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Diabetes management with a care coordinator improves glucose control in African Americans and Hispanics

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Abstract:

BACKGROUND: The purpose of this study was to evaluate diabetes control, as measured by hemoglobin A1c (HbA1c) improvements among African American and Hispanic patients receiving conventional clinical treatment combined with a bilingual diabetes educator using culturally and linguistically appropriate educational materials. This study also sought to estimate the healthcare cost savings resulting from any A1c improvements and assess the cost-effectiveness of this approach.

MATERIALS AND METHODS: This was a multistage, face-to-face observational study undertaken in Texas, United States and focused on 153 African American and Hispanic patients with poor blood glucose control (baseline A1c >8.0%). For two years, a bilingual care coordinator motivated patient behavior changes that could lead to improvements in glucose control. The primary evaluation measure was change in %HbA1c, with secondary measures being change in blood pressure (BP) and low-density lipoprotein (LDL). We also sought to gauge the program's potential cost-effectiveness.

RESULTS: Within the study group, A1c levels decreased over the study period from a mean of 10.0% to 8.4%. The same group saw no statistically significant improvement (reduction) in blood concentrations of LDL. The African American subgroup had a small reduction in systolic BP while changes for non-White Hispanics were not statistically significant. The average A1c reduction realized in this observational study provided estimated cost savings that are nearly twice pilot expenditures.

CONCLUSIONS: Combining standard diabetes care with a bilingual educational care coordinator results in significant reductions in mean A1c (−1.6% HbA1c) in patients with poorly controlled blood glucose and African American/non-White Hispanic heritage, an intervention that also was shown to be cost-effective. This may be an effective model for improving diabetes care in provider practices.

Keywords:

Care coordination, cost-effectiveness, glucose control, health care disparities, hemoglobin A1c

Introduction

Racial and ethnic disparities exist in US health care after controlling for insurance status, income, age, and disease severity.[1] These disparities include disease prevalence, use of services, evidence-based treatment, and health outcomes.[1-3] Minority groups are also disproportionately affected by diabetes, with African Americans and Hispanic Americans experiencing a higher prevalence of diagnosed diabetes compared to White Americans.[4] Despite generally improved glucose control over the past 10 years, appropriate glucose control remains lower in African American and Hispanic patients with diabetes compared to White Americans with diabetes.[5] Such disparities in health care have clear consequences for the health and longevity of America's growing minority populations.

Diabetics with poor glucose control experience more diabetic complications such as heart, kidney, nerve, and eye disease, and they incur more medical and pharmacy expenses.[6] Prior research has associated elevated glucose levels (hemoglobin A1c

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value [%HbA1c]) with increased medical and pharmacy costs, increased costs of complications, and more acute care visits.[7-11] Specifically, insured patients with diabetes and A1c values of 8% or above had statistically significant higher overall medical and pharmacy costs, and A1c values over 10% are associated with higher inpatient costs and increased risk of diabetic complications, with their associated costs.[7-11]

These increased costs are borne by patients and taxpayers, as well as by private US employers, about 50% of which provide health insurance coverage to employees.[12] Surprisingly, a national survey of the US showed that approximately half of employers did not know that racial and ethnic disparities in health status or health care were major drivers of medical costs and related health and productivity costs.[13] The companies surveyed did not view health and health care disparities as business issues. In reality, direct medical costs in the US due to health inequities were more than $230 billion over a four-year period.[14]

In this pilot we sought to measure whether a care coordinator using standard diabetes care tools coupled with culturally and linguistically appropriate member health education materials and care management activities would lead to improved glucose control in a cost-effective manner. We created estimates of cost savings resulting from reduced blood glucose levels. Finally, we compared the theoretical cost savings to the actual pilot costs to estimate the potential cost-effectiveness of this program, as well as its implied return on investment (ROI). We hypothesize that diabetes management that includes a care coordinator will lead to group-level glucose control improvement, resulting in estimated health care cost savings that exceed program expenditures.

Materials And Methods

As a national health insurer, Aetna utilizes health-related data provided by patients, providers, and government entities to manage our business and drive analytics for preventive health, early detection, disease management, and other initiatives. Beginning in 2001, the company began inviting its health plan members to self-report racial and ethnic information so that it could gain insight into potential health care disparities within this discrete subset of members. Since then, the company has collected racial and ethnic data from ~36% of its 18 million health plan members in the US for a total of ~6.5 million racially self-identified members.

