include the reduction of economic cost of the disease and improved quality of life for diabetic patients (Healthy People, 2020). Reduction in the death rate due to diabetes will occur secondary to improved glycemic management of the disease. The most important goal is to decrease the number of diabetics with A1C greater than 9%. Having A1C under 9% will decrease complications associated with diabetes, which will increase quality of life for these patients.

Limitations

The utilization of a before and after one group design, without the benefit of a control group, may have posed limitations to the program. The facility's financial hardship may also have impacted care outcome due to staffing patterns. Staff turnover rate and continuity of care may have affected the outcome, as low staffing ratio correlates with poor patient outcome (Ahmann, 2004). The testing of only one version of EMR may have impacted the outcome because of variations in end user utilization of the product. Other EMRs may have components that better correlate to the delivery of diabetes care than the system utilized for this program.

Notes

Conflict of interest: none reported

References

The Affordable Care Act (ACA) health care law. (2010). Retrieved from http://www.hhs.gov/healthcare/rights/law/index.html

Agency for Healthcare Research and Quality. (2008). *Plan-do-study-act (PDSA) cycle*. Retrieved from https://www.innovations.ahrq.gov/content.aspx?id=2398

Agency for Health Care Research and Quality (AHRQ) (2005). *Economic and health cost s of diabetes*: *HCUP Highlight 1*. (Publication No. 05-0)

Ahmann, A. (2004). Reduction of hospital costs and length of stay by good control of blood glucose levels. *Endocrine Practice Journal*, *10*(2), 53-6. Retrieved from http://www.ncbi.nlm.nih

Al-Azmi, S., Al-Enezi, N., & Chowdhury, R. (2009). User's attitude to an electronic medical record system and its correlates: A multivariate analysis. *Health Information Management Journal*, *38*(2):33-40. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19546486

American Association of Colleges of Nursing. (2006). *Advancing higher education in nursing practice*. Washington, DC: Author. Retrieved from http://www.aanc.nche.edu/DNP/pdf/Esentials.pdf

American Association of Diabetes Educators. (2012a). Position statement: Diabetes inpatient management. *The Diabetes Educator*, *38*(1), 142-145. doi:10.1177/0145721711431929

American College of Endocrinology and American Diabetes Association. (2006). Consensus statement on inpatient diabetes and glycemic control. *Endocrine Practice Journal,* 12,458-468. Retrieved from http://www.keepthefaith1296.com/parkinsons/american-college-of-endocrinology-and-american-diabetes-association-consensus-statement-on-

American Diabetes Association. (2008). Economic costs of diabetes in the U.S. in 2007. *Diabetic Care*, *31*(3), 596-615. doi:10.233. 7/dc08-9017

American Diabetes Association. (2012). Standards of medical care in diabetes-2012. *Diabetes Care*, *30*(1) S11-S63. doi:10.2337/dc12-5011

American Diabetes Association. (2013). Diabetes care. *The Journal of Clinical and Applied Research and Education, 36*(1), (Suppl 1) s45-s50. Retrieved from https://www.Diabetes.org/DiabetesCare

American Heart Association. (n.d.). *Women, heart disease and stroke.* Retrieved from: http://www.americanheart.org/presenter.jhtml?identifier=478

Arnold, P. (2010). *The Joint Commission inpatient diabetes certification*. Retrieved from http://www.bing.com/search?q=Pam+arnold+the+joint+commission+inpatient+

Blumenthal, D., & Tavenner, M. (2010). The meaningful use of regulation for electronic health records. *New England Journal of Medicine*, *363*(6),501-504. doi:10.1056/NEJMp1006114

Bodenhumer, T., Wagner, E., & Grumbach, K. (2002). Improving primary care for patients with chronic illness: The chronic care model, Part 2. *JAMA, 288*(15), 1909-14. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12377092

Brancati, F. L., Whelton, P. K., Kuller, L. H., & Klag, M. J. (1996). Diabetes mellitus, race, and socioeconomic status. A population-based study. *Annals of Epidemiology, 6*(1), 67-73. Doi:http://dx.doi.orj/10.10161

Bu, D., Pan, E., Walker, J., Adler-Milstein, J., Kendrick, D., Hook, J. M., . . ., Middleton, B. (2007). Benefits of information technology-Enabled diabetes management. *Diabetes Care*, *30*(5), 1137-1142. doi: 10.2337/dco6-2101

Burns, N., & Grove, S. (2009). *The practice of nursing research*. (6th edition). St. Louis, MO: Saunders.

