USE OF POINT OF CARE TESTING TO AFFECT CLINICIAN TREATMENT DECISIONS FOR PATIENTS WITH DIABETES

by
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Abstract
This process improvement initiative implemented a policy for medical assistants (MAs) to perform and record point of care (POC) glucose test results in the electronic medical record (EMR), for all patients with diabetes during clinic check-in. Actions and behaviors of practice staff were evaluated to determine how POC results affected clinician treatment decisions. A retrospective review of staff recorded (EMR) data was assessed at baseline, after a 2-week run-in, and 4-weeks prospectively. This initiative was implemented in a small group internal medicine practice, treating predominantly low-income, Hispanic immigrant patients in Texas. Staff include six medical assistants, three physicians, and two nurse practitioners. Primary outcomes assessed include MA adherence to the policy and clinician treatment decisions from EMR documentation. Diabetes prevalence was 54.2% in this practice. Medical assistant POC glucose tests were documented for 26.6% (103/387) of patients at baseline and 52% (178/342) of patients after policy implementation. Detailed clinical decision data collection was performed for every tenth record, the evaluated sample \( n = 34 \) of 342 records. POC glucose levels were recorded for 38.2% (13/34) of the sample. Clinician treatment decisions changed 23.1% (3/13) of the time when POC results were available. The number of POC glucose tests doubled after policy implementation, yet half of patients did not have POC glucose tests performed. Clinician treatment decisions occurred more frequently when POC glucose values were greater than 200 mg/dl at the time of the clinic visit.

Key words: Point of care testing, glucose, Hispanic, diabetes, clinician treatment decisions
Use of Point of Care Testing to Affect Clinician Treatment Decisions for Patients with Diabetes

Diabetes is a chronic condition that presents tremendous challenges to both the patients living with the disease and their health care providers. Patients frequently struggle with management of their medications, meal planning, exercise, work, finances, household responsibilities, and other priorities. Clinicians struggle to choose the appropriate therapeutic agents and doses for each patient; taking into account patient allergies, comorbid conditions, drug-interactions, insurance coverage, adherence, and other factors.

The practice of internal medicine involves the careful balance of health and well-being of medically complex patients. Clinicians are trained in the use of evidenced-based medicine. This evidence being obtained by a detailed history, physical exam, record review, laboratory assays, and radiology studies. When metabolic data is available for clinician treatment decisions, evidence-based decisions can be made. If data is not available, clinician treatment decisions may be neglected, delayed until data is available, or made empirically.

Crocker et al. (2014) summarized laboratory inefficiencies in primary care. Clinicians have three choices: to send the patient to the lab after a clinic visit, to send the patient to the lab several days before the next visit, or to use point of care testing to obtain results during the patient visit. Difficulties arise when the patient does not go to the laboratory for post-clinic or the next pre-clinic lab draws or if the studies were drawn so late that results are not available. Travel to the laboratory for lab draws are a patient burden: inconvenience, extra travel, parking charges, and lost wages for themselves and/or family members.

The target population for this process improvement initiative include employees of a small group internal medicine practice. The employees of the clinic include three internists, two
nurse practitioners, six medical assistants, and four front office team members. The clinic is part of an Accountable Care Organization (ACO), providing care at reduced costs for member Medicare patients.

**Problem Description**

The clinic provides medical care for a large population of low-income patients with diabetes. Patients at the clinic seek care when feeling poorly, more often than when feeling well. Providers and patients must triage and prioritize multiple health complaints during short office visits. A review of internal electronic medical records (EMR) revealed that diabetes related laboratory studies, education, and clinician treatment decisions were changed with very low frequency during medical office visits.

As part of an Accountable Care Organization (ACO), the clinic was challenged to provide high quality care in a fiscally conservative environment. Participating clinicians are evaluated in several ways. Healthcare Effectiveness Data and Information Set (HEDIS) scores are calculated for each provider based on their adult patient outcomes. This process improvement intervention focuses on medical assistant and clinician actions and behaviors to improve outcomes for adult patients with diabetes. Members of an ACO have the opportunity to share in cost savings to the plan if patient outcome targets are reached, however members of an ACO are at risk to re-pay savings if patient outcome targets are not reached (McWilliams, Landon, Chernew, & Zaslavsky, 2014).

Casual interviews with the physicians (MD) and nurse practitioners (NP) at the clinic revealed that diabetes was rarely a priority during office visits. Providers did not have specific plans to improve diabetes care for the majority. They were unaware of their frequency in making
treatment decisions to change diabetes medications or lifestyle and overestimated their frequency in attaining recognized diabetes therapy goals.

The clinic providers receive monthly gap reports from one Medicare Health Maintenance Organization (HMO). The October 2016 report identified 350 plan members treated at the office. Of these members, 39.43% ($n = 138$) had an ICD 10 code identifying diabetes in their record, more than three times the estimated Texas prevalence (Texas Department of State Health Services, 2015). The report indicated that 17.39% of patients with diabetes had no blood glucose data recorded during the year, 11.59% of patients with diabetes had no Hemoglobin A1c data recorded, and that 6.52% of last A1c’s were greater than 9%, classified as “uncontrolled diabetes.

Results of the gap report caused much debate and discussion. Questions amongst the physician and nurse practitioner clinicians included: “What steps can we take to improve the frequency of capturing diabetes data in the electronic medical record? Can we reduce patient burden in having their labs drawn? How can we encourage more patients to be adherent with their diabetes, lipid, and blood pressure medications?”

