Improving Population Health Among Uninsured Patients with Diabetes

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Abstract

Diabetes is a leading cause of morbidity and mortality; prevalence of diabetes is especially high in the southeastern United States among minority populations and those from lower socioeconomic sectors without access to health care services. The purpose of this project was to evaluate the clinical and financial outcomes of a nurse-led, interprofessional collaborative practice model that provides care coordination and transitional care for uninsured patients with diabetes. Data for this study were collected and evaluated from medical records of patients seen at the Providing Access to Health Care (PATH) Clinic between August 1, 2015, through May 30, 2017. Clinical outcomes were evaluated by comparing hemoglobin A1c (HbA1c) values before and after referral to the PATH Clinic. Cost savings to the academic medical center were evaluated by comparing costs associated with inpatient or emergency department encounters before and after referral to the PATH Clinic. A significant decrease in HbA1c ($P < .0005$) was noted for patients attending the PATH Clinic. In addition, financial analyses revealed a 55% decrease in pre to post PATH Clinic patients' direct costs. Similarly, a 42% decrease in the pre to post PATH Clinic patients' direct cost per encounter was noted. Average length of stay also was reduced when these patients were readmitted to the academic medical center. Results from this study support the effectiveness of the PATH Clinic model in caring for uninsured patients with clinically complex medical and social needs, often with behavioral health problems, who incur high health care spending and are often readmitted.

Keywords: diabetes care, uninsured, interprofessional model, clinical outcomes, financial outcomes

Introduction

DIABETES IS A LEADING CAUSE of mortality and morbidity in the United States. In 2015, diabetes was the seventh leading cause of death and the eighth leading cause of disability.[1] The disease and its associated complications result in approximately 200,000 deaths each year in the United States.[2] Diabetes is also costly, with estimates in 2012 of an economic social cost burden of $245 billion on the US economy, representing both medical expenses and lost productivity.[3] More than 20% of health care spending in the United States is for people with diagnosed diabetes.[4]

In 2015, it was estimated that the prevalence of diabetes in the United States reached a total of 30.3 million persons (23.1 million diagnosed and 7.2 million undiagnosed), approximately 9.4% of the population.[1] In the past 2 decades, the number of newly diagnosed cases of diabetes has more than doubled. Moreover, although the upward trend in diabetes prevalence has recently plateaued, projections are that diabetes will increase by 54% to almost 55 million Americans by 2030, with costs of more than $622 billion.[5,6] Individuals diagnosed with diabetes are plagued with higher risks of mortality, morbidity, and decreased life expectancy compared to those without diabetes, although not all

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individuals are impacted equally. Race, ethnicity, and socioeconomic status are key determinants of diabetes outcomes. In studies done in the United States between the 1970s and the early 2000s, prevalence of diabetes was double in those individuals from lower socioeconomic status sectors. Non-Hispanic blacks, Hispanics, and Asians have double the prevalence of diabetes of non-Hispanic whites, experience greater rates of hospitalizations related to diabetes, and have 50%-100% higher morbidity and mortality.[7]

There is wide disparity in prevalence of diabetes among states, with incidence highest in the ''Diabetes Belt,'' an area in the southeastern United States characterized by an especially high prevalence of diabetes. This area includes 644 counties within 15 states where the prevalence of diabetes is 11% or greater and where there also is significant adult obesity, physical inactivity, and a large African American population.[2,5] Alabama, one of the states in the Diabetes Belt, had a prevalence of diabetes in 2015 of 13.5% of adults, with projections that by 2030 the prevalence will be more than 18% of adults.[6,8] Jefferson County, home to Birmingham, the largest city in Alabama, had a diabetes prevalence of 12.0% of adults in 2013.[9]

Given the significant burden on health outcomes and the prevalence of diabetes in the United States and in the state of Alabama, it is imperative that innovative models of care delivery be implemented to reach those most impacted by the disease and least able to afford quality health care. Access to health care services remains an issue for many in Alabama, where almost 14% of the population is without health insurance and most counties are impacted by a shortage of health professionals.[10,11] In Birmingham, for instance, it is not unusual for uninsured adults with chronic conditions to use hospital emergency departments (EDs) for their ongoing care. Yet, in an era of population health and a desire to impact the Triple Aim,[12] providing care to this high-need, high-cost population who suffer from a variety of social determinants has been a focus of the University of Alabama at Birmingham (UAB) School of Nursing and UAB Medicine since 2012.