Cebul, R. D., Love, T. E., Jain, A. K., & Hebert, C. J. (2011). Electronic health records and quality of diabetes care. *New England Journal of Medicine, 365*(9), 825-833. doi:10.1056/NEJMsa1102519

Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System (BRFSS) Program. (2010). 2009 United States BRFSS Data. Atlanta, GA: Author. Retrieved from http://www.cdc.gov/brfss

Centers for Disease Control and Prevention. (2011). National diabetes fact sheet. Retrieved from http://www.cdc.gov/diabetes

Center for Disease Control and Prevention. (2012). *Program evalua*tion. Retrieved from http://www.cdc.gov/eval/framework/index.htm

Center for Medicare & Medicaid Services. (n.d.). *eHealth initiatives*. Retrieved from http://www.cms.gov/eHealth/downloads/eHealth-Fact-Sheet.pdf

Clement, S., Braithwaite, S., et al. (2004). American Diabetes in hospitals writing committee. Management of diabetes and hyperglycemia in hospitals*, 27*, 533-591. doi:10.2337/dc13-S011

Coats, A., & Marshall, D. (2013). Inpatient hypoglycemia: A study of nursing management. *Nursing Praxis in New Zealand*, 29(2), 15-24.

Connecticut Department of Public Health (2005). *Diabetes Prevalence in Connecticut, 2002-2004*. Retrieved from http://www.dph.state.ct.us/PB/HISR/BRFSS_Diabetes_prev.pdf

Connecticut Department of Public Health. (2006). *The burden of diabetes in Connecticut: 2006 surveillance report.* Retrieved from http: //www.ct.gov/dph/lib/dph/hisr/pdf/Diabetes_surveillance_2006CT. pdf

Connecticut Department of Public Health, Behavioral Risk Factor Surveillance System (BRFSS) Program. (2010). *2007-2009 BRFSS Survey Data*. Retrieved from http://www.ahrq.gov/data/hcup/highlight1/high1.pdf

Connolly, V., N., Unwin, P., Sherriff, R., Bilous, & Kelly, W. (2000). Diabetes prevalence and socioeconomic status: A population based study showing increased prevalence of type 2 diabetes mellitus in deprived areas. *Journal of Epidemiology and Community Health* 54(3). Doi:10.1136/jech.54.3.173

Crosson, J., Ohman-Strickland, P., Hahn, K. A., DiCicco-Bloom, B., Shaw, E., Orzano, A. J., & Crabtree, B. I. (2007). Electronic medical record and diabetes quality of care. Results from a sample of family medical practices. *Annals of Family Medicine*; 5(3), 209-215. doi:10.1370/afn.696

Down, S. (2013). Pattern management for glucose control. *Practice Nurse*, *43*(3), 28-31. Retrieved from http://ehis.ebscohost.com.ezp.waldenlibrary.org/ehost/delivery?sid=9a68ad63-

Dorr, D., Bonner, L. M., Cohen, A. N., Shoai, R. S., Perrin, R., Chaney, E., & Young, A. S. (2007). Information systems to promote improved care for chronic illness: A literature review. *Journal of American Medical Informatics*, *14*, 156-163. doi:10.1197/jamia.M2255

Edwards, C. (2012). Nursing leaders serving as a foundation for the Electronic Medical Record. *Journal of Trauma Nursing*, *19*(2), 111-116. doi:10.1097/JTN.0b013e31825629db

Edwards, E. (2013). Electronic record-keeping: Potential benefits and reasons for caution. *British Journal of Neuroscience Nursing*, *9*(5), 252-253.

eHealth. (2011). New report shows care coordination model positively impacts people living with type 2 diabetes and heart disease (Press Release eHealth Initiative US.GLA.11.05.263). Retrieved from www.ehealthinitiative.org

Evans, M. (2010). Evidence based practice protocol to improve glucose control in individuals with type 2 diabetes mellitus. *MEDSURG Nursing*, *19*(5):317-322. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/21337987

Fayez, S. (2011). Needs chain model. American Evaluation Association. Retrieved from http://comm.eval.org/resources/viewdocument/?DocumentKey=86d43b5d-f260-40d1-bc5a-befd9a17d956

Fowler, M. (2009). Inpatient diabetes management. *Clinical Diabetes*, *27*(3), 119-122. doi:10.2337/diaclin.12.3.119

Gertler, P., Martinez, S., Premand, P., Rawlings, L. B., & Vermeersch, C. M. J. (2011). *Impact evaluation in practice*. Washington, DC: The World Bank. Retrieved from http://document.worldbank.org/curated/en/2010/01/13871146/evaluation-practice

