Results of a Performance Improvement Initiative in Diabetes Care

Stephanie A. Stowell, MPhil,[1] Rachel Bongiorno Karcher, PharmD,[1] Robert C. Bartel, MS,[2] Carolyn A. Berry, PhD,[3] Liza King, MPH,[3] Reshma D. Carter, PharmD,[1] Jeanne Cornish, RPh,[1] William A. Mencia, MD[1]

[1]Med-IQ, Baltimore, MD; [2]The Endocrine Society, Chevy Chase, MD; [3]Robert F. Wagner Graduate School, New York University, New York, New York, USA

ABSTRACT

Background: The optimal treatment of patients with diabetes is a challenge despite the existence of multiple treatment guidelines. With adequate glycemic control and lifestyle modifications, patients with diabetes can often delay or prevent disease-related complications.

Methods: A clinician performance improvement (PI) program was developed to improve processes of care for patients with type 2 diabetes mellitus (T2DM). Clinician participants undertook a 3-stage process that included an initial self-assessment of performance via patient chart review, the development and implementation of a personalized performance improvement plan to address identified gaps, and a second patient chart review as a final self-assessment of the impact of their practice improvement plan. Improvement plans were focused on developing strategies to enhance processes of care related to patient exercise, foot care, and glycosylated hemoglobin (HbA1C).

Results: Thirty-one participants completed a total of 1240 chart reviews prior to and after the implementation of a personalized improvement strategy. After implementation of their improvement strategies, participants more frequently used a 128-Hz tuning fork during foot examinations; exercise plans were more likely to be established, documented, and discussed with patients; and discussions of HbA1C levels were more frequently documented. Clinicians were also more likely to implement strategies to control glycemic levels if HbA1C levels were ≥ 7%.

Conclusion: Participating clinicians identified gaps in their performance and improved processes of care with relation to exercise, foot care, and glycemic control for patients with T2DM. The results presented here demonstrate that PI programs are an effective and innovative method for delivering continuing medical education that can positively affect clinician performance.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic and progressive disease, affecting approximately 24 million people in the United States, 6 million of whom are undiagnosed [1]. Complications associated with diabetes include heart disease, stroke, kidney disease, neuropathy, and retinopathy. Research has shown that achieving and maintaining glycemic control, in addition to making lifestyle modifications, can delay or prevent diabetes-related complications, but many patients with T2DM fail to achieve adequate control [2,3].

The American Diabetes Association (ADA) has published guidelines for the management of patients with T2DM [2]. Specific recommendations for the management of hyperglycemia, hypertension, hypercholesterolemia, and neuropathy include hemoglobin A1C (HbA1C) testing twice a year, blood pressure measurements, lipid profile testing, foot exams, and the development of an exercise plan. Optimally, the goal for patients is to achieve an HbA1C < 7%, blood pressure < 130/80 mmHg, low-density lipoprotein (LDL) cholesterol < 100 mg/dL, triglyceride < 150 mg/dL, and high-density lipoprotein (HDL) cholesterol > 40 mg/dL for men and > 50 mg/dL for women.

Despite guideline recommendations, care for patients with T2DM remains suboptimal, with most patients failing to meet these goals. Approximately one-half of all T2DM patients fail to reach the ADA HbA1C goal of < 7%, and even fewer achieve the goal of 6.5% or less recommended by the American Association of Clinical Endocrinologists (AACE) [4,5]. Between 2003 and 2004, 75% of adults with diabetes had blood pressure ≥ 130/80 mmHg or used prescription medications for hypertension [6]. In 2004, 68% of diabetes-related deaths were due to heart disease.

In an effort to improve clinician performance with regard to the care of patients with T2DM, a performance improvement (PI) initiative was developed by Med-IQ in collaboration with The Endocrine Society

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Correspondence: Stephanie A. Stowell, MPhil, Med-IQ, 5523 Research Park Drive, Suite 210, Baltimore, MD 21228, USA (e-mail: sstowell@med-iq.com).