This data helped Aetna identify where significant health care disparities exist, and to create programs or initiatives aimed at eliminating those disparities and improving the health of targeted populations with specific health conditions. The data revealed that large concentrations of self-reported African American and Hispanic health plan members reside in the Southwest region of the United States, particularly in the state of Texas. Further analysis showed that Texas plan members experienced the widest disparity between African Americans and Hispanics versus non-Hispanic Whites for diabetic care compared to the other states with members who self-reported their race and ethnicity. African American and Hispanic members had rates of poor control of blood glucose levels (A1c ≥8.0%) that were nearly twice those of white members. Table 1 shows our overall demographics for poorly controlled blood glucose. This data suggests that these African American and Hispanic members are at risk of being twice as likely to suffer the health consequences of uncontrolled diabetes.

Pilot study design

To address this glucose control disparity, we created a provider-focused pilot program for African American and Hispanic plan members with diabetes in the Dallas–Fort Worth, Texas, area, which may have included Aetna employees, or employees or dependents of our business customers. A large multi-specialty provider group in Dallas, The Texas Provider Group (TTPG), was selected as a partner to develop this pilot intervention program.

TTPG and our company jointly developed a multi-faceted approach consisting of a bilingual nurse-certified diabetic educator ("care coordinator") and culturally and linguistically appropriate member health education materials, which were used in coaching the target population. The care coordinator, located at TTPG's facility, educated diabetic members using the selected health educational materials. The care coordinator worked directly with TTPG medical staff and provided community outreach. In addition, quarterly meetings were held with TTPG, the care coordinator and Aetna to review the status of the initiative and to resolve operational issues and concerns. Specific activities of the care coordinator included:

- Outreach to African American and Hispanic patients with an A1c ≥8% with a focus on identifying and closing gaps or barriers to care, and helping patients develop health care goals
- Outreach to all specialists involved in patient care by obtaining test results and consult notes, and

Table 1: Health insurance members with poorly controlled blood glucose (A1c ≥8.0%)

Year	Number of members with A1c ≥8.0%	A1c (%) (μ±SD)
2010	81,632	9.5±1.4
2011	159,409	9.6±1.5
2012	154,205	9.6±1.5

SD = Standard deviation

compiling them for primary care physicians (PCPs) to review and use to update the patient's electronic health record
- Engaging patients in scheduling office visits, obtaining their own laboratory blood test results, and working with physicians to develop needs-based care plans
- Providing patients with educational materials, or scheduling diabetes education sessions
- Connecting with patients for previsit and postvisit planning, including reminders for patient appointments and postappointment follow-ups to ensure patients had understood physician recommendations
- Communicating with patients through telephone calls and a "virtual patient portal" system that allows for secure internet discussions of laboratory reports, appointment schedules, or plans of care
- Educating patients and their families about prevention and health care management, which included the use of motivational interviewing techniques
- Assisting patients with prescription medication regimens and consulting with their PCPs on alternative medications when patients could not afford co-pays.

As part of the coaching process, the care coordinator supplied pilot participants and their families with culturally and linguistically appropriate member health education materials. These materials included:
- "*On the road to living well with diabetes*," published by the Joslin Diabetes Center in Boston, which aims to demystify concepts and aspects of care associated with diabetes (e.g., A1c, blood pressure [BP], estimated glomerular filtration rate, low-density lipoprotein [LDL], cholesterol, and eye exams) (In English and Spanish)
- "*First Steps*: *A Basic Guide to Managing Your Diabetes*," published by the Joslin Diabetes Center, a booklet with guidance for diet and exercise and other self-care for individuals who have been newly diagnosed with diabetes (In English and Spanish)
- "*Diabetes and You*," published by the Joslin Diabetes Center, designed for those who have already been diagnosed with diabetes and their loved ones. It demonstrates key diabetes concepts in a highly pictorial way (In English and Spanish)
- "*What You Need to Know about Diabetes – A Short Guide*," published by the Joslin Diabetes Center, a comprehensive (132 pages), yet simplified, resource for those with diabetes (In English and Spanish)
- "*La Historia de Rosa*" (Rosa's Story), developed by the Joslin Diabetes Center, is a three-CD, Spanish-language audio set that tells the story of Rosa, how she dealt with her diabetes diagnosis, and other challenges. An accompanying booklet highlights ways to manage type 2 diabetes (In Spanish)
- "*Living with Diabetes: An Everyday Guide for You and Your Family*," published by the American College of Physicians Foundation, is a photograph-based book about diet (food choices and portions), exercise, checking blood sugar and using medications and insulin injections (In English and Spanish).