Greenfield, C., Gilles, M., Porter, C., Shaw, P., & Willis, K. (2011). It's not just about the HbA1c, Doc! Understanding the psychosocial is also important in managing diabetes? *Australian Journal of Rural Health*, *19*, 15-19. doi:10.1111/j.1440-

Griffis, S., Morrison, N., Beauvais, C., & Bellefountaine, M. (2007). Identifying the continuing diabetes education needed in acute care nurses in Northern Ontario. *Canadian Journal of Diabetes*, *31*(4), 37. Retrieved from http://www.diabetes.ca/Files/NMorrison--Nov302007.pdf1-377

Hallinan, C. M. (2010). Program logic: A framework for health program design and evaluation—the Pap nurse in general practice program. *Australian Journal of Primary Health*, *16*(4), 319–325.

Healthy People 2020. *Diabetes.* Retrieved from http://www.healthypeople.gov/2020/topicsobjectives2020/nationaldata.aspx?topic

Hendrickson, K., Bozzo, J., Zimkus, J., Scorel, K., Maerz, L., Balcezak, T., & Inzucchi, S. (2011). Evaluating inpatient glycemic management: The quality hyperglycemia score. *Diabetes Technology & Therapeutics, 13*(7), 753-758. doi:10.1089/dia.2010.0252

Hodges, B., & Videto, D. (2011). *Assessment and planning in health programs. S*udbury, MA: .Jones& Bartlett Learning.

Hoffman S., & Podgurski, A. (2011). Improving health care outcomes through personalized comparison of treatment effectiveness based on electronic health record. *Journal of Law, Medicine & Ethics*, *39*(3), 425-436. doi:10.1111/j.1748-720x.2011.00612.x

Hussain, A. (2011). Meaningful use of information: A local perspective. *American College of Physicians*, *154*(10), 690-692. Doi:10.7326/003-4819

Hynes, M. M., Mueller, L. M., Li, H., & Amadeo, F. (2005). *Mortality and its risk factors in Connecticut, 1989-1998.* Hartford, CT: Connecticut Department of Public Health. Retrieved from http://www.dph.state.ct.us/OPPE/Mortality/mortalityriskfactors.htm

Institute of Medicine. (2003a). *Patient safety achieving a new standard of care*. Retrieved from http://www.bing.com/search?q=institute+of+medicine+2003&form=IE10TR&src

Institute of Medicine. (2003b). *Key capabilities of an Electronic Health Record system: Letter Report*. Washington, DC: Institute of Medicine of the National Academies, retrieved from http://www.nap.edu,2003:31

Institute of Medicine. (2010). *Future of nursing: Leading change, advancing health*. Retrieved from http://www.iom.edu/~/media/Files/Report%20Files/2010/The-Future-of-Nursing/Future%20of%20Nursing%202010%20Recommendations.pdf

Joos, D., Chen, Q., Jirjis, J., & Johnson, K. B. (2006). An electronic medical record in primary care: Impact on satisfaction, work efficiency and clinic processes. *AMIA 2006 Symposium Proceedings*, 394-398. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1839545

Koopman, R. J., Kochendorfer, K. M., Moore, J. L., Mehr, D. R., Wakefield, D. S., Yadamsuren, B., . . . , Belden, J. L. (2011). A diabetes dashboard and physician efficiency and accuracy in accessing data needed for high-quality diabetes care. *Annals of Family Medicine*, *9*(5), 398-405.

Kotter, J. (1996). *Leading the change.* Boston, MA: Harvard Business Press.

Laschinger, H. (2009). The impact of unit leadership and empowerment on nurses' organizational commitment. *The Journal of Nursing Administration*, *39*(50), 228-235. doi:10.1097/NNA.0b013e3181a23d2b

Lien, L., Cox, M., Feinglos, M., & Corsino, L. (2011). Glycemic control in the hospitalized patient (1st ed.). New York: Springer Science +Business Media.

MacPhail, L. H., Neuwirth, E. B., & Bellows, J. (2009). Coordination of diabetes care in four delivery models using an electronic health record. *Medical Care*, *47*(9), 993-999. doi:10.1097/MLR.0b013e31819e1ffe

Manchester, C. (2008). Diabetes education in the hospital: Establishing professional competency. *Diabetes Spectrum*, 21(40), 268-271. doi:10.2337/diaspect.21.4.268

Mayfield, J. A., Rith-Najarean, S. J., Acton, K. J., Schraer, C. D., Stahn, R. M., Johnson, M. H., & Gohdes, D. (1994). Assessment of diabetes care by medical record review: The Indian Health Service model. *Diabetes Care, 17*(8), 918-923. doi:10.2337/diacare.17.8.918

McBryde-Foster, M. J. (2005). Break-even analysis in a nurse-managed center. *Nursing Economics*, *23*(1), 31–34.

