

Incorporating ADA Best Practice Guidelines in Electronic Medical Records to Improve Glycemic Management in Health Care Facilities

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 electronic medical record (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 improves glycemic management in hospitalized patients. A quality improvement project 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 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 Type2) and increased corrective measures for abnormal glycemic events (increased 16% 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.

Keywords: Diabetes; Electronic medical record; American Diabetes Association

Research Article

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Abbreviations: ADA: American Diabetes Association; EMR: Electronic Medical Record; CMS: Centers for Medicaid and Medicare Services; CDE: Certified Diabetes Educator; IGT: Impaired Glucose Tolerance; IFG: Impaired Fasting Glucose; PCC: Point Click Care

Introduction

Stakeholders in the United States are of the mindset that diabetes health care is insufficient [1-3]. 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 [2]. In 2004, the CMS spent \$17.4 billion on unplanned hospitalizations [4]. Health care facilities have become more aware of the impact of untimely and poor treatment of diabetes on the nations' resources. Manchester [5] 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 [1].

The prevalence of diabetes continues to increase in the US with an estimated 230 million adults living with diabetes [6,7]. The U.S. cost of diabetes care has risen to \$245 billion in 2012,

an increased from \$174 in 2007 [10]. The ADA [8] 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 [8,9]. Evidence has shown that targeted glucose control in the acute care setting reflected improved clinical outcomes [8].

The ADA [8] endorsed Arnold [10] 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 [11].

Utilization of inpatient EMR systems have shown improved

care in some chronic clinical settings such as diabetes care [12]. 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 [13]. The EMR has been projected as a sustainable solution for improving the quality of medical care and assisting in practitioners' decision-making [14]. Two main challenges that affect the usefulness of the EMR are quality and completeness of available data [15].

Electronic medical records are promptly accessible and exceedingly valued in diabetes care [3,16]. The view of EMR based health care and diabetes management range way beyond the notion of computerized charting [3]. 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 [17,18].

EMRs that are fixed with clinical decision systems provide outstanding setups in diabetes disease management [3]. Edwards [19] 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 et al. [20] clinics that used EMRs achieved better diabetes care outcomes compared to clinics that used traditional paper charts. McCullough et al. [20] 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 [21]. The focus of this evaluation was to evaluate the impact of the ADA best practice guidelines incorporated into the EMR to management diabetes care.

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 [1]. 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 [22]. There are high expectations for health care reform and the majority of stakeholders are that change must occur to curb the skyrocketing costs of patient care.

The cost of diabetes care is no exception and falls under the recommendation put forth by the Institute of Medicine [23]: Nurses should work in complete partnership with other health care practitioners to ensure better delivery of care. Onham [21] identified nursing as the largest group of health care professionals who generate and record health care information. Onham [21] 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 [24] 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 [21,24].

Diabetes care should be receptive to prevention and early intervention, mitigating the need for more expensive acute care [25]. 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 [25,26]. As a result, the EMR has become an important system-based support in recognizing safety and quality concerns [12]. According to McCullough et al. [20], clinics that used EMRs achieved better diabetes care outcomes compared to clinics that used traditional paper charts. McCullough et al. [20] 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.

Evidence-based significance of the project

The CDC [27] 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 [8]. 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 [3]. 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 [28] 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.

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 [3,29]. 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 [3,30]. The use of EMRs has validated substantial benefits in the management of preventative medicine and the management of chronic diseases such as diabetes [24]. Integral to continued success are EMRs that will support health care practitioners in their day-to-day

functions [19].

Implications for social change in practice

Shared information on current health care practice is significant to quality improvement [31]. EMR systems are used to improved care through documentation, communication of clinical information and measurement of productivity [12]. 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 [12,32]. The EMR can be used to apply guidelines, such as staged diabetes management and to suggest a clinical pathway for the identified patient [33]. The use of EMRs can be an effective tool in providing patient education because of access to customized information [34].

In an ambulatory setting, the use of EMR has been recommended as a way to reduce cost and improve care [35]. 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. 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 [36] goals for diabetes include the reduction of economic cost of the disease and improved quality of life for diabetic patients [36]. 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 [8].