The race of study participants was determined by TTPG, with African American defined as one of the following racial categories regardless of ethnicity: Black, African American or Asian/African American. Hispanic was defined as one of the following ethnic categories: Hispanic, Mexican or Central American. A study participant was considered to have received outreach if they had at least one phone call or face-to-face meeting with the care coordinator.

%HbA1c (percentage glycated hemoglobin as defined in the Diabetes Control and Complications Trial) is a 3-month measure of glucose control. Glucose control was categorized as either good glucose control (A1c <8%) or poor glucose control (A1c ≥8%). A1c value is reported as a percentage: the normal value for a nondiabetic is <5.7%.[15,16] All study group members started with poor glucose control ($A1c_{Baseline}$ ≥8.0%). Over the course of the study, change in A1c from this initial baseline value was calculated as:

$$\Delta A1c = A1c_{Final} - A1c_{Baseline} \quad (1)$$

Where $A1c_{Baseline}$ is the patient's first lab-measured A1c value, collected between January 2010 and December 2012, and $A1c_{Final}$ is the non-baseline value closest to September 30, 2012, that was collected between February 2011 and December 2012. A negative ΔA1c value is an improvement.

LDL value measures low-density lipoprotein (i.e., "bad cholesterol") in the blood. LDL control was categorized as either good LDL control (LDL <100) or poor LDL control (LDL ≥100). Over the course of the study, change in LDL (ΔLDL) was calculated as the difference between the baseline LDL value ($LDL_{Baseline}$) and the most recent LDL value (LDL_{Final}). LDL values are reported in units of milligrams per deciliter (mg/dL). A negative ΔLDL represented an improvement.

Blood pressure is a general indicator of cardiovascular health. BP was categorized as either good BP control (BP <130/90) or poor BP control (BP ≥130/90), which at the time aligned with the American Diabetes Association's clinical practice guidelines (Note: The ADA's guidelines have changed: Their 2014 guidelines categorize good BP control as BP <130/80 and poor BP control as BP ≥140/80). Over the course of the study, change in BP (ΔBP) was calculated as the difference between the baseline systolic/diastolic

BP values ($BP_{Baseline}$) and most recent BP values (BP_{Final}). All BP values are reported in units of mm Hg. A negative systolic ΔBP value is an improvement.

Pilot study patient group

The pilot was a longitudinal, observational one-group study, designed under consultation with Aetna's Racial and Ethnic Equality External Advisory Committee, which is made up of physicians, scholars, academicians, and business leaders. The pilot study group was comprised of Aetna members with diabetes who were African American or Hispanic, seen by TTPG physicians at least twice between January 2010 and December 2012, whose first A1c value ($A1c_{Baseline}$) during the study period was ≥8% (i.e., poorly controlled), and whose most recent A1c value ($A1c_{Final}$) was after February 2011. Although there were 479 TTPG patients with diabetes who were racially black or ethnically Hispanic, only 153 in this group (32%) were qualified to be part of the study group after applying the above requirements. Table 2 shows the demographics for this study. Of the 153 members in the study group, 98 were African American and 55 were Hispanic; 46% were women and 8% were Spanish-speaking [Table 2]. 112 (74%) spoke to the bilingual diabetic educator at least once, whereas the remaining patients received only educational materials regarding diabetes. The average age in this group of poorly controlled diabetics was 50.6 years [Table 2]. Statistical significance of A1c, BP, and LDL results were tested using the one-sample *t*-test, with results considered statistically significant when $P < 0.05$. A1c and LDL were assayed using standard blood tests. BP was assayed by nurses at the start of appointments using a standard sphygmomanometer. Upon completion of the study, pilot participants were transitioned to TTPG's patient-centered medical home model for continued diabetic management.