The plan for this process improvement project was created. The development and implementation of the Point of Care (POC) Glucose Testing Policy directs the medical assistants to test glucoses during the usual check-in and rooming process of all patients with “diabetes.” Results were to be recorded in the EMR and made available for the physician/nurse practitioner clinicians. By providing this testing in the office, no additional burden would be placed on the patient to make an extra trip to the laboratory before their clinic visit. It was anticipated that “real-time, clinical data” would facilitate improved evidence-based clinician treatment decisions.
Available Knowledge

It is estimated that 75-90% of patients living with diabetes are cared for by primary care providers (Davidson, 2010; Nam, Chesla, Stotts, Kroon, & Janson, 2011). These primary care providers include physicians, nurse practitioners, physician assistants, and others that may not have been exposed to intensive diabetes management during their professional training. More than 25 new therapeutic agents for diabetes have been approved since 2005 by the United States Food and Drug Administration. The lack of continued professional training and multitude of new agents create clinician confusion.

Data from the National Health and Nutrition Examination Survey (NHANES) between 2007-2010, indicate that nearly 50% of patients with diabetes in the United States do not achieve glycated hemoglobin levels <7% (Ali et al., 2013). The Standards of Medical Care in Diabetes (American Diabetes Association, 2017), has placed new emphasis on health promotion and reduction of health disparities in populations. These recommendations encourage clinicians to select therapeutic treatments using evidence-based guidelines while considering patient preferences and comorbidities, when attempting to lessen disease burden.

The clinic is located in a stable, low-income, immigrant community. Approximately 85% of the patients are of various Hispanic origins, with the majority speaking Spanish as their primary language. Approximately 60% of the clinic patient population has Medicare or are dual eligible Medicare/Medicaid patients. An estimated 35% have commercial insurance and the remaining 5% are cash pay patients. The community is poor, with median household income for persons living in the area approximately 50% below the national median household income. Seniors 65 years and over live in greater poverty, with even lower median household incomes (Semega, Fontenot, and Kollar, 2017).
An exhaustive review of the literature was conducted between 2016-2017 using the Cumulative Index to Nursing and Allied Health (CINAHL), ProQuest, and Google Scholar via the Capella library portal. These search engines allow directed focus of the literature in nursing, psychology, sociology, health economics, and medicine. Keyword searches included: diabetes care goals, diabetes in primary care, diabetes AND multimorbidity, diabetes quality improvement projects, diabetes process improvement projects, HEDIS scores for diabetes, clinician treatment decisions AND diabetes, blood glucose testing, glucose point of care testing, point of care testing AND office efficiency, barriers to diabetes care, managing diabetes in poverty, barriers reported by Hispanic patients, and special populations with diabetes.

Search terms were used alone and in combination for pertinence. Advanced search strategies such as building blocks, citation pearl growing, successive fractions, and berry picking were used (Booth, Papaioannou, & Sutton, 2012). ProQuest and Google Scholar were used extensively with search limiters including full text, peer reviewed, scholarly articles. The themes of retained articles fell into six domains. Articles were retained if they: explored diabetes and multimorbidity, evaluated diabetes care and barriers to care in Hispanic patients, presented Texas demographics and quality measures for diabetes, studied point of care testing in primary care, assessed POC testing and office efficiency, and examined clinician treatment decisions related to diabetes quality or process improvement.

**Diabetes and multimorbidity.** Diabetes is a chronic condition, known to increase the utilization of health care services. Patients need more frequent visits for lifestyle and nutrition education, initiation and titration of medications, and lab studies for episodic evaluation of metabolic health. It is rare for patients with diabetes to have that condition alone. Patients with diabetes have strong associations with other chronic health conditions including: hypertension,
dyslipidemia, and cardiovascular disease (Ornstein, Nietert, Jenkins, & Litvin, 2013). Multimorbidity increases with age (Salisbury, Johnson, Purdy, Valderas, & Montgomery, 2011; Wallace et al., 2015). The onset of multiple co-morbidities may occur earlier in people living in socioeconomically depressed areas (Barnett et al., 2012). Many patients of the clinic live with more than three to five chronic disease that require lifestyle changes and coordinated medical management. Research by Salisbury et al. (2011) found that patients with multiple co-morbidities require more frequent access to medical care (9.35 visits/year compared to 3.75 visits/year for patients without multiple co-morbidities). The increased frequency of visits and complex decision making during these visits represent a high burden on clinician workload.

**Diabetes care and barriers to diabetes care in Hispanic patients.** Many factors contribute barriers to diabetes care. Studies have identified that race and ethnicity impact diabetes care. Ali, Bullard, Imperatore, Barker, and Gregg (2012) analyzed NHANES data from 2007-2010 and found that 18.7% of blacks and 18.8% of Hispanics had poorly controlled diabetes (A1c ≥ 9%), nearly double the rate of non-Hispanic whites. Data from the 2010 Medical Expenditure Panel Survey found Non-Hispanic whites had higher numbers of diabetes personal care tests performed (A1c, cholesterol, eye exam and foot exams), when compared to black and Hispanic patients in the previous year. (Hu, Shi, Rane, Zhu, & Chen, 2014).

Numerous studies have noted language as a barrier to diabetes care. Kaiser Permanente has performed the largest study of how social, behavioral, language, and other factors impact diabetes outcomes. The Diabetes Study of Northern California (DISTANCE) survey was conducted in five languages with a sample of insured members treated at Kaiser (Fernandez et al., 2010). Approximately 20,000 patients responded to the survey. Cohort evaluations of responses from whites, English proficient Latinos, and low English proficiency Latinos found
that Latino patients were twice as likely to have uncontrolled diabetes than white counterparts. For low English proficiency Latino patients, 16.1% of patients had A1c results > 9% when receiving care from language-concordant primary care providers (PCPs). This value nearly doubled to 27.8% of patients having A1c results > 9% when receiving care from language-discordant physicians (Fernandez et al., 2010).

Physician trust is higher in the presence of language-concordant care (Schenker et al., 2010). Language-concordance impacts patient satisfaction and health quality measures (Gany et al., 2007; Green et al., 2005; Sequist et al., 2008). Kaiser Permanente’s scientific evaluation of the impact of language on health care has culminated in the development of a formalized Language-Concordance Program. The DISTANCE Study Group have now published 33 papers based on their research and findings. Kaiser received the Innovation in Multicultural Health Award from the National Committee for Quality Assurance (NCQA) for their actions (Kaiser Permanente, 2006). Health plan advocates recommend increasing provider panels to match patient needs with fluency in other languages than English.