McCullough, J., Christianson, J., & Borwornson, L. (2013). Do electronic medical records improve diabetes quality in physician practices? *American journal of Managed Care*, *19*(20), 144-149.

Meigs, J. B., Cagliero, E., Dubey, A., Murphy-Sheehy, P., Gildesgame, C., Chueh, H., . . . , Nathan, D. M. (2003).A controlled trial of web based diabetes disease management: The MGH diabetes primary care improvement project. *Diabetes Care*, *26*(3), 750-757. doi:10.2337/diacare.26.3.750

Moghissi, E., Korytkowski, M. T., DiNardo, M., Einhorn, D., Hellman, R., Hirsch, I. B., . . . , Umpierrez, G. E. (2009). American Association of Clinical Endocrinologist

and American Diabetes Association consensus statement on inpatient glycemic control. *Diabetes Care, 32*(6), 1119-1131. doi:10.2337/dc09-9029

Montori, S., & Smith, A. (2009). A treatment decision aid may increase patient trust in the diabetes specialist. *Health Expectation, 12*(1), 38-44. doi:10.1111/j.1369-7625.2008.00521.x

New England Journal of Medicine. (2004). Medical definitions. Retrieved from http://www.medterms.com/script/main/art.asp?articlekey=33263

O'Connor, P. (2003). Electronic medical records and diabetes care improvement. *Diabetes Care*, *26*(3), 942-943. doi:10.2337/diacare.26.3.942

O'Connor, P. J., Crain, A. L., Rush, W. A., Sperl-Hillen, J. M., Gutenkauf, J. J., & Duncan, J. E. (2005). Impact of an electronic medical record on diabetes quality of care. *The Annals of Family Medicine, 3*(4), 300-306. doi:10.1370/afm.327

O'Connor, P. (2010). Using electronic health records to improve outpatient diabetes care. *Diabetes Spectrum, 23*(3), 146-148. doi:10.2337/diaspect.23.3.146

O'Connor, P. J., Speri- Hillen, J. M., Rush, W. A., Johnson, P. E., Amundson, G. H., Asche, S. E., . . . , Gilmer, T. P. (2011). Impact of EHR clinical decision support in diabetes care: A randomized trial. *Annals of Family Medicine*, *9*(1), 12-21. doi:10.1370/afm.1196

Orzano, J., Ohman-Strickland, P., Tallia, A. F., Hudson, S., Balasubramanian, B., Nutting, P. A., & Crabtree, B. F. (2007). Improving outcomes for high risk

diabetes care using information system. *Journal of American Board of Family Medicine*, *20*(30), 245-251. doi:10:3122/jabfm.2007.0

Plemmons, S., Lipton, B., Fong, Y., & Acosta, N. (2012). Measurable outcomes from standard nursing documentation in an electronic health record. *American nursing Informatics Association*. Retrieved from http://omahasystemmn.org/data.php

Polit, D. (2010). *Statistics and data analysis for nursing research*. Upper Paddle River, NJ: Pearson Education Inc.

Rasekaba, T. M., Graco, M., Risteski, C., Jasper, A., Berlowitz, D. J., Hawthorne, G., & Hutchinson, A. (2012). Impact of diabetes disease management program on diabetes control and patient quality of life. *Population Health Management, 15*(1), 12-19. doi:10.10.1089/pop.2011.0002

Reed, C., Richa, J. M., Berndt, A. E., Beadle, R. D., Gerhardt, S. D., Stewart, R. & Corneille, M. (2012). Improving glycemic control with the adjunct use of data management software programs. *American Association of Critical Care Nurses*, *23*(4), 362-369. doi:10.1097/NCI.0b013e31825d5dc8

Robbins, J. M., Vaccarino, V., Zhang, H., & Kasl, S. V. (2000). Excess type 2 diabetes in African American women and men aged 40-74 and socioeconomic status: Evidence from the Third National Health and Nutrition Examination Survey. *Journal of Epidemiology and Community Health, 54*(11), 839-845. Doi:10.1136/jech.54.3.173

Rogers, S. (2008). Inpatient care coordination for patients with diabetes. *Diabetes Spectrum*, *21*(4), 272-275. doi:10.2337/diaspect.21.4.272

Santanta, S. (2013). Diabetes population management with an electronic health record. *Online Journal of Nursing Informatics*, *17*(1). Retrieved from htpp://ojni.org/issues/?p=2378