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 [37].

Convenience sampling: This sampling method is a non-probability sampling procedure that involves the selection of the

most readily available people for a study [38].

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 [8].

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 [3].

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 [39].

Glycemic management: Glycemic management is defined as the restitution of carbohydrate metabolism as close to normal as possible [8].

Glycemic control: Glycemic control is defined as maintaining blood sugar to as normal range as possible (70-100mg/dL) [8].

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 [8].

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 [8].

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 [8].

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 [40].

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 [8].

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 [39].

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 [40].

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 [8].

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 [39].

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 post implementation. 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 [4]; (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.

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 [37]. 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 [9]. 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 was 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. The tools were used for data collection from the EMR to the calculation data base.

Demographic data form

This tool 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 post implementation 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 1-3.

Table 1: 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	12.50%
	Other	1	12.50%
Education Level	Associate	3	37.50%
	BSN	3	37.50%
	MSN	1	12.50%
	Diploma	1	12.50%

Table 2: Patient Demographic Pre- and Post Implementation 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

Table 3: 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 American	2	25%
	European American	4	50%
	Hispanic	1	12.50%
	Other	1	12.50%
Education Level	Associate	3	37.50%
	BSN	3	37.50%
	MSN	1	12.50%
	Diploma	1	12.50%

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:

- a. Type of diabetes
- b. Measurement of blood sugar
- c. A1C level
- d. Hypoglycemic event
- e. Hyperglycemic event
- f. 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 was 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 post implementation 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 (Table 4 & 5).

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 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, 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 post implementation period.

Table 4: Patient Demographic Pre Implementation 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 American	9	36%
	Hispanic	5	20%
	Other	2	8%
	Missing Data	0	0%
Diabetes	Type 1	0	0%
	Type 2	25	100%
	Other	0	0%

Table 5: Patient Demographic Post Implementation 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 American	9	36%
	Hispanic	5	20%
	Other	0	0%
	Missing Data	1	4%
Diabetes	Type 1	6	24%
	Type 2	18	72%
	Other	1	4%

Implications

The findings reflected that study patients in the pre- and post-samples had similar age and gender characteristics. Further

review indicated that the pre implementation patient outcome data were collected from patients that were all identified with Type 1 diabetes, compared to the post implementation 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 post implementation 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. [20] and the IOM [41] revealed that the EMR facilitated coordination of care, improved treatment and decreased patient exposure to unnecessary care. O’Connor [42] 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 [31]. Electronic medical record systems are used to improved care through documentation, communication of clinical information and measurement of productivity [12]. 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 [12,32]. The EMR can be used to apply guidelines, such as staged diabetes management and to suggest a clinical pathway for the identified patient [33]. The use of EMRs can be an effective tool in providing patient education because of

access to customized information [34].

Healthy People 2020 goals for diabetes include the reduction of economic cost of the disease and improved quality of life for diabetic patients [36]. 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.