The absence of medical insurance is a barrier to diabetes care. Uninsured minorities were found to be at the greatest risk for uncontrolled diabetes (A1c ≥ 9%) (Ali et al., 2012). A study of uninsured Hispanics living on the Texas-Mexico border sought health care inconsistently, struggled obtaining medications, and received fewer preventive care services (Mier et al., 2012). The Hispanic Community Health Study conducted in the Bronx, Chicago, Miami, and San Diego from 2008-2011 found that younger and middle aged Hispanics had higher rates of being uninsured than seniors 65-74 years of age (Schneiderman et al., 2014). This finding was attributed to seniors becoming Medicare eligible at 65 years of age.
Patients report multiple barriers to diabetes care. Survey respondents in South Texas reported many factors contributing to poor medication adherence: cost, no refills remaining, forgetfulness, problems with pharmacy stock, transportation issues, side effects of prescribed medications, and hospitalizations were barriers to medication adherence (Bailey et al., 2012). Interviews with Hispanic immigrants indicated a lack of culturally relevant resources (Hu, Amirehsani, Wallace, & Letvak, 2013).

**Texas demographics and quality measures.** Socioeconomics greatly impact the lives of individuals living with chronic disease. Texas data regarding diabetes estimates that 11.0% of adult Texans have diabetes (Texas Department of State Health Services, 2015). The prevalence of diabetes in 2013 was higher in minorities with blacks at 12.9%, Hispanics at 12.7%, and whites at 9.9% with the disease. The Texas Behavioral Risk Factor Surveillance System reports diabetes prevalence was greater among adults with less than a high school education than for individuals with some college, and that diabetes was more prevalent in households with income less than $25,000 than for those households earning greater than $25,000/year (Texas Department of State Health Services, 2013). Staff interviews confirm lower patient education levels and greater household poverty.

Texas state law requires that health maintenance organizations report Healthcare Effectiveness Data and Information Set (HEDIS) scores on adults 18-75 years of age that have been diagnosed with diabetes (Texas Department of State Health Services, 2013). HEDIS measures for diabetes include A1c testing, A1c control less than 7%, A1c control less than 8%, A1c control more than 9%, retinopathy screening, LDL-cholesterol screening, LDL-cholesterol less than 100mg/dl, screening and attention for nephropathy, blood pressure control with reading less than 140/80 mm Hg, and blood pressure control less than 140/90 mm Hg. HEDIS scores
captured in Texas in 2011 fell behind the national averages for nine of the ten measurements. Tragically, 49.8% of patients with diabetes in Texas had A1c levels greater than 9% in 2011, compared the national average of 27.3% (Texas Department of State Health Services, 2013).

**Point of care testing in primary care.** POC testing has the potential to reform and improve quality in healthcare (Price, St John, & Kricka, 2010). Health care trends indicate that 75-90% of patients with diabetes are cared for by primary care providers (Davidson, 2010). As such, primary care clinicians have increased responsibility in chronic disease management. Clinicians are tasked to examine, assess, diagnose, and treat a multitude of conditions in a fiscally conscious way. They are tasked to oversee preventive care measures in addition to managing acute and chronic health care needs. Primary care clinicians function as the hub to coordinate additional health services.

The benefits of POC testing have been reported by physicians around the world. Findings from a multinational survey of general practitioners found that POC testing was beneficial for primary care practitioners caring for patients with chronic health conditions, especially for those working in rural areas (Howick et al., 2014). The US subset of this study later published that 90% of US physicians reported that POC testing could help them monitor and manage diabetes, 24% reported that POC testing could be used to reduce referrals to specialists and hospitals (Sohn, Hickner, & Alem, 2016).

**Point of care testing and office efficiency.** Two studies evaluating the improvement of office efficiency with POC testing and were influential in the forming the measures of this process improvement plan. The first was a study performed at the employee and spouse outpatient clinic at Massachusetts General Hospital, aimed to evaluate the medical, operational, and financial outcomes for patients that received POC testing versus controls (Crocker et al.,
The researchers examined the number of phone calls, letters, and follow-up visits required before and after POC testing was initiated. They found that POC testing reduced the need for follow-up phone calls by 89%, decreased follow-up letter generation by 85%, and decreased the need for follow-up visits by 61% for abnormal lab results. These reductions reduced clinic staff time required for these tasks, postage, and other operational costs. Financial evaluation of this POC testing project estimated a net gain of +$6.62 per patient (revenue-cost). Improvements in practice efficiency were estimated at +$24.64 per patient. Combining these two gains, the estimated financial gain for the clinic of +$31.26 per patient.

**Clinician treatment decisions and quality improvement.** Researchers of the second key study performed retrospective chart reviews requiring providers document whether a therapeutic change was made or not, for all patients with diabetes that had an A1c > 7% (Mata-Cases et al., 2013). Data was evaluated for 997/2783 patients that were not at goal. Clinicians were requested to respond with one of five therapeutic actions they implemented at the last clinic visit for each record submitted: diabetes treatment has not changed, the dose of antidiabetic treatment was increased, a new oral diabetes medication was added, basal insulin has been added, or oral diabetes treatment discontinued and insulin therapy started. The authors suggested that clinical inertia contributed to clinicians not advancing diabetes treatment. Mata-Cases et al. (2013) recommends that clinicians give early attention to poor control, set realistic goals, improve patient adherence, provide diabetes education, discuss treatment options, and ultimately prompt intervention.

**Rationale**

The Johns Hopkins nursing evidence-based practice model encourages nurses to describe an evidence based practice question and to create an interdisciplinary team to address the issue.
Team members are encouraged to investigate internal and external resources for evidence and to consider expert opinion, clinical reasoning, and patient preferences during the investigational process. Members translate research findings for a clinical setting; create a plan for change, implement the plan, evaluate outcomes, and disseminate findings (Newhouse, Dearholt, Poe, Pugh, & White, 2005).