The purpose of this project was to evaluate a nurse-led, interprofessional collaborative practice model (IPCP) that provides transitional care and ongoing care coordination for underserved patients with diabetes discharged from UAB Hospital. Outcomes associated with care quality and cost burden to the academic health system are evaluated. For this study, the term ''underserved'' has been defined as individuals who have a payment source of ''self-pay'' or no insurance coverage.

Methods

This descriptive, observational study was set in UAB Medicine, the third largest public hospital and fourth largest academic medical center in the country. Initial and ongoing approval from the Institutional Review Board at UAB was received.

PATH clinic model

The PATH (Providing Access to Healthcare) Clinic operates using an IPCP model, which strives for competence in the domains of values/ethics, roles/responsibilities, interprofessional communication, and teams and teamwork.[13]

The clinic was initially funded in 2012 by a Health Resources and Services Administration (HRSA) Nurse Education, Practice, Quality and Retention (NEPQR) award to UAB School of Nursing. The school partnered with a local faith-based community organization in Birmingham to provide free care to uninsured residents of Jefferson County with chronic conditions. The original nurse-led clinic included professionals from nursing, social work, nutrition, optometry, medicine, mental health, and informatics. A care coordinator and a social worker dedicated to navigating pharmaceutical patient assistance programs (PAP) were added in 2013. Because of the improved health and cost reductions noted for PATH Clinic patients who had previously utilized the UAB ED for their ongoing care, when HRSA funding ended in June 2015 UAB Medicine committed the funds necessary to sustain the clinic. At that time, the clinic relocated to space on the UAB campus and reopened in August 2015 to serve indigent patients with poorly controlled diabetes discharged from UAB Hospital with no other option for care. Clinical and financial data for this report were obtained from patients seen at the PATH Clinic since August 2015.

The PATH Clinic operates 2 full days each week using a team-based interprofessional model. Current part-time clinic providers include 4 nurse practitioners (NPs) with students, an internist with 4 medical residents, an optometrist with 6 optometry interns, a care coordinator, the PAP social worker, a dietitian, and a physical therapist who provides wound care. Both the care coordinator and dietitian are certified diabetes educators. In addition, a second HRSA NEPQR grant was funded in July 2016 with the goal of seamlessly integrating behavioral health into current primary care and chronic disease management to address the high percentage of patients with mental and behavioral health needs. The behavioral health grant funds a psychiatrist (monthly), a psychiatric/mental health NP (weekly), a licensed independent clinical social worker, a behavioral health care coordinator, and an exercise physiologist. Common mental and behavioral health concerns include depression, anxiety, and alcohol and substance abuse.

Although the clinic has a clinical director (an NP faculty member with expertise in diabetes), it operates under a patient-centered model of shifting leadership and deference to expertise based on the greatest need of each patient at every visit. For example, the visit of a patient with fairly well-controlled diabetes but worsening depression would be directed by one of the behavioral health specialists. Similarly, if a patient's most urgent need is an impending eviction, the visit would be directed by the social worker. All clinicians meet at the beginning of each clinic for a ''huddle,'' during which each patient is discussed briefly and the primary emphasis for the visit is determined. However, most patients see multiple providers at every visit; a typical visit would include a primary care provider, dietitian, social worker, and care coordinator.