Satlin, M., Hoover, D., & Glesby, M. (2011). Glycemic control in HIV- Infected patients with diabetes mellitus and rates of meeting American Diabetes association management guidelines. *AIDS Patients Care and STDs*, *25*(1). doi:10.1089/apc.2010.0237

Scott, J. T., Rundall, T. G., Vogt, T. M., & Hsu, J. (2005). Kaiser Permanente's experience of implementing an electronic medical record: A qualitative study. *British Medical Journal, 331*(7528), 1313-1316. doi:10.1136/bmj.38638.497477.68

Sharma, A., Lanum, M., & Suarez-Balcazar, Y. (2000). *A community needs assessment guide*. Retrieved from http://www.docstoc com/docs/11855157/A-Community-Needs-Assessment-Guide

Sperl-Hillen, J. M., Averbeck, B., Palattao, K., Amundson, J., Ekstrom, H., Rush, B., & O'Connor, P. (2010). Outpatient EHR-based diabetes clinical decision support that works: Lessons learned from implementing diabetes wizard. *Diabetes Spectrum, 23*(3), 150-154. doi: 10.2337/diaspect.23.3.150

Stonham, G. (2012). Measuring the nursing contribution using electronic records. *Nursing Management, 19*(8), 28-32. Retrieved from http://dx.doi.org/10.7748/nm202.19.8.2869447

Topaz, M., & Bowles, K. H. (2012). Electronic health record and quality of care: Mixed results and emerging debates. *Online Journal of Nursing Informatics*, *16*(1). Retrieved from http://ojni.org/issues/?p=1262

U. S. Department of Health and Human Services. (2009). *Healthy People 2020 framework.* Retrieved from http://www.healthypeople.gov/hp2020/Objectives/framework.aspx

Valen, M. S.**,** Narayan, S., & Wedeking, L. (2012). An innovative approach to diabetes education for a Hispanic population utilizing community health workers. *Journal of Cultural Diversity, 19*(1),10-7.

Warrington, L., Ayers, P., Baldwin, A. M., Wallace, V., Riche, K. D., Saulters, R., . . ., Butler, K. (2012). Implementation of a pharmacist-led, multidisciplinary diabetes management team. *American Journal of Health-System Pharmacy, 69*(14), 1240-1245. doi:10.2146/ajhp110297

Woods, N., & Magyary, D. (2010). Translational research: Why nursing's interdisciplinary collaboration is essential. *Research and Theory for Nursing Practice: An International Journal*, *24*(1), 9-24. doi:10.1891/1541-6577.24.1.9

Zaccagnini, M. E., & White, K. W. (2011). *The doctor of nursing practice essentials: A new model for advanced practice nursing.* Sudbury, MA: Jones & Barlett Publishers.

Appendix A

Pre ADA Intervention Collection Form

Type of diabetes Ty1=1 T2=2 O=3	Age	Sex M=1 F=2	Race B=1 W=2 O=3 H=4	Admit date	blood sugar(BS)	A1C Y=1 N=2	Hypoglycemia Events <70(BS) Y=1 N=2	Hyperglycemia Events >300(BS) Y=1 N=2	Adjustment Therapy Y=1 N=2
2	81	1	2	3/5/14	165	2	2	2	2
2	76	1	1	3/1/13	273	2	2	2	1
2	62	2	1	3/6/13	107	2	2	2	2
2	55	1	2	3/12/13	96	2	2	2	2
2	68	1	2	3/20/13	213	2	2	2	1
2	56	2	3	3/16/14	72	2	2	2	2
2	70	2	4	3/27/13	81	2	2	2	2
2	52	2	1	3/22/14	76	2	2	2	2
2	60	2	3	3/4/13	83	2	2	2	2
2	58	2	2	3/28/14	161	2	2	2	2
2	57	2	2	3/29/14	250	2	2	2	1
2	80	1	1	3/20/14	182	2	2	2	2
2	66	1	1	3/18/14	136	1	2	2	2
2	51	1	4	3/24/14	141	2	2	2	2
2	59	2	4	3/19/14	77	2	2	2	2
2	57	2	4	3/13/14	110	2	2	2	2
2	71	2	1	3/15/13	161	2	2	2	2
2	60	2	1	3/3/14	101	2	2	2	2

2	79	2	2	3/22/14	91	2	2	2	2
2	56	2	2	3/15/14	139	2	2	2	2
2	77	1	4	3/23/13	96	2	2	2	1
2	62	1	2	3/6/14	437	2	2	1	2
2	53	1	2	3/24/13	84	2	2	2	2
2	65	1	1	3/8/13	90	2	2	2	2
2	54	1	1	3/9/14	256	2	2	2	2