A stakeholder team was formed. What could be done to improve diabetes care practices at the clinic? What interventions might be helpful to reduce the clinic EMR gaps? Discussion focused on development of processes to reduce the 17.39% gap of diabetes patients with no recorded blood glucose results. The stakeholders insisted that interventions must provide timely, low-cost, relevant health information, without placing undue burden on office staff.

The process improvement plan tactics were selected: operationalize the process of in clinic POC testing. This had the direct potential to document more blood glucose levels in the electronic medical record. A policy was developed to perform POC testing for all patients with diabetes recorded in their problem list, during usual patient check-in activities. Once recorded in the EMR, results are made available to affect clinician treatment decisions. Clinicians must be responsible to consider all relevant information. Audit of clinician treatment decisions would be performed similarly to the Mata-Cases (2013) study. Charges for the POC testing would automatically be documented for electronic billing associated with the encounter. The cost of POC testing might be offset by other gains.

A program logic model was created as a visual way to organize concepts and display associated thought processes (Knowlton & Phillips, 2013). Organizations use logic models to “facilitate thinking, planning, and communication regarding program objectives and actual accomplishments” (W.K.Kellogg Foundation, 2004). The program logic model for In Clinic
POC Glucose Testing (Appendix A) roadmap documents stockholder thought processes regarding clinic resources, activities, outputs, desired outcomes, and potential impact of this project.

The PICOT question was developed by incorporating the principles of the Johns Hopkins nursing evidence-based practice model and the program logic model. The integration of these models resulted in a process improvement initiative to provide evidence to clinicians to affect diabetes related care. The PICOT question: In a small group internal medicine practice (P), how does point of care glucose testing (I) affect clinician treatment decisions for patients with diabetes (O), seen over a 4-week implementation period (T)?

The program logic model for POC Glucose Testing includes major project assumptions in the roadmap. If the resources (medical assistant, glucose monitoring equipment, and electronic medical record) are present, then the activities (staff education, implementation of the POC policy, and results recorded in the EMR) will be provided. If the providers and patients have the glucose results, they can engage in a care discussion. If the activities are provided, then the outputs (increased POC testing for patients with diabetes, results for provider review, facilitate patient centered care) can be produced. If the outputs are produced, then the outcomes (medical assistant adherence to the policy, charges captured in the billing record, POC results elicit clinical treatment decisions) will be secured. If outcomes are secured, then impact is achieved (improved diabetes care) over time.

**Specific Aims**

Three gaps in diabetes documentation were identified for providers at the clinic. These gaps were the lack of recorded blood glucose data during the year, the number of patients with diabetes that had not had at least one Hemoglobin A1c value recorded during the year, and the percent of patients with last A1c’s greater than 9%, denoting “uncontrolled diabetes.”
This process improvement initiative addresses the specific aim to improve the first identified gap - the lack of recorded blood glucose data during the year. This initiative proposed to operationalize POC glucose testing for every patient with diabetes during the check-in and rooming process. The clinic had not previously allowed “protocols” or “standing orders.” While it was anticipated that adding POC glucose testing might slow the patient check-in process, the physician and nurse practitioner providers felt that having results in the patient record would facilitate their clinician treatment decisions.

The process improvement initiative involves implementation of the POC glucose testing policy, assignment of responsibilities, measurement of specific outcomes, review of clinician treatment decisions as documented in the EMR, and a cost/benefit analysis related to policy implementation. The overarching goal of this initiative was to improve diabetes care in a cost-efficient manner. This process improvement initiative may be replicated in any primary care practices where providers have similar gaps in EMR documentation. Stakeholder aims for supporting this initiative during the implementation and evaluation period were largely to improve HEDIS scores and thus improve ACO bonuses.

**Methods**

**Context**

The clinic is located in a mid-rise medical office building in a predominantly Hispanic community. This is the second practice location for a clinic that was established in the area more than 40 years ago. The founding physicians had immigrated from Spanish speaking countries, they were well respected and trusted in the Hispanic community. The founders have retired and the practice legacy continues with physicians also from Latin-American countries and acculturated bilingual nurse practitioners.
The patients at the clinic are predominantly of Hispanic origin and experience many barriers to health care. When health care is necessary, they prefer encounters with providers that speak their language and understand their culture. Patients prefer to see specialists and have diagnostics performed within the community, rather than traveling into the medical center. Patients often struggle with prescriptions based on their circumstances and ability to pay. Many clinic patients depend on family members or medical transportation to bring them to appointments. While some patients may live independently, others reside in multigenerational homes, rented rooms, or low-income housing.

**Interventions**

This process improvement initiative was created with the participation of all six medical assistants (MAs), three physicians (MD), and two nurse practitioners (NP) in mind. The process was designed to increase the number of documented blood glucose values in the EMR. This would improve the first documented gap. Actions and behaviors would be measured for clinic MAs, MD, and NP clinicians across the implementation of the POC glucose testing policy initiative.

The stakeholder group included the three physicians, two nurse practitioners, office manager, a preceptor, a representative from one Medicare managed care plan, and two electronic medical record specialists. Planning focused on task assignment and strategies to improve data collection in the electronic medical record. The groups key objectives were to improve HEDIS and Medicare Advantage Plan scores, closing the gaps of missing information. The practice would receive bonuses for improvement in diabetes related patient care when provided specific targets were reached.

Fifteen-minute presentations were made at several staff meetings to increase staff awareness related to diabetes data collection. Education was provided regarding diabetes
prevalence and socioeconomic data in the clinic community. National, Texas, and provider level HEDIS data was reviewed. Measures of accountability were discussed for recording diabetes related health information. The office policy was created instructing the MAs to perform a POC glucose test during the check-in process for every patient with an ICD-10 code E11* for diabetes in the problem list. Staff education was provided on the POC glucose testing policy, opportunity for questions and discussion was available.