Program costs, estimates of savings and return on investment

Cost savings were estimated using the Milliman model.[11] The Milliman model associates A1c reduction with reductions in diabetic complications, which in turn lead to cost savings. The cost savings were based on the National Health and Nutrition Examination Survey section on diabetic control of A1c, LDL, and BP;[11] the United Kingdom Prospective Diabetes Study's rate of diabetic complications for diabetic control of A1c, LDL, and BP;[17] and commercial claims data from MarketScan Research Data (Truven Health Analytics, Ann Arbor, MI). The Milliman model trended the costs to 2012 dollars. Table 3 shows cost savings due to different A1c reductions, as estimated using the Milliman model. Cost savings associated with each study member's A1c value reduction were then estimated. The cost savings per member were summed and averaged to represent the group as a whole.

ROI for this pilot was calculated using:

$$\text{ROI} = \frac{\text{Total estimated cost savings}}{\text{Pilot costs}} \quad (2)$$

Where 'total estimated cost savings' represents Milliman model-based cost savings estimates [Table 3], and 'pilot costs' represents costs of the bilingual diabetic educator and the member educational materials. The costs associated with pilot development, pilot evaluation, and standard diabetes care were not included.

Results

Pilot study

Figure 1a shows how many patients achieved different ΔA1c values over the course of the study. Figure 1b shows each patient's ΔA1c value plotted versus his or her initial $A1c_{Baseline}$ value. Most study participants had a small improvement in A1c, while smaller groups had either a large improvement of A1c or mild worsening of A1c [Figure 1a]. Patients with larger $A1c_{Baseline}$ values had larger average decreases in A1c [Figure 1b], possibly because starting with higher blood glucose affords more opportunity for, or easier, blood glucose reduction. Overall, there were 117 (77%) members with A1c improvement, 9 (6%) members with statistically

Table 2: Pilot study group demographics

Race/Ethnicity	Number of patients in study (A1c ≥8%)	Age (μ±SD)	Female patients (%)	Spanish-speaking patients (%)	Patients receiving outreach (%)
AA	98	51.4±9.9	46 (47)	0 (0)	71 (73)
Hispanic	55	49.2±12.2	24 (44)	12 (22)	41 (75)
Combined	153	50.6±10.8	70 (46)	12 (8)	112 (74)

Ages ranged from 20 to 77 years. AA = African American, Hispanic = Non-White Hispanic, SD = Standard deviation

Table 3: Milliman model-based cost savings estimates for different ranges of A1c reduction in a poorly controlled diabetic population

ΔA1c	No reduction	–0.1-–1.24%	–1.25-–1.49%	–1.5% or more
Cost savings (2012 $USD)	$0	$1,193	$1,545	$1,898

A1c values are in units of %HbA1c. HbA1c = Hemoglobin A1c insignificant change in A1c, and 27 (17%) members with a higher most recent A1c. Table 4 shows group statistics for these changes in A1c. For the group as a whole, there was statistically significant improvement in A1c for the poorly controlled diabetics that comprise the study group: the mean baseline A1c value was 10.0%, and the mean most recent A1c value was 8.4% – an absolute A1c improvement of 1.6% [Table 4]. The A1c change for the African American members was similar to that for Hispanic members, with changes of −1.5% and −1.6%, respectively.

Table 5 shows overall glucose control outcome for the study group. At the baseline measurement, all study group members had poorly controlled blood glucose (it was a precondition for study participation). At the final measurement, 43.8% of the group had moved to well-controlled blood glucose (defined as A1c <8%).

Table 6 shows observed LDL values for the study group. Changes in LDL were not statistically significant ($P > 0.05$), so it appears that average LDL was effectively unchanged for the study population over the duration of the study. $LDL_{Baseline}$ and LDL_{Final} were both 99 mg/dL [Table 6].

Table 7 shows observed BP values for the study group. Only an improvement for systolic BP in African American patients was found to be statistically significant ($P < 0.05$), whereas other changes in BP were statistically insignificant. Mean baseline systolic and diastolic BPs ($BP_{Baseline}$) for African American study group members were 135/82 mm Hg and the most recent mean BPs (BP_{Final}) were 130/80 mm Hg [Table 7], indicating an improvement of 5 mm Hg in systolic and 2 mm Hg in diastolic BPs. Hispanic members had a statistically insignificant increase of 3 mm Hg in systolic BP, and no change in diastolic BP.