Table 1. Demographic Patient Information

	Stage A (n = 620)	Stage C (n = 620)	*P*
Patient Race			< .05
Asian	9%	12%	
American Indian/Alaskan Native	0%	0%	
Hispanic	15%	13%	
African American	58%	58%	
Caucasian	14%	15%	
Other	4%	2%	
Patient Age			NS*
< 20 years	0%	0%	
20-35 years	3%	3%	
36-50 years	20%	20%	
>50 years	77%	77%	
Patient Sex			NS*
Male	54%	55%	
Female	46%	45%	

*NS indicates not significant (ie, $P > .10$).

and expert multidisciplinary faculty. The basis for this initiative stemmed from the goals of multiple medical interest organizations, including the Physician Consortium for Performance Improvement (convened by the American Medical Association [AMA]), the American Board of Medical Specialties, and the ADA, who seek to enhance the quality of patient care through the implementation of evidence-based performance measures [2,7,8]. This article is the second in a series of 2 articles describing this multiplatform continuing medical education (CME) PI initiative. The first article discussed the educational design and goals of this initiative; this second article discusses the results and key findings [9].

METHODS

PI is a nationally standardized CME format, approved by the AMA, which allows physicians to earn up to 20 *AMA PRA Category 1 Credits*™. Physician assistants and nurse practitioners can also participate in PI programs; their respective organizations will accept *AMA PRA Category 1 Credits*™. For this PI initiative, clinicians initially completed a self-assessment of their current practice patterns to identify gaps in the treatment of their patients with diabetes (Stage A). After self-assessment, participants developed and implemented a personalized self-identified plan to address identified gaps with a goal of improved patient care over a 3-month period (Stage B). Finally, participants completed a second self-assessment, comparing their post-intervention performance to their pre-intervention performance (Stage C). A detailed methodology of this program was previously described by Stowell and colleagues [9].

Each chart review included 3 demographic questions about the age, race, and sex of the patients and 27 questions assessing care of diabetes patients. Assessment questions focused on 3 benchmarks in diabetes care: exercise, foot care, and HbA1C. Unless otherwise specified, questions regarding "performance" were defined by whether or not the clinician participant carried out the noted care process. Although a portion of the data collection was dedicated to patient outcomes, the main focus of this initiative was process-related measures. Performance measures were derived from ADA 2008 and AACE 2007 guidelines, which were the most recent versions of the guidelines at the time the program was developed [10,11].

The analyses presented here used patient charts as the unit of analysis. Chi-square tests were performed to compare demographic characteristics as well as the 3 general benchmark areas of diabetes care prior to (Stage A) and upon completion of the performance improvement period (Stage C). Results were considered statistically significant if the resulting chi-square test would have occurred by chance less than 10% of the time ($P < .10$).

Patient Confidentiality, Participant Confidentiality, and Exemption From Consent

To ensure compliance with the Health Insurance Portability and Accountability Act (HIPAA) requirements, only de-identified patient data and no personal medical information of patients were submitted to the CME provider. Neither participant information nor individual patient data were submitted to the commercial supporter. Data regarding PI participants were only reported anonymously and in aggregate.

RESULTS

Overall, 210 participants were active in Stage A, 116 were active in Stage B, and 77 were active in Stage C. Presented here are data from the 31 participants who completed all 3 stages of the PI program at the time of this publication. These participants completed 20 charts in Stage A and 20 charts in Stage C, for a total of 1240 chart reviews. Six hundred twenty charts were reviewed before the intervention (Stage A), and 620 were reviewed after 3 months of implementation of participant practice improvement plans (Stage C).

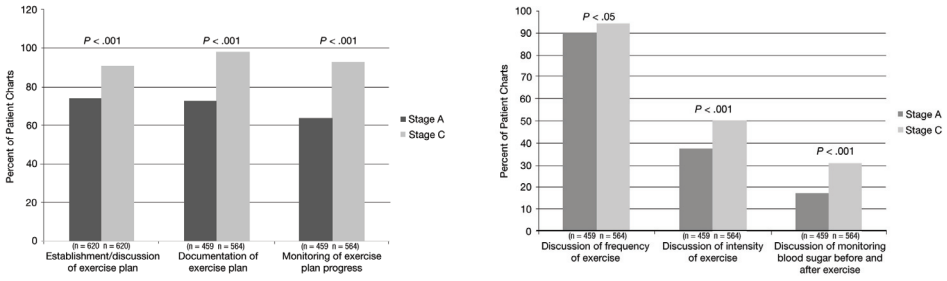

Figure 1. Exercise Benchmark Results. A, exercise plan establishment, documentation, and monitoring. B, discussion of exercise frequency, intensity, and monitoring of blood sugar.