Clinicians were coached to review POC glucose data in the EMR and to engage the patient in discussion regarding some aspect of their diabetes care. The clinicians were instructed to evaluate whether lifestyle counseling or therapeutic changes would benefit the patient. The physicians and nurse practitioners were requested to document clinician treatment decisions in the plan section of the electronic medical record.

The POC glucose testing policy was implemented. Weekly reminders were made to the MAs to test and record POC glucose values in the EMR for all patients with diabetes during the check-in and rooming process. Providers were reminded weekly to review the POC glucose values, engage the patient in discussion regarding some aspect of their diabetes care, and to document clinician treatment decisions in the plan section of the electronic medical record.

**Study of the Interventions**

POC glucose testing is also known as near patient testing or bedside testing. POC testing refers to a straightforward medical test that can be performed near the patient in just a few minutes. For purposes of this process improvement initiative, POC glucose testing can be performed in the clinic in less than 2 minutes using the HemoCue Glucose 201 system. This assay is waived under the Clinical Laboratory Improvement Amendments (CLIA), requiring that tests be simple to perform and have a low risk of error in results. POC testing may be used by clinicians for screening, to make medical diagnoses, or to help manage and monitor disease.
This in-office test performed from a simple finger stick provides a glimpse at a patient’s diabetes care during the brief time the patient is in the office. If the POC glucose test is in target, this value may reflect controlled diabetes on their current regimen. If the POC glucose test is below target, this represents a safety issue and suggests that the medication, food, or exercise regimen needs to be changed. Likewise, if the POC glucose test is above target, changes in medication, food, or exercise may also be needed.

The increased use of POC glucose testing is necessary to improve the 17.39% gap of having no blood glucose data recorded in the EMR during the year. The intervention to operationalize the use of POC glucose testing for all patients with diabetes represents a procedural change to facilitate closing this gap. Medical assistant adherence to the POC glucose testing policy was variable amongst the six MAs. This variability impaired measuring how POC glucose testing affected clinician treatment decisions.

**Measures**

Two primary outcomes and one secondary outcome would be measured. The primary outcomes included an assessment of MA adherence to measuring the POC glucose levels and recorded results in the EMR per the policy, and assessment of provider utilization of the POC glucose results to affect clinician treatment decisions as evidenced by documentation in the care plan. The secondary outcomes would be the cost evaluation of whether POC glucose testing was performed at a profit or loss to the practice.

The Timeline for the POC Glucose Testing Policy and Clinician Treatment Decisions Initiative is attached (Appendix B). At baseline, a 4-week retrospective review was made of EMR data to determine the total number of patients seen at the office, the number of patients with diabetes in the problem list seen at the office, and a review of the total number of POC glucose tests performed over that period.
A 2-week run-in period was included in the design to allow the MAs time to create a habit of performing the POC tests for every patient with diabetes. Weekly reminders were made to the MAs to perform and document the POC glucose values in the EMR. The MD and NP clinicians were encouraged to review POC glucose data in the EMR, to engage the patient in discussing some aspect of their diabetes care, and to document clinician treatment decisions in the plan section of the EMR.

At the end of the 2-week run-in, the total number of POC glucose tests recorded in the EMR were calculated. This information was used as a surrogate marker of MA behavior change related to the number of POC glucose tests documented in the EMR. An increase in the number of tests performed compared to baseline would indicate increased adherence to the policy.

The 4-week evaluation period began immediately following the run-in period. During this period EMR data was evaluated to determine the total number of patients seen at the office, the number of patients with diabetes seen, and a review of the total number of POC glucose tests performed over that period. The 4-week results were compared against baseline data.

Every patient record was evaluated using dichotomous variables to describe the presence (+) or absence (-) of diabetes. A systematic random sampling method was employed where every tenth record of a patient (+) with diabetes, would be selected for detailed data collection. The Detailed Clinician Treatment Decisions Post-POC Policy Implementation Data Sheet (Appendix C) was utilized for the manual review of sample data. The date of service, patient initials, age, and providers initials were recorded. Verification of POC glucose testing was recorded with dichotomous variables- yes (+) or no (-). The POC value was recorded on the data sheet.

Detailed clinician treatment decisions were reviewed manually for each patient record in the sample. Clinician treatment decisions were captured under the headings of medication
changes or counseling. Dichotomous variables - yes (+) or no (-) were recorded where applicable, based on clinician treatment decisions documented in the plan. The range of defined diabetes medication changes spanned: treatment did not change, resume diabetes medication, dose of diabetes medication changed, new diabetes medication added, basal insulin started, basal insulin titrated, multiple daily injections started, multiple daily injections titrated, pump initiated, and pump titrated. The range of counseling changes spanned: lifestyle, adherence, monitoring, and other.

An important component of evaluating value based health care is related to the cost of services used during care delivery. All clinic supplies are purchased from one vendor. The number of POC glucose monitoring materials and cost were requested from the vendor. The estimated cost per test will be calculated to include materials and staff time. The standard Texas Medicare reimbursement rate was obtained. It was anticipated that the total number of POC glucose tests would increase as the result of this POC glucose testing initiative. An annualized revenue was projected if increased rates of POC glucose testing are maintained. The stakeholder practice partners previously voiced concern regarding the costs of additional testing supplies and staff time versus potential revenue, thus this secondary outcome was evaluated.

Analysis

Descriptive statistics will be used to summarize the findings from the POC glucose testing process improvement initiative. Variables in this study include the: patient age, whether POC glucose testing was performed and documented in the EMR for each member of the sample cohort, the ordinal POC glucose values, and the type of clinician treatment decisions- no change, medication changes, and/or lifestyle counseling provided. Cost analysis will be made using simple mathematical calculations.
Ethical Considerations

Point of care glucose testing is typical, minimally invasive, practice performed in clinic by the MAs, when ordered by one of the MD or NP clinicians. All medical assistants have completed competency check-offs using the HemoCue 201 Glucose Analyzer as a part of their annual job requirements. The policy to operationalize blood glucose testing during the check-in and rooming process for all patients with diabetes will standardize clinician practices and enhance patient care.

