Improving Microvascular Complications Screening Rates: Implementation of a Dedicated Diabetes Clinic (Diabetes 360) in an Underserved Area in Philadelphia, PA

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Quality Improvement Success Stories are published by the American Diabetes Association in collaboration with the American College of Physicians and the National Diabetes Education Program. This series is intended to highlight best practices and strategies from programs and clinics that have successfully improved the quality of care for people with diabetes or related conditions. Each article in the series is reviewed and follows a standard format developed by the editors of *Clinical Diabetes*. The following article describes the establishment of a dedicated patient-centered diabetes clinic within an academic primary care center serving a diverse population in Philadelphia, PA.

Describe your practice setting and location.

The Community Practice Center (CPC) is an academic primary care practice. It serves as the primary ambulatory training site of the internal medicine residency program of Albert Einstein Medical Center. It is run by 70–80 medical residents and supervised by internal medicine board-certified physicians. The clinic is located in northeast Philadelphia, PA, and provides care to a complex patient population. It serves the community with the highest prevalence rates of type 2 diabetes, HIV, obesity, poverty, and food insecurity in the city. This area also has a life expectancy that is 20 years lower than that of other areas of the city.

The CPC serves primarily a Medicaid population (85%), which is 80% African American, 10% Hispanic, and 10% other, which includes Arabic, Asian, and Caucasian patients. It offers integrated behavioral health services, medication-assisted therapy for opioid addiction, and refugee health services.

Describe the specific quality gap addressed through the initiative.

This project aimed to implement a patient-centered diabetes clinic allowing for time to be set aside specifically for treatment of this chronic condition. We identified care gaps in screening rates for microvascular complications as well as frequency of A1C measurements in our population with diabetes. With the implementation of this clinic, we aimed to improve microvascular complications screening rates, patient engagement (by improving no-show rates), and diabetes control in patients with type 2 diabetes. We also aimed to provide an ideal setting for physicians-in-training to learn about social determinants of health, particularly food insecurity and the role it plays in diabetes care.

How did you identify this quality gap? In other words, where did you get your baseline data?

We identified this gap in quality by performing a chart review of patients followed in regular primary care visits in the same facility and noticing that we had a high rate of patients whose care did not meet American Diabetes Association standards of care with regard to screenings for diabetic neuropathy, nephropathy, and retinopathy. We also found a high rate of uncontrolled

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TABLE 1 Baseline Characteristics for Intervention and Control Groups

	Control Group (n = 41)	Intervention Group (n = 43)
Age, years, mean ± SD	56 ± 15.4	55.2 ± 12
Female sex, %	56.1	55.8
Race/ethnicity, %		
African American	80.5	79.1
Hispanic	17.1	11.6
Arabic	2.4	4.7
Caucasian	0	2.3
Asian	0	2.3

type 2 diabetes and A1C measurements performed less frequently than recommended.

The majority of the outreach was from a Health Care Effectiveness Data and Information Set (HEDIS) list of care gaps. Our electronic medical records (EMR) system provider (Cerner) and data analysis team were able to produce lists of patients who were missing a HEDIS care parameter, including retinal eye exam, nephropathy screening, or A1C measurement within the past 3 months. Sixty percent of patients enrolled in the diabetes clinic were contacted from the aforementioned HEDIS care gaps list and referred from home, and 40% were referred from the regular primary care clinic by direct outreach from a patient navigator, physician, or other health care professional assisting patients.

Summarize the initial data for your practice (before the improvement initiative).

Patients for the control group were selected from a random sample of patients with diabetes seen for routine care in the CPC during the same period of all the patients seen in the diabetes clinic (June to December 2018). During that time period, 43 patients were seen in the diabetes clinic, which was scheduled on one-half day per week. We then obtained a random sample of 41 patients with type 2 diabetes seen in regular primary care visits in the CPC with the same baseline characteristics (i.e., sex, age, and ethnicity) as patients seen in the diabetes clinic (Table 1).