Patients referred to the PATH Clinic from UAB Hospital are uninsured adults with uncontrolled diabetes (hemoglobin A1c [HbA1c] ≥9.0 or blood glucose ≥300) who have no source for ongoing care and who have been identified as at risk for frequent ED use (defined as ≥3 ED visits within 12 months) or are considered likely to be readmitted. Uninsured patients with a new diagnosis of diabetes or those new

to insulin also are referred to the clinic. Most patients suffer from multiple comorbidities and are impacted by a variety of social determinants.

The PATH Clinic currently has a panel of approximately 300 patients who receive care at no cost. In addition to patients discharged from UAB Hospital who are the focus of this analysis, the clinic also cares for young adults discharged from the local children's hospital when they no longer qualify for Medicaid at age 19, and patients referred from medical screenings conducted at Birmingham area shelters, some of whom may not have UAB Hospital medical records. Only patients with a UAB Hospital medical record number are included in these analyses.

The PATH Clinic is located in a building leased by UAB located several blocks from UAB Hospital along the Birmingham bus line. The clinic is free for patients and UAB Medicine fully covers expenses including staff salaries, the building lease, and most diabetes supplies. Laboratory testing is limited to point-of-care devices and there is no radiology. The clinic makes use of pharmaceutical company sample programs to obtain insulin and other supplies such as pen needles. Most patients are eligible for pharmaceutical PAP and receive their medications at no cost. Medications that are not available through PAP can usually be obtained for $4 from local pharmacies and chain stores through their regular discount pricing.

Because of the PATH Clinic's part-time status, panel size is limited and patients are screened for eligibility for other sources of care starting at the first visit. The clinic's goal is to bring patients' diabetes under control at a time of high risk for hospital and ED admission and then discharge them to a permanent source of care, if possible. For residents of Jefferson County, the most common resource for a permanent medical home is a county-owned comprehensive public ambulatory care facility near UAB Hospital. Undocumented patients or those who live in rural areas of Alabama are more difficult to transition. The overall goal of the IPCP model of care is to provide high-quality, patient-centered, team-based transitional care for a vulnerable population at a vulnerable time, thus reducing hospital costs while improving health and quality of life.

Data collection and analysis

Using an industry standard structured query language (SQL) database and a leading analytics tool, both clinical and financial data for PATH Clinic patients were collected and evaluated for this study. Because this clinic operates using a nonpayment model, the cost data evaluated were related to inpatient and ED costs from UAB Hospital for the patients prior to enrolling in the PATH Clinic and after the patients' ''first-show'' appointment date at the PATH Clinic. Two different analyses were conducted using the same time frame to determine clinical outcomes and financial outcomes.

Clinical analysis

PATH Clinic patients' medical records were used to aggregate clinical outcome data for each patient. Medical records from August 1, 2015, through May 30, 2017 were reviewed. To determine if glycemic control improved after referral to the clinic, 2 variables were evaluated: (1) HbA1c upon referral from UAB Hospital and (2) the most recent

HbA1c measured at the PATH Clinic. HbA1c measurements were checked at least every 3 months. However, the time span between the HbA1c upon referral and most recent HbA1c varied between patients but at most could include 4 different hemoglobin A1c values. Those patients with missing values for either variable were eliminated from the analysis. Thus, only patients who had both a value for HbA1c upon referral from UAB Hospital *and* a value for most recent HbA1c were included in the study. In order to analyze these data, the 2 data points were recorded in an Excel spreadsheet, de-identified, and copied and pasted into SPSS for Windows (IBM Corp., Armonk NY) for analysis.

Financial analysis

Using the medical record numbers for each patient, the hospital's financial systems were used to aggregate total direct cost data for each patient utilizing the PATH Clinic. Data for inpatient and ED encounters were extracted in order to evaluate cost of care for these services at UAB Hospital. Patients who had at least 1 PATH Clinic visit between August 1, 2015, and May 30, 2017 were evaluated using aggregated cost and encounter data pre and post initial PATH Clinic visits.