Overall, the percentage of African American members with poorly controlled A1c, LDL, and BP decreased between baseline and most recent measurement; however, only the A1c control improvement was

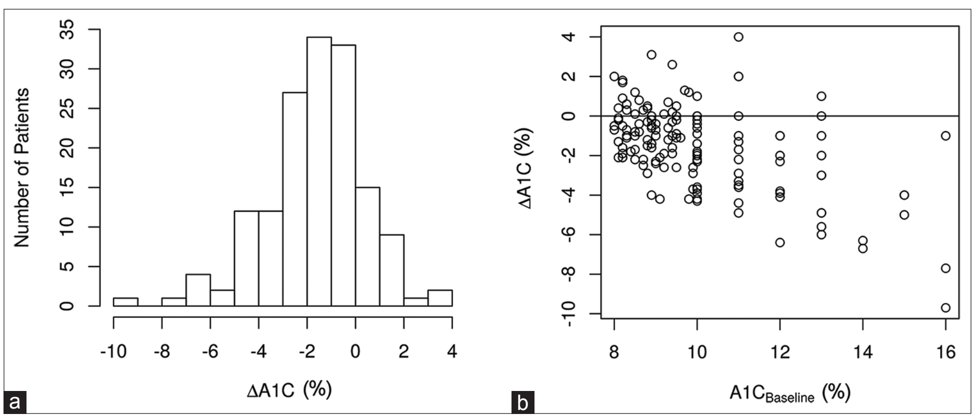

Figure 1: Change in study group A1c (% hemoglobin A1c) visualized by (a) ΔA1c values, and by (b) ΔA1c versus $A1c_{Baseline}$. Patients with larger $A1c_{Baseline}$ values saw larger average decreases in A1c (Panel b). Overall, 117 members (77%) showed A1c improvement, 9 (6%) had no statistically significant change, and 27 members (17%) had an increased A1c

Table 4: Observed change in study group A1c between baseline ($A1c_{Baseline}$) and most recent ($A1c_{Final}$) values

Race/Ethnicity	Number of patients measured	$A1c_{Baseline}$ (%)		$A1c_{Final}$ (%)		Mean ΔA1c	*P*
		μ±SD	Minimum, maximum	μ±SD	Minimum, maximum		
AA	98	10.1±1.9	8.0, 16.0	8.6±2.0	4.9, 15.0	−1.5	<0.0001
Hispanic	55	9.9±1.6	8.0, 15.0	8.3±1.6	5.6, 13.0	−1.6	<0.0001
Combined	153	10.0±1.8	8.0, 16.0	8.4±1.9	4.9, 15.0	−1.6	<0.0001

All A1c values are reported in units of %HbA1c. AA = African American, Hispanic = Non-White Hispanic, SD = Standard deviation, HbA1c = Hemoglobin A1c

Table 5: Diabetic control outcomes for the study group

Race/Ethnicity	Number of patients measured	Glucose control	Baseline (%)	Most Recent (%)	*P*
AA	98	Poor	98 (100)	57 (58)	<0.01
		Good	0 (0)	41 (42)	
Hispanic	55	Poor	55 (100)	29 (53)	<0.01
		Good	0 (0)	26 (47)	
Combined	153	Poor	153 (100)	86 (56)	<0.05
		Good	0 (0)	67 (44)	

Over the course of the study, 44% of participants had their glucose control status change from "poor" to "good," with good glucose control defined as A1c<8.0%, and poor glucose control defined as A1c ≥8.0%. AA = African American, Hispanic = Non-White Hispanic

Table 6: Observed change in study group LDL

Race/Ethnicity	Number of patients measured	$LDL_{Baseline}$ (mg/dL)		LDL_{Final} (mg/dL)		Mean ΔLDL	*P*
		μ±SD	Minimum, maximum	μ±SD	Minimum, maximum		
AA	92	98±34.3	36, 220	98±34.6	36, 220	0	0.9181
Hispanic	53	99±33.5	29, 212	99±33.8	29, 212	0	0.9748
Combined	145	99±33.9	29, 220	99±34.3	29, 220	0	0.9493

AA = African American, Hispanic = Non-White Hispanic, SD = Standard deviation, LDL = Low-density lipoprotein