Percentages of demographic patient information were compared between charts reviewed in Stages A and C. The majority of patient charts reviewed in Stage A were African American (58%) followed by Hispanic (15%) (Table 1). For Stage C, the majority of patient charts reviewed were African American (58%) followed by Caucasian (15%). The racial distribution of patients in Stages A and C differed slightly, but this difference was considered minor. Patients were also predominately over the age of 50 years (77% in both Stage A and Stage C) and male (54% in Stage A and 55% in Stage C). Statistically, Stage A and C groups differed significantly only in race, and that significance was substantively minor. The 2 sets of patients were comparable in age and sex. There was no evidence that charts from different patient populations were reviewed in Stages A and C.

Exercise

The establishment and discussion of an exercise plan with patients increased significantly after PI intervention (74% versus 91%, $P < .001$) (Figure 1A). During the discussion of an exercise plan with patients, clinicians significantly improved discussing the frequency of exercise (90% versus 94%, $P < .05$), intensity of exercise (37% versus 50%, $P < .001$), and monitoring of blood sugar before and after exercise (17% versus 31%, $P < .001$) (Figure 1B). Improvement, however, was not seen with regards to discussing the type or duration of exercise. Clinicians were also more likely to document established exercise plans (73% versus 98%, $P < .001$) and monitor patient progress (64% versus 93% $P < .001$) (Figure 1A).

Foot Care

Clinicians participating in this initiative significantly increased their performance of foot exams (79% versus 89%, $P < .001$). The documentation (95% versus 98%, $P < .05$) and discussion (95% versus 98%, $P < .05$) of foot exam results with patients also increased. For patients who received a foot exam, participants were asked to identify the methods used to perform the exam. Participant use of a 128-Hz tuning fork significantly increased from Stage A to Stage C (17% versus 45%, $P < .001$) (Figure 2). The percentage of clinician participants who performed visual foot exams (94% at Stage A), who used a 10-g monofilament (51% at Stage A), or who palpated dorsalis pedis and posterior tibial pulses (82% at Stage A) did not change significantly.

HbA1C

The documentation of patient discussions regarding their HbA1C values improved significantly between Stage A and Stage C charts (92% versus 100%, $P < .001$) (Figure 3). Physician participants were also more likely to initiate insulin therapy (5% versus 12%, $P < .05$) if patient HbA1C levels were ≥ 7%. No other significant changes in the initiation of oral therapy or modification of insulin or oral therapy were observed. There was also modest evidence that HbA1C values improved slightly in Stage C charts compared with Stage A charts for patients with elevated levels (>7%). Prior to intervention, Stage A charts had a mean HbA1C value of 8.6%. After intervention, the mean HbA1C value for Stage C charts was 8.4% ($P < .10$).

A high percentage of clinician participants discussed HbA1C test results with their patients prior to intervention (94%), and no significant change was observed post-intervention. Other areas in which no significant changes were demonstrated in reference to HbA1C were recommendation of lifestyle modification, modification of oral therapy, and modification of insulin therapy for those patients with HbA1C levels ≥7%.

Evaluation Data

An overwhelming majority of clinician participants (98%) reported that their individualized plans were successful in improving patient care, and all participants intend to continue incorporating these plans into practice (Table 2). Seventy-four percent of participants intend to modify their implementation plans after reviewing the results from their Stage C analysis. Also, the majority (67%) of clinician participants reported that completing an individualized practice improvement plan was either "somewhat" or "very" easy.

DISCUSSION

The program objective was for the participants to assess their practice using performance measures defined by the ADA 2008 and AACE 2007 guidelines within 3 general benchmark areas: exercise, foot care, and HbA1C [10,11]. This PI initiative supplemented other ongoing quality improvement initiatives in diabetes, but was unique in that it used individual practitioner self-assessment, benchmark-focused CME, and self-developed PI plans to improve process-related diabetes care.