In the analysis of the pre-PATH and post-PATH populations, cost savings were found to have been achieved through a reduction in total inpatient days, a decrease in the average inpatient length of stay (LOS), and a decrease in the average number of ED encounters per patient. In addition to these cost savings, further revenue opportunity is available by filling the newly available bed days that were obtained through this reduction in inpatient days. This additional revenue opportunity will vary by hospital depending on each hospital's cost and reimbursement structure. No attempt is made here to quantify this potential additional revenue and no attempt is made to evaluate specific resource utilization (eg, laboratory and/or diagnostic testing) at the patient level.

Results

Clinical analysis

The HbA1c values upon referral ranged from 5.3 to 18.5 ($n = 187$). The most recent HbA1c values collected at the PATH Clinic ranged from 4.9 to 14.0 ($n = 191$). After listwise deletion, 139 matched patient values (patients who had both a value for HbA1c upon referral *and* a value for most recent HbA1c checked at the PATH Clinic) remained in the analysis. Using a repeated measures *t* test, HbA1c values upon referral from the hospital were compared to the most recently performed HbA1c at the PATH Clinic. HbA1c values were significantly higher before referral to the clinic (M = 11.625, SD = 2.73) than those most recently performed (M = 9.10, SD = 2.62) as indicated by a significant *t* test ($t(138) = 9.24$, $P < .0005$). The mean difference associated with the paired *t* test indicates a 2.53% reduction in HbA1c.

Financial analysis

The PATH Clinic population for this analysis represented 178 distinct patients with UAB Hospital medical record numbers and spanned a time frame from August 1, 2015, to November 30, 2016. To accurately compare the financial impact of the clinic, the analysis was restricted to patients

having at least 1 inpatient or ED visit 6 months *prior* to their first PATH appointment and having at least 1 inpatient or ED visit within 6 months *following* their first PATH appointment. Thus, the total time frame of analysis was February 1, 2015, through May 30, 2017. A total of 51 patients were included in the analysis.

The analysis shows meaningful cost savings for patients utilizing the PATH Clinic. The average direct cost per patient was $6063 in the pre-PATH Clinic population, versus $2730 in the post-PATH Clinic population. This represents a 55% decrease in pre to post PATH Clinic patients' direct costs. A similar reduction in direct cost per encounter was found. The pre-PATH Clinic population had an average direct cost of $2454 per encounter versus $1426 per encounter in the post-PATH Clinic population. This represents a 42% decrease in the pre to post PATH Clinic patients' average direct cost per encounter.

Average LOS also was reduced. The average LOS for the pre-PATH Clinic population was 5.4 days versus 4.8 days for the post-PATH Clinic population. This represents an almost 12% reduction in the average LOS for the post-PATH Clinic patient population.

An annual cost avoidance opportunity of $361,728 was determined for the 51 patients. This represents the decreased costs to the organization for the 51 PATH Clinic patients who had fewer inpatient encounters and had a decreased LOS as a result of the PATH Clinic. Extrapolating these results to the existing 300 PATH Clinic patients results in a cost avoidance of up to $2,300,000 annually. Reasons for ED visits and inpatient admissions were not determined as part of this study; however, the top 3 diagnoses when PATH Clinic patients were readmitted were type 2 diabetes with hyperglycemia, type 1 diabetes with ketoacidosis, and sepsis. In comparison, 48 nonparticipating PATH Clinic patients, (those who failed to attend one or more scheduled appointments and thus never came to the clinic), cost the hospital $905,269 in total direct costs during the same time period.

Because UAB Hospital typically operates at near 100% occupancy, there also are potential revenue opportunities to be achieved through the hospital's ability to fill vacant inpatient beds that are available because of the decreased LOS of PATH Clinic patients. This revenue will vary depending on the cost and reimbursement model of each organization. Although these figures may total millions of dollars in potential revenue, they are not included in the analysis as the opportunity dollars are based on the reimbursement structure for each organization. The estimates provided for this organization are conservative as the current analysis includes only patients who had both pre and post PATH Clinic encounters at UAB Hospital (ED visits and/or inpatient hospitalizations). There are many active PATH Clinic patients who had no further encounters with UAB Hospital following their entry into the PATH Clinic who were not included in the analysis. Including these patients would have shown an even greater cost savings and would also lead to an additional revenue opportunity.