Positive adherence was anticipated by the six medical assistants. No negative consequences for the MAs were included in the policy related to adherence. Participation in this process improvement initiative will not be included in annual employee evaluations, per the physician partners decision.

Patients with diabetes are familiar with the use of blood glucose monitors at home as a standard of diabetes care. Patient risks are minimal. Most patients will experience no discomfort when the blood drop is obtained, others may report mild tenderness at the lancing site.

This project was submitted to the Institutional Review Board (IRB) of Capella University. The IRB determined that this project did not meet the definition of human subject research. As such, IRB review and oversight was exempted.

Results

The prevalence of patients with diabetes seen for medical treatment exceeds the estimated 11.0% of adult Texans reported by the Texas Department of State Health Services (2015). This high prevalence of diabetes was greater than 50% of total clinic patients when evaluated retrospectively (at baseline) and prospectively (during the evaluation period), as shown in Table 1. The total of 342 patients with diabetes were treated during the evaluation period. The pre-specified, systematic randomized sampling method, yielded a sample \( n = 34 \), EMRs for detailed
data collection. The number of recorded POC glucose tests for the sample was too small to determine the true effect of the POC policy intervention and its effect on clinician treatment decisions. The planned bivariate analysis is not reported, as the project was not large enough to form reliable conclusions.

Table 1

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</table>

Subject ages of the reviewed records ranged from 42-94 years, with a mean of 66.76 years, and median of 68 years. This information is consistent with many immigrant Hispanic patients, that are new to insurance when they turn 65 years old and are eligible for Medicare in zip code in Texas. The high prevalence of diabetes draws special consideration to the clinical staff regarding efforts to intensify the clinical management of diabetes in the office.

Findings related to the first primary outcome- assessment of MA adherence to measuring the POC glucose levels and recording in the EMR, are shown in Table 2. The number of POC glucose tests increased during the 2-week run-in period, and slowed during the evaluation period. POC glucose results were performed and documented in 13/34 records. POC results ranged from 103-333 mg/dl, with the mean of 189.15 and median of 190 mg/dl. The overall number of POC glucose tests performed and recorded in the EMR nearly doubled during the evaluation period, yet almost half of patients did not have a POC glucose test performed.
Table 2

**Outcome 1: Number of Point of Care (POC) Glucose Tests Performed**

<table>
<thead>
<tr>
<th></th>
<th>Retrospective Run-in 4-weeks</th>
<th>Run-in 2-weeks</th>
<th>Evaluation 4-weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>POC tests in EMR</td>
<td>103</td>
<td>105</td>
<td>178</td>
</tr>
<tr>
<td># patients with diabetes</td>
<td>387</td>
<td>342</td>
<td></td>
</tr>
<tr>
<td>% patient’s diabetes with POC</td>
<td>26.6%</td>
<td></td>
<td>52.0%</td>
</tr>
</tbody>
</table>

Findings related to the second primary outcome—assessment of provider utilization of the POC glucose results to affect clinician treatment decisions as evidenced by documentation in the plan section of the EMR, are shown in Table 3. Clinician treatment decisions documented in the plan section of the EMR for the sample, revealed that the medical treatment did not change in 26/34 subjects. Some type of clinician counseling was documented a total of 20 times, in 12 discrete patient records. Medication changes were documented in the EMR of 8 discrete patients. Clinicians treatment decisions did change for 23.1% of patients after POC glucose results were documented in the EMR. Medication changes were made for subjects with the glucose values of 236, 254, and 273 mg/dl, but did not change for subjects with glucose values <200, and two subjects with POC glucose results of 244 and 333 mg/dl.

Findings related to the secondary outcome, the cost evaluation of whether the POC glucose testing was performed at a profit or loss to the practice, are shown in Table 4. The cost of supplies to perform one POC glucose using the HemoCue Glucose 201 System was calculated at -$1.63/test. Staff costs were estimated at -$0.50/test. Total expense was calculated at -$2.13/test. The clinic charges $13.40 for the POC glucose via electronic billing. In Texas, Medicare reimburses +$5.24/test (this varies by state), for a net revenue of +$3.11/test. Private
insurance carriers negotiate reimbursement payments and discounts at varied rates, not less than the Medicare rate. For this reason, cost estimates represent a minimum net revenue.

Table 3

*Outcome 2: Rank-Ordered Clinician Treatment Decisions*

<table>
<thead>
<tr>
<th>Clinician Treatment Decisions</th>
<th># of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment did not change</td>
<td>26</td>
</tr>
<tr>
<td>Counseling- Monitoring</td>
<td>10</td>
</tr>
<tr>
<td>Counseling- Lifestyle</td>
<td>6</td>
</tr>
<tr>
<td>Dose of diabetes medication changed</td>
<td>5</td>
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<tr>
<td>New diabetes medication added</td>
<td>4</td>
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<tr>
<td>Basal insulin titrated</td>
<td>3</td>
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<tr>
<td>Pump titrated</td>
<td>2</td>
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<tr>
<td>Resume diabetes medications</td>
<td>1</td>
</tr>
<tr>
<td>Multiple daily injections titrated</td>
<td>1</td>
</tr>
<tr>
<td>Counseling- Other</td>
<td>1</td>
</tr>
</tbody>
</table>

Clinic stakeholders confirmed the need to sustain the use of POC testing to document blood glucose data in the patient EMR. The Medicare HMO will continue to evaluate records and provide practitioner ratings with this information. The potential net revenue gain for 100% adherence to the POC glucose testing policy provided additional motivation to the partners.