Appendix B

Summary of the ADA Best Practice Guidelines

(Provided to facility staff)

Topic: Diabetes Management

Objectives:

Definition of diabetes

Rational and blood sugar targets for optimal glucose control in hospital setting

Identify the roles of oral agents and insulin in the treatment of diabetes

Formulate strategies to educate patients regarding diabetes self-management

- Diabetes statistics general, state, facility
- Criteria for diagnosis
- What is pre-diabetes?
- Different types of diabetes
- Hemoglobin A1C
- Reasons for keeping glucose on target
- Outcome of unmanaged glucose
- Out -patient target goals for people with diabetes
- In-patient goals for blood glucose
- Challenges faced in the inpatient setting
- Use of insulin in the inpatient setting
- Types of insulin
- Correction or supplemental dose
- Insulin drips
- Acute complication of diabetes
- Hypoglycemia
- Sign and symptoms of hypoglycemia
- Treatment of hypoglycemia
- 15-15 Rule
- Oral hypoglycemia treatment
- NPO status
- Impact of NPO status
- Factors that raise blood glucose

- How does altered health affect blood glucose
- Impact of medication on blood glucose
- Impact of feedings on blood glucose level
- Patient education

Appendix C

Summary of the Inpatient ADA Best Practice Guidelines

- Specific staff education requirements (Education must be provided by CDE).
- Written blood glucose monitoring protocols
- Plans for the treatment of hypoglycemia and hyperglycemia
- Data collection of incidences of hypoglycemia
- Patient education on self-management of diabetes
- An identified program champion or program champion team

(ADA, 2013).

Appendix D

Post ADA Intervention Collection Form

Type of diabetes Ty1=1 T2=2 O=3	Age	Sex M=1 F=2	Race B=1 W=2 O=3 H=4	Admit date	blood sugar (BS)	A1C Y=1 N=2	Hypoglycemia Events <70(BS) Y=1 N=2	Hyperglycemia Events >300(BS) Y=1 N=2	Adjustment Therapy Y=1 N=2
2	79	1	1	5/28/14	86	1	2	2	2
2	76	2	1	5/16/14	208	1	2	2	1
2	52	2	1	5/9/14	121	1	2	2	2
2	58	2	2	5/23/14	224	1	2	2	1
1	58	2	4	5/19/14	93	1	2	2	2
1	81	1	1	5/7/14	245	1	2	2	1
2	69	1	2	5/18/14	61	1	1	2	2
2	85	2	2	6/2/14	345	1	2	1	1
2	80	2		5/28/14	76	1	2	2	2
1	54	1	4	5/11/14	230	1	2	2	1
2	76	1	1	5/22/14	131	1	2	2	2
2	70	1	1	5/9/14	43	1	1	2	2
2	61	2	2	5/23/14	199	1	2	2	2
2	*77*	2	4	5/24/14	218	1	2	2	2
2	*66*	2	1	5/29/14	177	1	2	2	1
2	83	1	2	5/10/14	253	1	2	2	1
1	62	1	2	5/19/14	177	2	2	2	2
2	55	1	2	5/15/14	262	1	2	2	2
2	69	1	1	5/11/14	342	1	2	1	1
2	87	2	2	6/5/14	28	1	1	2	1
1	51	2	2	5/21/14	101	1	2	2	2
1	68	1	1	5/18/14	215	1	2	2	1
2	60	2	1	5/26/14	89	1	2	2	2
2	62	2	4	5/28/14	64	1	1	2	2
3	56	2	4	5/6/14	50	1	1	2	1

Appendix E

Data Collection Plan

First	ACTIVITY	PLAN START	PLAN DURATION
	Review EMR	1	1
	Review EMR	1	1
Second	ADA/CDE in-service	1	1
	In-service staff	1	1
	implement EMR/ADA	1	1
	implement EMR/ADA	1	1
Third	Review EMR	1	1
	Review EMR	1	1
	Data comparison	1	1
	data comparison	1	1
	data comparison	1	1
	data comparison	1	1

Appendix F

Data Use Agreement

This Data Use Agreement ("Agreement"), effective as of 5/30/14 is entered into by and between Jennifer Benjamin") and Aurora Corporation. The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in research in accord with the HIPAA and FERPA Regulations.

1. Definitions. Unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the "HIPAA Regulations" codified at Title 45 parts 160 through 164 of the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Aurora Healthcare Management LLC, shall prepare and furnish to Data Recipient in accord with any applicable HIPAA or FERPA Regulations. Collected data from the EMR will include A1C, types of diabetes, hypo/hyperglycemic events and treatments. Collected data from staff participants will include age, education level, gender and ethnicity.