Within that period, only 61% (25/41) patients in the control group had had an annual screening for diabetic nephropathy by measuring microalbuminuria, 39% (16/41) had been screened for diabetic neuropathy, and 19.5% (8/41) had had their annual screening for retinopathy. The mean baseline A1C in the intervention group was 8.67 ± 2.40 (5.50–14.00), which was statistically significantly higher than the mean baseline A1C of the control group (7.67 ± 2.28 [4.60–14.00]).

All of the patients, whether attending primary care regular visits or the diabetes clinic, were seen by the same providers, as the diabetes clinic was developed within the CPC primary care clinic.

What was the time frame from initiation of your quality improvement (QI) initiative to its completion?

For data analysis, the initial QI project lasted for 6 months from June through December 2018. However, the project continues to expand in the clinic to the present time.

Describe your core QI team. Who served as project leader, and why was this person selected? Who else served on the team?

The project leader was one of the attending physicians in the practice. She was selected because the diabetes clinic was devised by her as a senior resident and then partially grant funded with resident participation. This attending physician also earned a degree in public health and had a special interest in population health and health disparities.

The development of this clinic involved all stakeholders. A representative from each of the following participating groups took part in the planning phase: medical residents, medical assistants, nutritionists, diabetes educators, front desk staff, care coordinators, managers, and podiatry residents. These stakeholders were present during the weekly sessions of the diabetes clinic. Before the implementation phase, medical assistants received training in diabetes care and screening parameters for type 2 diabetes. In addition, all medical assistants were trained in the use of the RetinaVue retinal camera, and "super users" were identified. The associate chair for quality improvement of the Department of Medicine led

the Plan-Do-Study-Act (PDSA) cycles throughout the project design and implementation.

Describe the *structural* changes you made to your practice through this initiative.

The Diabetes 360 program was implemented as a clinic-within-a-clinic model through which patients could come to their primary care office for a separate appointment focused on their diabetes. This format allowed for a different type of patient encounter and greater availability on the schedule, improving access to care. During this visit, patients underwent all diabetes-related screenings, including for the presence of retinopathy, nephropathy, and neuropathy, and needed A1C measurements were performed.

The initial and most important step of the clinic was the patient diabetes passport. This passport lists the screening parameters that need to be performed before the resident or educator enters the exam room. The medical assistant assigned to the diabetes clinic is responsible for completing the tasks on the passport. These may include collecting a urine sample (nephropathy screening), ordering a lipid panel, performing a blood pressure check, getting an A1C measurement, giving flu and pneumonia vaccines, performing a point-of-care glucose measurement, and/or taking a retinal image.

For retinopathy screening, patients could have the retina screening done in the diabetes clinic via telemedicine services using the Welch Allyn RetinaVue 100 imager as an alternative to ophthalmology referrals. This imager is a handheld device that captures a nonmydriatic image. The images are sent via the secure Health Insurance Portability and Accountability Act–compliant RetinaVue Network to a board-certified ophthalmologist within our network. The images are then evaluated by the ophthalmologist, who provides the diabetes clinic provider with a diagnostic report and screening plan within 48 h. Some patients also underwent traditional direct ophthalmologic evaluation without the requirement of obtaining pictures with the retina camera.

For the neuropathy screening, a comprehensive exam was performed on the initial visit, including dermatological and musculoskeletal inspection and neurological assessment of the feet with a 10-g monofilament as well as at least one other assessment, including pinprick sensation, temperature, or vibration. Vascular assessment was also performed by palpating distal pulses in the lower extremities, and patients were provided education about foot care and proper footwear.

For the nephropathy screening, a random urine sample was collected at the initial visit for measuring the albuminuria-to-creatinine ratio for patients who had not had this test performed within the past year.

To determine glycemic control, point-of-care A1C testing was done at the initial visit and repeated as appropriate to achieve adequate diabetes control. For patients who were not at their A1C goal, this test was repeated at every visit, if visits were 3 months apart, to assess for any improvement.

Describe the most important changes you made to your *process* of care delivery.

At their initial visit to the Diabetes 360 clinic, patients were screened for microvascular complications (retinopathy, neuropathy, and nephropathy) on-site without the need for any referrals. They also had a baseline point-of-care A1C measurement at that time.