Discussion

Analyses of health status and health systems costs for PATH Clinic patients before and after enrollment in the clinic support the effectiveness of the model aimed at caring for a population of uninsured patients with clinically complex medical and social needs, often with behavioral health problems, who incur high health care spending and are often readmitted. Both clinical and cost outcomes were found to support the Institute of Medicine's aims for quality of safe, timely, effective, efficient, equitable, patient-centered care.[14]

The costs associated with patients participating in the PATH Clinic were lower on average per patient and per encounter when compared to the costs of their care received prior to PATH Clinic participation. When comparing participating PATH Clinic patients to nonparticipating patients (those who failed to attend one or more scheduled appointments and thus never came to the clinic), the costs were much lower, potentially representing an opportunity to reduce costs even further if nonparticipants can be successfully brought into the PATH Clinic.

PATH Clinic patients had a reduced inpatient LOS when compared to their pre PATH Clinic care and nonparticipants. A reduced LOS not only decreases the chance for patient adverse events, but is also an opportunity to gain a return on the investment in quality of care by avoiding extra patient days and creating potential for other patients to fill beds not occupied by PATH Clinic patients. More importantly, most PATH Clinic patients studied did not have return visits to UAB Hospital at all, despite nearly all of them initially requiring hospitalization there – often on multiple occasions. These results indicate that this interprofessional, population health-focused model is successful in both improving health and decreasing costs for this vulnerable patient population. PATH Clinic patients are uninsured and it is possible that some may incur ED visits or inpatient admissions elsewhere. However, because the PATH Clinic is a UAB-affiliated clinic, the strong likelihood is that the majority of patients return to UAB Hospital when seeking care outside of the clinic.

Conclusions

Interprofessional team-based care has proven effectiveness for clinical outcomes, patient satisfaction, and provider satisfaction.[15–18] Further, care coordination has become a mainstay for effective management of populations of patients at risk for adverse outcomes and high costs of care. The Patient-Centered Medical Home model is based on these principles. Medical homes in various levels of intensity are tools for improving primary care. Although the medical home has been shown to be effective for improving some health outcomes, for cost-effectiveness and long-term financial sustainability selective, risk-based implementation may be required.[19]

Analyses of large national data sets suggest that a small number of patients account for a significant portion of health care costs in a given year – as disproportionate as 5% of patients accounting for half the costs in some studies.[20] This suggests that coordination of higher risk patients may be most effective for improving health outcomes as well as decreasing health care costs. That is the premise of the PATH Clinic - effective care for a high-need, high-risk population can significantly improve health outcomes while also reducing costs.

Although this study demonstrated improved clinical outcomes and cost savings, several limitations are noted. For example, the direct costs per patient reflect costs regardless of diagnoses. Therefore, a potential exists for cost savings

differentials based on diagnoses. In addition, the researchers were unable to determine if care was provided to PATH Clinic patients by other non-UAB affiliated clinics or hospitals. Likewise, the researchers were unable to provide comparisons on patients outside the PATH Clinic, except for those patients who were referred but never attended an appointment. Future studies will focus on determining clinical and financial outcomes over a longer period of time.

UAB School of Nursing continues to lead the PATH Clinic and UAB Medicine continues to provide sustainable funding for the clinic because it has been shown to be a model that works. The clinic provides an opportunity for faculty as well as a variety of health professions students and residents to gain experience practicing in a team-based environment. Moreover, the ability to care for this high-need, high-cost population as outpatients allows UAB Hospital increased ability to treat more urgent patients with subspecialty needs.

Author Disclosure Statement

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