3. Data Fields in the LDS. No direct identifiers such as names will be included in the Limited Data Set (LDS). In preparing the LDS, Aurora Healthcare Management LLC shall include the ethnicity, gender, education level, medical diagnosis, blood sugar monitoring, hypo/hyperglycemic events, treatments, diabetes types and A1C results.

4. Responsibilities of Data Recipient. Data Recipient agrees to:

    a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

    b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

    c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

    d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or

disclosure of the LDS that apply to Data Recipient under this Agreement; and

e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

5. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS for its Research activities only.

6. Term and Termination.

a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

7. Miscellaneous.

a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or

regulations, either Party may terminate this Agreement as provided in section 6.

b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

DATA PROVIDER	**DATA RECIPIENT**
Signed:	*Signed:*
Print Name: Lara Alatise	Print Name: Jennifer Benjamin
Print Title: Vice President of Operations	Print Title: Student

Appendix G

Demographic Data for Staff

A. Age_30-59__ B. Gender (1) Female__6____ (2) Male__2____

C. Race_____ (1) European American__4___ (2) African American _2_____ (3) Asian__1_____ (4) Hispanic _1____ (5) American Indian_0_____ (

D. Education (1) AA__3_____ (2) Diploma __1_____ (3) BSN __3_____

(4)MSN_____1_ (5) PhD/DNP_____0_____ (6) APRN __0_____

Jennifer C. Benjamin, MSN, DNP(c) RN, CLNC, CCHP

- Cell: (860) 670-2820
- Email: Benjaminclnc@yahoo.com

PROFESSIONAL EXPERIENCE:

Doctoral Practicum
2013-2014

Director of Out-Patient Mental Health Clinic

Staffier's Associates, INC.

Westborough M.A.

- Responsible for departmental budgets
- Directed and lead quality initiatives through planning, execution and communication to relevant stakeholders
- Formally designated clinical educators as leadership members by expanding scope of responsibility
- Redesigned job descriptions to align with scope and practice standards for nurse clinician
- Supported and implemented new performance review metric
- Review ,audit, update and implement Electronic Medical Record

Quality and Safety

- Review Corrective action plan of health care facilities for implementation of Plan of Corrections for regulatory violations, citation and deficient health practices

from the MA. Department of Public Health and Centers for Medicare and Medicaid Services
- Patient Care Services (PCS) Operations Identified regulatory gaps and patient safety issues with immediate resolution
- Designed and implemented policy, procedure and protocol process that incorporated the review of clinical practice standards and evidence-based literature
- PCS policy, procedure and protocol approval process through shared governance
- Shared governance structure
- Revitalized practice and education committee by creating vision statements and bylaws

State and Federal Health Care Compliance Officer **2000 - Present**

Department of Public Health, Hartford, CT

Nurse Consultant

- Investigate consumer complaints against long term care facilities
- Analyzes complaints for possible violation of state statutes, regulations and guidelines
- Leads case review; reviews medical records and consults with treating physician and other medical experts to build cases for non-compliance under Connecticut law
- Interviews consumers, families and providers to collect facts related complaint/reportable events
- Provides consultation to state licensed health care facilities and institutions and to unlicensed facilities to bring them into compliance with statutes
- Community institutions and individuals regarding planning, implementation and evaluation of nursing services, and specialized problems in public health

- Performs independent and/or team on-site inspection surveys of health care facilities and provides consultation regarding licensure and certification laws, regulations and policies
- Evaluates quality of services rendered by facility; monitors facilities during strikes prepares relevant federal and state forms and reports
- Testified in court as an expert witness for the department of Corrections
- Identifying substandard surveys
- Identifying immediate jeopardy(IJ)

Quality and Safety:

- Troubling shooting Quality Indicator Survey to improve electronic survey efficiency
- Reviewing long term care providers' violations and citations to ensure implementation of plan of corrections for Public Health and Centers for Medicare and Medicaid Services
- Savings and transformation Steering Committee member
- Team building and communication member
- Review electronic Medical Records

- ***Staffing/Scheduling:***
  - Responsible to team lead long term care surveys monthly
  - Liaisons between long term care providers and State Agency
  - Coordinated long term care surveys to ensure compliance with state and federal regulations
  - Supported and trained new surveyors

Veteran's Hospital
West Haven CT
2002-2006

- Psych Emergency Room
- Managed the nursing care of psychiatric patients in accordance with established policies procedures and protocols of the healthcare organization
- Tasks and responsibilities include: Performed initial and on-going physical and psychosocial assessment according to accepted standards of nursing practice