After their initial visit, patients were scheduled for subsequent clinic visits as needed depending on their glycemic control based on evaluation of blood glucose logs and A1C results. During these subsequent encounters, patients continued to receive diabetes education from the clinic's diabetes educator and had repeat A1C testing as appropriate, with the entire visit focused only on diabetes management, including reviewing medications, providing counseling, and answering questions.

As opposed to regular primary care visits, in which patients had appointments for various chief complaints and usually included only a few moments to discuss diabetes management, blood pressure control, use of statins, and screening for microvascular complications, in the diabetes clinic, patients would have about 30 minutes to discuss only those topics related to their diabetes management. This format allowed them to improve their understanding of the disease and how to manage it, as well as of the complications and conditions associated with the disease.

In addition, screening for food insecurity was incorporated into the diabetes clinic. This inclusion allowed physicians to enlist the help of social workers as needed and provide food prescriptions in the form of resources for obtaining fresh fruit and vegetables.

If you used the PDSA change model, provide details for one example.

We used the PDSA methodology for evaluating changes. PDSA cycles were performed quarterly for the duration of the implementation process. The initial cycle was:

TABLE 2 Screening Rates in Intervention and Control Groups

Screening	Control Group (*n* = 41)	Intervention Group (*n* = 43)
Nephropathy	25 (61)	41 (95.3)
Neuropathy	16 (39)	43 (100)
Retinopathy*	8 (19.5)	35 (81.4)

Data are *n* (%). *P* <0.005 for all screenings. *Retinopathy screening rates include both retinal camera and ophthalmology standard direct screening.

- **Plan.** Our goal was to decrease no-show rates by 20%. At the time of initial implementation, the no-show was 80%.
- **Do.** We sent text reminders for diabetes clinic appointments.
- **Study.** Text messaging improved the no-show rate by 10%.
- **Act.** We incorporated a reminder call the day before appointments, in addition to the text messages.

Summarize your final outcome data (at the end of the QI initiative) and how it compared with your baseline data.

To evaluate the efficacy of the clinic, we compared the rates of appropriate microvascular complication screenings performed for patients in the diabetes clinic (*n* = 43) versus patients seen in regular primary care visits (*n* = 41) during the same time period (June to December 2018). We also compared the mean A1C values between the groups at the beginning of the evaluation period (June 2018) and at the 3- to 6-month follow-up. The same cohort of patients in each group was evaluated in the beginning of the period of observation and 6 months later.

For nephropathy screening, at some point during the 6-month period of the study, 95.3% (41/43) of the patients in the intervention group were screened for an albumin-to-creatinine ratio for diabetic nephropathy, whereas only 61% (25/41) of those in the control group were screened. There was a 34 percentage point increase in the screening rate in the intervention group (*P* <0.005, relative risk [RR] 1.56), as shown in Table 2.

With regard to the neuropathy screening, 100% of patients in the intervention group were screened for neuropathy with a foot exam, including the 10-g monofilament test, during the time frame of the study, whereas 39% (16/41) of patients in the control group were screened. There was a 61 percentage point increase screening in the intervention group (*P* <0.005, RR 2.5), as shown in Table 2.

Regarding retinopathy screening either by retina camera or ophthalmology referral, 81.4% of patients in the intervention group completed a screening, whereas the control group had a rate of 19.5% (*P* <0.005, RR 4.17), as shown in Table 2. When looking at the breakdown of the methodology for these screenings, 55.8% of patients in the intervention group received screening via the retinal camera and 25% in direct ophthalmology visits, versus 5% of patients in the control group receiving screening by retinal camera and 14.6% by direct ophthalmology visits (*P* <0.005), as shown in Table 3.

The mean baseline A1C in the intervention group was 8.67 ± 2.40 (5.50–14.00), whereas the mean baseline A1C of the control group was 7.67 ± 2.28 (4.60–14.00). At the 3- to 6-month follow-up, 3 patients in the intervention group and 14 in the control group were lost to follow-up. The mean A1C in the intervention group decreased to 8.08 (± 2.20), a change of 0.59 percentage points, and the mean A1C for the control group increased to 7.86 (± 2.08). These changes were not statistically significant as determined by ANCOVA.