Overall, the results from this PI program were encouraging. These outcomes suggest

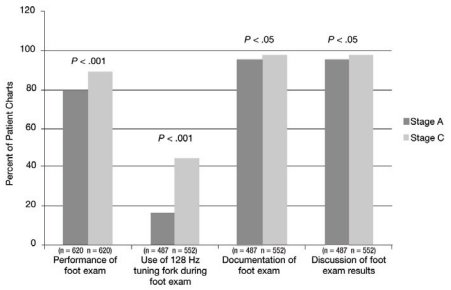

Figure 2. Foot Exam Benchmark Results.

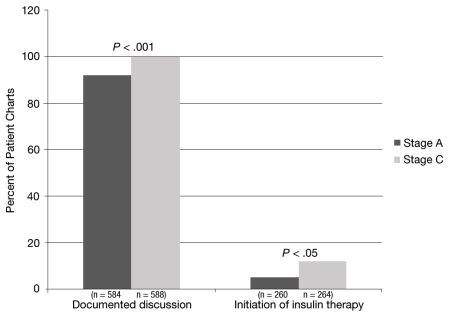

Figure 3. HbA1C Benchmark Results.

improvement as a result of participation in the self assessment and implementation of self-identified goals. Notably, clinicians improved performance with regards to foot examinations, specifically by using a 128-Hz tuning fork during the examinations and documenting and discussing exam results with patients. Similarly, exercise plans were more likely to be established, documented, and discussed with patients, and plan progress was more likely to be monitored.

Current guideline recommendations and study findings help demonstrate the value of the improvements seen in this PI program. The ADA recommends annual comprehensive foot examinations to identify symptoms that are indicative of ulcers, nerve disease, and poor circulation, which can lead to amputations [2]. In a study in which primary care physicians adopted practice guidelines regarding foot care in their patients, low-extremity amputation decreased from 21/1000 to 6/1000 ($P < .0001$) persons with diabetes [12]. In another study where foot screenings included the evaluation of neuropathy, peripheral vascular disease, deformities, foot pressures, and history of lower extremity pathology, the incidence of amputations decreased by 47% [13]. Overall, foot examinations can reduce amputation rates by 45% to 85%, and the results from this PI program indicate that patients treated by clinician participants may have a reduced risk of amputations [14].

Participants in this PI program increased their establishment, documentation, and discussions of patient exercise plans. Therefore, patients of these clinicians may have improved health outcomes as a result of enhanced clinician performance. The ADA recommends regular exercise to reduce patients' HbA1C levels and cardiovascular risk factors, as well as to improve weight loss results [2]. In one study, patients were able to reduce HbA1C levels an average of 1.2% after 6 months of resistance training and weight loss [15]. In another study, Boule et al found that structured aerobic exercise for at least 8 weeks or more resulted in lower HbA1C levels compared with controls (7.7% versus 8.3%; $P < .001$) [16]. That study also showed that a reduction in body weight was not necessary for patients to see the benefits of exercise for glycemic control [16].

In addition to showing improvements in initiating and documenting exercise plans (ie, a lifestyle intervention) for their patients, our PI CME initiative also demonstrated that, after intervention, physician participants were more likely to initiate insulin therapy if patient HbA1C levels were ≥ 7%. Together, these areas of improvement represent 2 of the 3 key strategies for achieving and maintaining HbA1C levels <7% that are emphasized in a recently published expert statement: (1) starting therapy with lifestyle interventions and metformin, (2) rapidly adjusting and adding medications as needed, and (3) initiating insulin therapy early in the course of treatment for patients who are not meeting goals [17]. These recommended strategies are based on studies demonstrating that lower levels of glycemia are associated with decreased long-term complications. The United Kingdom Prospective Diabetes Study Group (UKPDS), for example, found that participants who had low (<140 mg/dL) and intermediate (140 to 180 mg/dL) fasting plasma glucose levels at diagnosis had a significantly reduced risk of developing retinopathy, neuropathy, and microalbuminuria [18]. In a more recent study, patients with T2DM who initiated insulin therapy within 1 year of diagnosis had an increase in life expectancy of 0.61 years compared with patients who delayed insulin therapy for 8 years [19]. Significant reductions in time to onset of myocardial infarction events, retinopathy, microalbuminuria, foot ulcers, and neuropathy were also observed [19]. Clinicians, like those in this PI program, who adopt these key glycemic control strategies may reduce the rates of diabetes-related complications in their patients.