- Assessed plans and evaluates patient care needs
- Carried out physician ordered administers prescribed medications monitors vital
  Sign and CIWA
- Participated in treatment team conferences to assist in planning and revising goals objectives and interventions appropriate to the age-related and problem-specific needs of each patient
- Implemented nursing plan of care for assigned patients and conducts and/or co-led group therapy sessions for patients
- Evaluated patients response to interventions and revises nursing plan of care as needed
- Collaborated with the treatment team to revise goals, objectives and interventions appropriate to the changes in patient status
- Monitored, recorded and communicated patient condition as appropriate
- Ensured the unit was in compliance with health care regulations

-2-
Jennifer Benjamin

Correctional Head Nurse-Hartford, CT **1994-2000**

- Led planning of care and implementation of nursing process
- Coordinated nursing and/or mental health unit workflow; determined priorities; schedules, assigns, oversees and reviews work
- established and maintained unit procedures; identified staff development needs;
- provided staff and inmate education and assistance; conducted or assisted in conducting performance evaluations
- led professional and paraprofessional nursing staff in provision of inmate general and mental health care
- instructed staff regarding policies and procedures

- maintained and promoted standards of nursing; acted as liaison with other operating units, agencies and outside officials regarding unit policies and procedures
- participated in interdisciplinary meetings; made recommendations on policies and standards prepared reports and correspondence

Various Positions at Long Term Care Facilities **1994–2000**

- Supervisor of Clinical Services
- Nursing Administrative Supervisor
- Staff Nurse
- Coordination of care for identified stakeholders
- Supervisory and professional duties; in directing and/or coordinating all nursing units in accordance with state and federal regulations.
- Evaluated staff, conducted corrective action for noncompliance with facility policy; and procedures and standard of practice.
- Educate staff on current standard of practice and scope of practice.

Faculty Affiliation

- **Capitol Community Technical College 1/95-5/95**
  - ADN Nursing Tutor responsible to tutor struggling nursing students attending an associate degree program**.**
  - Clinical Instructor
  - Classroom Instructor

EDUCATION:

Doctorate of Nursing Practice **Anticipated graduation 2014**

Walden University, Minneapolis, Minnesota

Masters of Science in Nursing Education
1997-2001

University of Hartford, West Hartford, CT

Bachelors of Science in Nursing **1994-1997**

University of Hartford

West Hartford CT

Associate of Science Degree
1992-1994

Capitol Community Technical College

Hartford, CT

Diploma in Secondary Teacher's Education **1981-1984**

University of the West Indies Extra Mural Program

Kingston, Jamaica

CERTIFICATIONS / SPECIALIZED TRAINING:

- CERTIFIED LEGAL NURSE CONSULTANT
- CERTIFICATE OF TRAINING LONG TERM CARE
- SUPERVISOR CERTIFICATE PROGRAM, STATE OF CT

- CERTIFIED CORRECTIONAL HEALTHCARE PROFESSIONAL
- CERTIFIED QUALITY INDICATOR SURVEYOR(ELECTRONIC LONG TERM CARE SURVEY PROCESS)

COMPUTER EXPERIENCE:

- EXPERIENCE WITH VARIOUS ELECTRONIC MEDICAL RECORD(EMR)
- SPREADSHEET
- POWER POINT
- GANTT CHART

PRESENTATIONS:

Benjamin, J & Powell, J. (2010). Making the transition to retirement. Our Lady of Perpetual Health

Nursing Home, Kingston Jamaica

Benjamin, J., & Powell, J. (2012). Cultural impact on West Indian diabetic patients. Presented to Adventist Council Greater Hartford

Benjamin, J. (2013). ADA best practice guidelines incorporated in the Electronic Medical Record to improve diabetes care. Presented to long term care facilities in Massachusetts

PUBLICATIONS:

JOHNSON, J. (2003). SERVING TIME, ***NURSING SPECTRUM*****,** 7(1). RETRIEVED FROM WWW.NURSING

SPECTRUM.COM

DOCTOR OF NURSING PRACTICE CAPSTONE PROJECT

UTILIZATION OF THE ELECTRONIC MEDICAL RECORD TO IMPROVE DIABETES CARE IN HEALTH CARE FACILITIES

MEMBERSHIPS/AFFILIATIONS:

- Association of Legal Nurse Consultant **2002-present**
- American Nurses Association 20**11-present**
- Connecticut Nurses Association **2011-present**
- Sigma Theta Tau **2012-present**
- West Indian Nurses Association (founder) **2012-present**
- Golden Honor Society **2013-present**