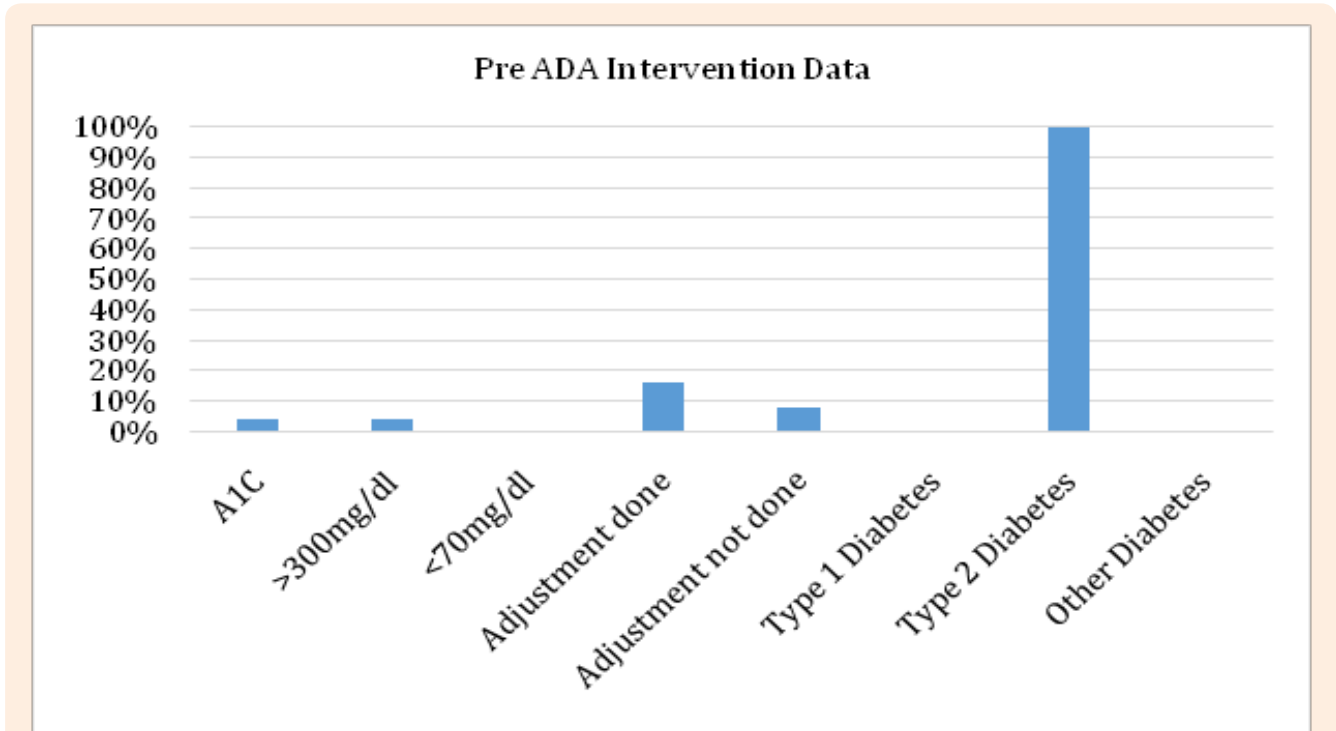


Figure 1: Pre ADA Intervention Data.