Table 7: Observed change in study group systolic and diastolic BPs

Race/Ethnicity	Number of patients measured	BP Component	$BP_{Baseline}$ (mm Hg)		BP_{Final} (mm Hg)		Mean ΔBP	*P*
			μ±SD	Minimum, maximum	μ±SD	Minimum, maximum		
AA	98	Systolic	135±16.8	104, 182	130±14.1	96, 163	−5	0.0259
		Diastolic	82±9.9	60, 110	80±9.1	60, 100	−2	0.1174
Hispanic	55	Systolic	126±14.0	96, 162	129±14.9	104, 164	+3	0.2619
		Diastolic	80±10.0	56, 104	80±9.6	58, 108	0	0.8837
Combined	153	Systolic	131±16.4	97, 182	129±13.3	96, 164	−2	0.2639
		Diastolic	81±10.0	56, 110	80±9.2	58, 108	−1	0.1820

AA = African American, Hispanic = Non-White Hispanic, SD = Standard deviation, BP = Blood pressure

statistically significant [Tables 4-7]. At baseline, 100% of African American study members had poorly controlled A1c, 41.3% had poorly controlled LDL, and 61.2% had poorly controlled BP. At their final measurements, 58.2% had poorly controlled A1c, 40.2% had poorly controlled LDL, and 49.0% had poorly controlled BP.

Overall, Hispanic members showed statistically significant improvement in control of A1c, no significant change in LDL control, and no significant improvement of BP control [Tables 4-7]. At baseline, 100% of Hispanic study members had poorly controlled A1c, 52.8% had poorly controlled LDL, and 45.4% had poorly controlled BP. At their final measurements, 52.7% had poorly controlled A1c, 50.9% had poorly controlled LDL, and 54.6% had poorly controlled BP. The Hispanic population appeared to have more improvement in A1c values than the African American population.

Program costs, estimates of savings and return on investment

Table 8 shows costs of the pilot study, which were $88,904 (2011 USD) and covered all 153 study members. Thus, the cost per poorly controlled diabetic member was approximately $581 (2011 USD).

Table 9 shows annual cost savings for the study group calculated using Milliman model-based cost-saving estimates. The poorly controlled diabetics had a mean $A1c_{Baseline}$ of 10.0% and a mean $A1c_{Final}$ value of 8.4% [Table 4]. Using the Milliman model, this −1.6% change in mean A1c converts to an estimated cost savings of $192,110 for a 12 month period. The estimated ROI for this pilot study's intensive diabetic outreach was $2.16, or $192,110 of cost savings in return for $88,904 of pilot costs.

Table 8: Pilot study costs

Resource	Cost
Bilingual diabetic educator (1-year)	$85,000
Educational materials – English (140 at $24.40 each)	$3,416
Educational materials – Spanish (13 at $38.50 each)	$488
Total cost	$88,904
Cost per patient in study (*n*=153)	$581

All prices are in 2011 $USD

Table 9: Annual cost savings estimates for study group

Race/Ethnicity	Pilot estimated savings per poorly controlled member	Pilot estimated savings
AA	$1,198	$117,410
Hispanic	$1,358	$74,701
Combined	$1,256	$192,111

AA = African American, Hispanic = Non-White Hispanic

Discussion

Diabetics with poor glucose control experience more diabetic complications such as heart, kidney, nerve, and eye disease as well as incur more medical costs.[6] Aetna's insured African American and Hispanic members are more likely to have uncontrolled diabetes compared to non-Hispanic White members, and are therefore more likely to experience diabetic complications.[18] We collaborated with TTPG on a pilot to improve diabetic glucose control. This pilot employed a bilingual nurse-certified diabetic educator (coordinator) who used linguistically and culturally appropriate patient health educational materials in English and Spanish.

This 24 to 36 month pilot program appeared to successfully improve blood glucose control, with a mean A1c reduction of −1.6% (%HbA1c) for these 153 African American and Hispanic diabetic patients at TTPG. This is noteworthy since a −1% change in %HbA1c translates to 21% fewer deaths from stroke, 37% fewer eye and kidney complications, and 14% fewer heart attacks.[17] The percentage of members with A1c >8.0% (categorized as poor glucose control) decreased from 100% to 56.2% during the course of the study. Overall, these improvements in A1c were larger than we expected. For comparison, a 1.6% improvement in HbA1c is greater than is affected by most prescribed diabetic medications.[19]

The care coordinator successfully contacted 74% of the poorly controlled diabetics at TTPG. We believe this interaction with the bilingual diabetic educator may have contributed to this positive outcome for the following reasons: (1) The social interactions between the coordinator and patient build trust and helps involve the patient, thereby improving how they care for their diabetes at home, (2) Motivational interviewing techniques were used to improve adherence to both medications and to lifestyle changes, (3) The use of culturally and linguistically appropriate member health education more effectively communicated these necessary lifestyle changes and the importance of regimens/medication, and (4) Being able to verbally communicate with patients using their own language while taking into account their culture increases the credibility of the care coordinator, cementing her supportive role as part of the physician's team.