This process improvement initiative was the first such project implemented at the clinic. The project was “owned” by the investigator with minimal stakeholder participation. The goal to improve diabetes care for Hispanic patients requires the full engagement and participation of every team member.
Table 4

Outcome 3: Cost Analysis- Net Expenses Versus Revenue

<table>
<thead>
<tr>
<th></th>
<th>Actual 2016 Tests</th>
<th>Evaluation Period Rate</th>
<th>If 100% Adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>#POC Tests</td>
<td>1600</td>
<td>2314</td>
<td>4446</td>
</tr>
<tr>
<td>Total cost per test</td>
<td>$2.13</td>
<td>$2.13</td>
<td>$2.13</td>
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<tr>
<td>Cost billed per test</td>
<td>$13.40</td>
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<tr>
<td>Medicare TX reimbursement/test</td>
<td>$5.24</td>
<td>$5.24</td>
<td>$5.24</td>
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<tr>
<td>Cost of supplies &amp; staff</td>
<td>$3404.16</td>
<td>$4928.82</td>
<td>$9469.98</td>
</tr>
<tr>
<td>If reimburse at Medicare TX rate</td>
<td>$8384.00</td>
<td>$12125.36</td>
<td>$23297.04</td>
</tr>
<tr>
<td>Minimum net revenue</td>
<td>$4979.84</td>
<td>$7196.54</td>
<td>$13827.06</td>
</tr>
</tbody>
</table>

Areas for future research should investigate mechanisms to increase the prioritization of diabetes with every MD/NP clinician at the clinic. While the clinicians cannot directly monitor patient lifestyle and medication adherence, there should be an accountability that interventions and counseling have been provided. Future quality and process improvement studies are needed to evaluate baseline patient panels, measures of A1c, and incidence of diabetes complications. Intervention studies should include strategies to manage specific cohort patient panels, provider panels, and patient outcomes over time.

Discussion

Summary

The 54.2% prevalence of diabetes in Hispanic patients treated in this internal medicine clinic identifies the need for increased diabetes focused care. The implementation of the POC glucose testing policy was beneficial to decrease the 17.39% gap in documented blood glucose
data, however this initiative did not close the gap completely. The frequency of POC glucose values being performed and recorded increased from 26.6% to 52% of all patients with diabetes over the 4-week evaluation period. Clinician treatment decisions were not changed in the EMR plan for 76.9% of patients in the sample cohort, but did change for 23.1% of patients after having POC glucose results available. The cost analysis demonstrated that this initiative was not performed at a financial loss to the clinic.

**Interpretation**

This process improvement initiative improved provider scores with the Medicare HMO in this one domain. The implementation of the POC glucose testing policy operationalized a procedure that had previously required a provider order, before the MAs performed this usual diabetes care test. Functionally this task was performed by the MA and did not require extra efforts on behalf of the MD and NP clinicians. The other two identified diabetes care gaps: the percentage of patients with no Hemoglobin A1c data recorded for the year and the percentage of patients with “uncontrolled diabetes” were not the target of this initiative. These gaps were not impacted directly during the short 4-week evaluation interval. Increased clinician attention to the diabetes care plan is required to affect outcomes for these gaps.

The cost analysis of this initiative was well received by clinic stakeholders. The annualized, small, net revenue gain assured the physician partners that this initiative was not done at a financial loss to the practice. The partners were interested that they could double this revenue gain if the MA’s had 100% adherence to the POC glucose testing policy. To date, the physician partners have not yet required 100% MA adherence.

This initiative is the first of many steps towards improving the diabetes outcomes of Hispanic patients treated at the clinic. The design utilized similar assessment components as two studies noted in the available knowledge (Crocker, 2014; Mata-Cases et al., 2013). Process
improvement change is possible. The use of POC glucose testing for all patients with diabetes in private primary care practices is less common than the actions of well-organized health systems such as Kaiser Permanente. A long-term goal for the family nurse practitioner (FNP), certified diabetes educator (CDE), doctor of nursing practice (DNP) investigator will be to have improved diabetes care at the clinic to the extent to apply to the National Committee for Quality Assurance (NCQA) for Diabetes Recognition Program status.

**Limitations**

The greatest limitation to this POC glucose testing process improvement initiative was the lack of support and participation of the full health care team. Stakeholders gave verbal commitment during meetings and initiative development. The majority of POC glucose results were done by three of the medical assistants (half). There was no penalty to employees for non-participation per the physician partners decision. Diabetes plan documentation was more detailed for two clinicians, than the other three. Perhaps the providers felt this project was only a medical assistant project to increase documentation of the POC glucose results in the EMR? Extensive discussions and presentations with the providers to increase prioritization of diabetes care and documentation of their clinician treatment decisions did not elicit the anticipated changes.

The sampling procedure used to study clinician treatment decisions for patients with diabetes after implementation of the POC glucose testing policy was small \((n = 34)\). Evaluation of all 342 patient records in detail would have been cumbersome within the time commitments of this project. The findings are not generalizable, they are the results of one small group internal medicine practice in Texas. Results from other primary care practices may be variable. If replicated, larger samples with greater participation of the clinic staff may reflect true effects of POC glucose results on clinician treatment decisions.
Conclusions

While the goal of this specific process improvement project was geared towards increasing the frequency of recorded POC glucose levels in the EMR, the overarching long-term goal is to improve the diabetes care of the Hispanic patients. Diabetes is difficult to manage when poverty and other priorities compete for limited resources. The consequences of poor diabetes care are well known: retinopathy, neuropathy, nephropathy, amputation, and early cardiac death.

The Latino physicians and acculturated bilingual nurse practitioners are familiar with the barriers faced by diabetes patients in the community. They have an advantage in providing language-concordant care. Clinicians across the country struggle to triage and prioritize multiple health conditions during short office visits. The demand for health care is high, the need for diabetes focused care in this population is higher. It is time to change from functioning in an illness model to a prevention and wellness model.