Comparing these findings with those reported in other studies seeking to improve care of patients with diabetes was difficult due to differences in measurement approaches and time periods of study. Ornstein and colleagues reported the impact of their multicomponent quality improvement intervention to enhance adherence with clinical practice guidelines in diabetes care (Diabetes Summary Quality Index) [20]. After guideline adherence intervention by the clinicians in that initiative, results showed a superior percentage of their patients meeting guideline-recommended goals with 51% of patients with HbA1C levels <7%, 59.8% with blood pressure <130/80 mmHg, 51.9% with LDL cholesterol <100 mg/dL, and 45% with triglycerides <150 mg/dL [20]. Comparatively, for the patients in this PI program, 55% had HbA1C levels <7%, 72% had blood pressure <130/80 mmHg, 59% had LDL cholesterol <100mg/dL, and 56% had triglycerides <150 mg/dL.

Comparing these health indicators to national averages, the results from this initiative are similar to the National Healthcare

Table 2. Participant Evaluation Data

Participant Responses	Percent (n = 54)
Difficulty in completing individualized implementation plan	
Very difficult	0%
Somewhat difficult	33%
Somewhat easy	52%
Very easy	15%
Success of implementation plan improving patient care	
Very successful	39%
Successful	42%
Somewhat successful	17%
Not successful	2%
Intention to continue to incorporate implementation plan into practice	
Yes	100%
No	0%
Intention to change implementation plan as a result of Stage C analysis	
Yes	74%
No	26%

Quality Report (NHQR) [21]. The NHQR reported that 55% of patients with diabetes were at glycemic goal (<7%), and results from this initiative revealed 55% of patients were at glycemic goal. This initiative also demonstrated that 89% of patients with diabetes had undergone a foot examination, surpassing the national average reported by the NHQR of 71% [22].

High baseline performance levels most likely reflected a positive bias that may be attributable to: (1) the participants who completed this program were highly motivated clinicians to begin with; (2) a selection bias in charts chosen by the participants; and/or (3) a reporting bias among these self-assessors. The first bias held constant across all stages, as the charts in both stages came from the same group of clinicians. The other 2 biases were likely to be consistent across Stage A and C, but it is possible that participants put forth additional effort during Stage C to ensure a positive outcome, either by pulling better charts, assessing the charts more favorably, or both. Nonetheless, the widespread significant—and in some cases substantial—improvement in charting suggests a real change over and above any differential bias.

What could not be ascertained from these data was whether the frequency of actual care processes increased, or whether improvement was due to better charting. It was quite possible that the intervention heightened participants' awareness of the need to chart their various discussions with patients in a way that had not been done previously. This implies an inherent issue in chart review data, but is not unique to this initiative [23]. Furthermore, this PI program was not designed in such a way as to follow patients over time or evaluate individual patient outcomes. Specifically, with regards to improvement in HbA1C values, this evidence was difficult to interpret because patient charts were not linked between Stage A and Stage C. Additionally, Stage C charts included an unknown number of first-time patients. It is unclear whether this modest improvement correlated with improved patient outcomes. Finally, the implementation period was limited to 3 months, and this time period may have been too short to observe measurable improvements in patient outcomes.

CONCLUSION

This PI initiative demonstrated that clinicians can improve the process and quality of care for their patients with diabetes through clinician self-assessment, benchmark-specific CME education, and the implementation of participant practice improvement plans. PI is an innovative way of delivering CME with demonstrable positive effects in clinician performance. Clinician participants reported that they are more aware of proper processes of care, they understand that simple changes to their practices can make a meaningful difference, and patients are appreciative and responsive to their improved communication efforts. Most importantly, all of the evaluated clinician participants report that they intend to continue their practice changes, and a majority feel this program was successful in improving their patient care.

Given the number of organizations supporting quality improvement programs in diabetes care, we expect to see more initiatives focused on this condition [2,7,8,24-26]. This type of initiative can be adapted to other disease states to create educational interventions that are specific to individual clinical practices and able to result in true overall behavioral and system changes. In the future, we hope to see more clinicians participate in these practice-based, self-directed initiatives to improve patient care.

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