Another important result to address is the fact that 14 patients in the control group were lost to follow-up. Therefore, it was difficult to demonstrate statistical significance in the difference in change in A1C. However, this finding might show that patients in the diabetes clinic were more likely to be engaged in their care and to return to follow-up than patients in the control group.

Since its implementation, the diabetes clinic has always been highlighted in biannual patient focus groups as one of the most positive experiences encountered by patients at the clinic.

What are your next steps?

We continue to refer patients with poor diabetes management to the diabetes clinic, including patients with inadequate screening for microvascular complications; those with A1C values above their individualized goal with no improvement at 3-month follow-up; those who

TABLE 3 Retinopathy Screening Rates by Screening Method in Intervention and Control Groups

Screening Method	Control Group ($n = 41$)	Intervention Group ($n = 43$)
Retinal camera	2 (4.9)	24 (55.8)
Ophthalmology direct visit	6 (14.6)	11 (25.6)

Data are n (%). $P < 0.005$.

are considered medically complex, with too many medical problems to be managed during a single primary care visit without compromising management of chronic conditions such as diabetes, blood pressure, and hyperlipidemia; and those with barriers to scheduling ophthalmology or podiatry visits for retinal and foot exams. Once patients have been referred to the diabetes clinic and attended the first visit, the goal is to have all needed screenings done in a single visit, as well as to have discussion and education regarding all of the other aspects of diabetes management, such as appropriate vaccinations, counseling on quitting smoking, alcohol use, and management of blood pressure and lipids.

Patients with adequately controlled type 2 diabetes and all appropriate screenings performed as recommended are not necessarily referred to the diabetes clinic. Our idea is to improve diabetes management and reduce long-term morbidity and mortality by including patients in their own care and increasing screening rates without increasing patients' burden with regard to attending and paying for unnecessary referral visits.

Our next steps include expanding the clinic by referring more patients and assessing their satisfaction quantitatively via questionnaires. Going forward, it would also benefit our patient population to expand the reach of the diabetes clinic by actively screening for food insecurity and including social workers in the multidisciplinary team. We also plan to include an objective evaluation of food insecurity in our future measurements as we subjectively noted that this is a prevalent problem in our population.

Further evaluation of the clinic in 1 year will also be beneficial, allowing us to determine parameters for new patients to include in the clinic and new components to add to the intervention, such as prescriptions for fruits and vegetables and the implementation of continuous glucose monitoring.

What lessons did you learn through your QI process that you would like to share with others?

This project is an example of a successful resident-run population health initiative. It improved screening rates for microvascular complications of diabetes and facilitated better A1C follow-up in our population. This success might be explained by our hypothesis that patients in the intervention group benefit from having focused visits and that access is a significant barrier to completion of screenings. If referrals are given for each screening parameter rather than performing them in real time, there is a much-lower likelihood that patients will be able to actually complete them.

This project was successful in a short-term evaluation of our population with poor health literacy and multiple other health barriers. We believe it can probably be replicated successfully in other health care facilities with similar patient characteristics and can also serve as an example for the management of other chronic disease states through adoption of the dedicated clinic-within-a-clinic model.

Further monitoring of outcomes in the future will be necessary to evaluate whether this initiative will continue to be beneficial for patients in the long term.

DUALITY OF INTEREST

AUTHOR CONTRIBUTIONS

L.R.S.S. conducted medical visits, created the database, collected pre- and post-intervention data, analyzed the results, and wrote and edited the manuscript. H.D.H. and M.B. developed and coordinated the clinic, led the staff education sessions, and supervised medical residents. K.M.C. analyzed the results, edited the manuscript, developed and coordinated the clinic, led the staff education sessions, and supervised medical residents. K.M.C. is the guarantor of this work and, as such, had full access to all the data in the project and takes responsibility for the integrity of the data and the accuracy of the data analysis.