This was the first targeted process improvement initiative to be implemented at the clinic. Commitment to the POC glucose testing initiative was not ideal, but results demonstrate that gaps in the quality of diabetes care can be improved. Quality improvement and process improvement initiatives work best when all participants do their part. Cost analysis of this intervention demonstrated a positive net revenue gain, not a loss. Clinicians must be committed to increasing the priority of diabetes care during each patient visit, especially in primary care. The practice of evidenced-based care takes time and requires effort. Engage patient participation when making diabetes health decisions. Patient engagement will facilitate making effective clinician treatment decisions.
References


care to clinical quality and outcomes. *Journal of General Internal Medicine, 23*(11), 1784-1790. doi:10.1007/s11606-008-0760-4


APPENDIX A. PROGRAM LOGIC MODEL FOR IN CLINIC POC GLUCOSE TESTING

<table>
<thead>
<tr>
<th>Resources</th>
<th>Activities</th>
<th>Outputs</th>
<th>Outcomes</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical assistants</td>
<td>Staff education, implementation of the POC policy, results recorded in EMR</td>
<td>Increased POC tests in patients with diabetes</td>
<td>Medical assistant adherence to the policy</td>
<td></td>
</tr>
<tr>
<td>POC glucose monitoring materials</td>
<td>Results available for MD/NP review</td>
<td></td>
<td>Charges captured in the billing record</td>
<td>Improved diabetes care</td>
</tr>
<tr>
<td>Electronic medical record</td>
<td>Review POC glucose results, engage in care discussion</td>
<td>Facilitate patient centered care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicians and Nurse Practitioners</td>
<td>POC result to elicit treatment decisions by MD/NPs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients</td>
<td>Review POC glucose results, engage in care discussion</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
APPENDIX B. TIMELINE FOR THE POC GLUCOSE TESTING POLICY AND CLINICIAN TREATMENT DECISIONS INITIATIVE

<table>
<thead>
<tr>
<th>Time</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td># of patients seen</td>
<td>Y</td>
<td>Y</td>
<td>Y from T0</td>
</tr>
<tr>
<td># of patients with DM</td>
<td>Y</td>
<td>Y</td>
<td>Y from T0</td>
</tr>
<tr>
<td># POC glucose tests</td>
<td>Y</td>
<td>Y</td>
<td>Y from T0, T1</td>
</tr>
<tr>
<td>Behavior change</td>
<td></td>
<td></td>
<td>Y from T0, T1</td>
</tr>
<tr>
<td>Identification of cohort</td>
<td></td>
<td></td>
<td>Y from T0, T1</td>
</tr>
<tr>
<td>MA adherence to policy</td>
<td></td>
<td></td>
<td>Y from T0, T1</td>
</tr>
<tr>
<td>Δ Medications</td>
<td></td>
<td></td>
<td>Every 16th record</td>
</tr>
<tr>
<td>Δ Counselling</td>
<td></td>
<td></td>
<td>Y Outcome #1</td>
</tr>
<tr>
<td>Cost of POC testing</td>
<td></td>
<td></td>
<td>Y Outcome #2</td>
</tr>
</tbody>
</table>

T0= Baseline, T1= end of 2-week run-in, T2= end of 4-week measurement period
## APPENDIX C. DETAILED CLINICIAN TREATMENT DECISIONS POST- POC

### POLICY IMPLEMENTATION

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>Data of Service</th>
<th>Age</th>
<th>POC</th>
<th>Y/N</th>
<th>Treatment did not change</th>
<th>New diabetes medications</th>
<th>Diet/Calorie modification</th>
<th>Medication change</th>
<th>Basal results tested</th>
<th>Multiple daily injections tested</th>
<th>PMP pharmacist</th>
<th>PMP clinical</th>
<th>Lifestyle</th>
<th>outros</th>
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APPENDIX D. STATEMENT OF ORIGINAL WORK

Academic Honesty Policy

Capella University’s Academic Honesty Policy (3.01.01) holds learners accountable for the integrity of work they submit, which includes but is not limited to discussion postings, assignments, comprehensive exams, and the dissertation or capstone project.

Established in the Policy are the expectations for original work, rationale for the policy, definition of terms that pertain to academic honesty and original work, and disciplinary consequences of academic dishonesty. Also stated in the Policy is the expectation that learners will follow APA rules for citing another person’s ideas or works.

The following standards for original work and definition of plagiarism are discussed in the Policy:

- Learners are expected to be the sole authors of their work and to acknowledge the authorship of others’ work through proper citation and reference. Use of another person’s ideas, including another learner’s, without proper reference or citation constitutes plagiarism and academic dishonesty and is prohibited conduct. (p. 1)

- Plagiarism is one example of academic dishonesty. Plagiarism is presenting someone else’s ideas or work as your own. Plagiarism also includes copying verbatim or rephrasing ideas without properly acknowledging the source by author, date, and publication medium. (p. 2)

Capella University’s Research Misconduct Policy (3.03.06) holds learners accountable for research integrity. What constitutes research misconduct is discussed in the Policy:

- Research misconduct includes but is not limited to falsification, fabrication, plagiarism, misappropriation, or other practices that seriously deviate from those that are commonly accepted within the academic community for proposing, conducting, or reviewing research, or in reporting research results. (p. 1)

Learners failing to abide by these policies are subject to consequences, including but not limited to dismissal or revocation of the degree.
Statement of Original Work and Signature

I have read, understood, and abided by Capella University’s Academic Honesty Policy (3.01.01) and Research Misconduct Policy (3.03.06), including the Policy Statements, Rationale, and Definitions.

I attest that this dissertation or capstone project is my own work. Where I have used the ideas or words of others, I have paraphrased, summarized, or used direct quotes following the guidelines set forth in the APA Publication Manual.

Learner name and date
Shannon I. Brow October 11, 2017

Mentor name and school
Dr. John Schmidt, School of Nursing and Health Sciences