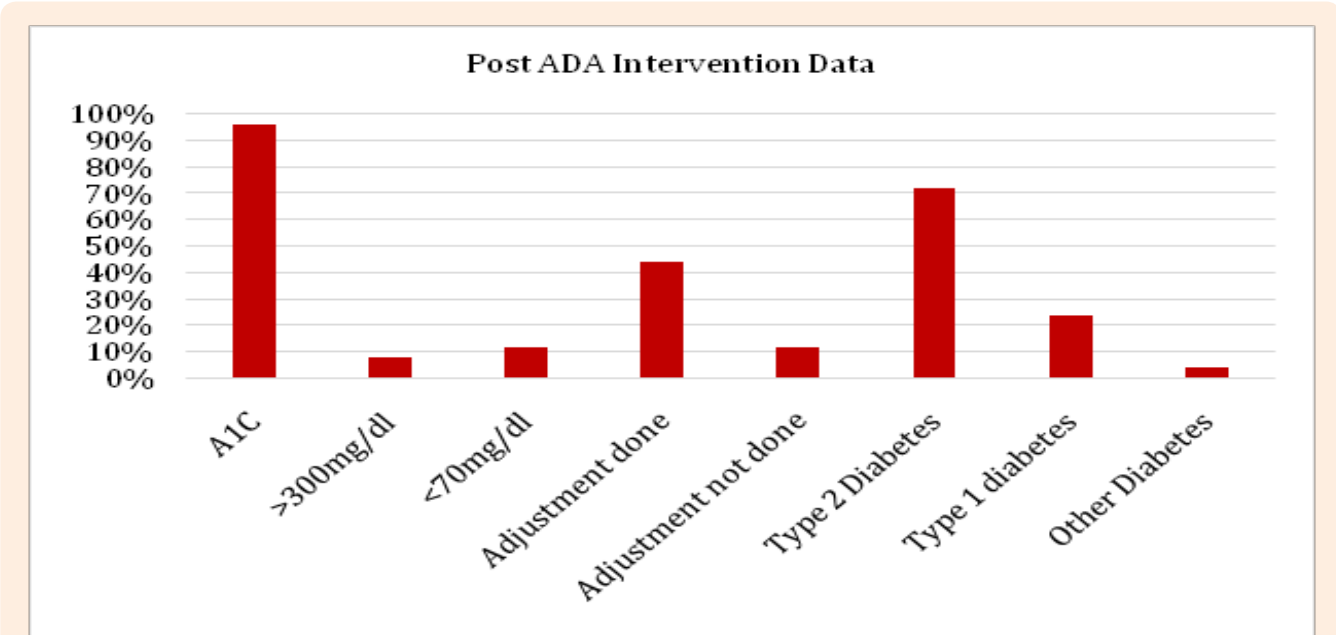


Figure 2: Post ADA program data.

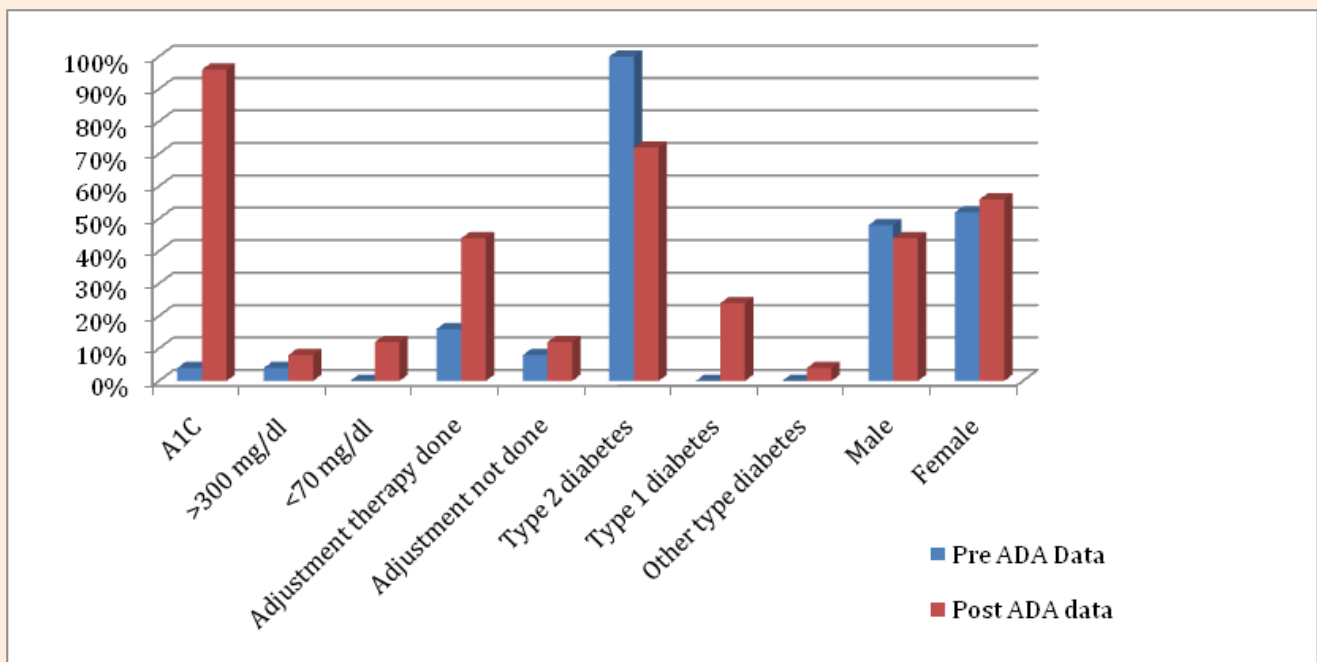


Figure 3: Comparison graph showing pre and post-outcome data.

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 [4]. 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.

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