Although changes in BP and LDL were measured, they were not statistically significant.

Although our Milliman model-based cost savings estimates suggest that the pilot achieved overall cost savings through A1c reductions, the cost of standard diabetes care was not included in the pilot costs, therefore the ROI we report may overestimate the total ROI of this intervention.

This study partnered with only one medical group, TTPG, and other physician groups may not effect an improvement of the same magnitude. TTPG already has a good diabetes control profile – 37% of Aetna's diabetic members there had A1c >8%, compared to the national average of 43%.[11] Also, TTPG had the infrastructure in place to implement this initiative with relative ease. These infrastructure elements included electronic medical records (including the collection of race and ethnicity), IT support, data analytics capabilities, the ability to capture lab data and a robust internal quality management framework. Absence of these capabilities may limit the transferability of this initiative.

Overall, this study was an observational/pre-post evaluation study, so it doesn't conclusively prove the diabetic educator was responsible for all of the mean −1.6% change in A1c. This change may have also been influenced by a community-based media campaign in Texas or individual physician practices.

Implications and recommendations

We believe that this model (using a co-located diabetic care coordinator/educator) would be easily transferrable to large physician practices, patient medical homes, and accountable care organizations. We believe this culturally and linguistically focused approach was more effective than the standard approach for African American and Hispanic members. If a medical practice is unable to secure a bilingual RN diabetic educator, one could consider employing other personnel, such as community health workers or licensed practical nurses, to carry out the program. Based on the ROI that was achieved for this intervention, we believe that most practices would be able to afford the additional personnel without significant financial impact. While there have been improvements over the years, eliminating racial and ethnic disparities in health care will require extensive efforts at promoting health, preventing disease, and delivering appropriate care.

Conclusion

Combining standard diabetes care with a bilingual educational care coordinator results in significant reductions in mean A1c (−1.6% HbA1c) in African American and Hispanic patients with poorly controlled blood glucose. This combination of professional activity and culturally and linguistically appropriate health information also appeared to be cost-effective, with the average A1c reduction realized in this observational study providing estimated cost savings that are nearly twice pilot expenditures. Overall, this pilot may be an effective model for improving diabetes care in provider practices.

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Conflicts of interest

There are no conflicts of interest.

References

1. Smedley BD, Stith AY, Nelson AR. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care.

Washington, DC: Institute of Medicine National Academies Press; 2002.

2. DeNavas-Walt C, Proctor BD, Lee CH. Income, Poverty, and Health Insurance Coverage in the United States: 2005. Washington, DC: US Government Printing Office; 2006.
3. Committee on the Quality of Health Care in America. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: Institute of Medicine; 2001.
4. Centers for Disease Control and Prevention. National diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States. Atlanta, GA: Centers for Disease Control and Prevention; 2011.
5. McMahill-Walraven CN. Health Care Disparities in Diabetic Care. Prescott Valley, AZ: Northcentral University; 2011.
6. Herman WH, Dungan KM, Wolffenbuttel BH, Buse JB, Fahrbach JL, Jiang H, *et al.* Racial and ethnic differences in mean plasma glucose, hemoglobin A1c, and 1,5-anhydroglucitol in over 2000 patients with type 2 diabetes. J Clin Endocrinol Metab 2009;94:1689-94.
7. Gilmer TP, O'Connor PJ, Rush WA, Crain AL, Whitebird RR, Hanson AM, *et al.* Predictors of health care costs in adults with diabetes. Diabetes Care 2005;28:59-64.
8. Oglesby AK, Secnik K, Barron J, Al-Zakwani I, Lage MJ. The association between diabetes related medical costs and glycemic control: A retrospective analysis. Cost Eff Resour Alloc 2006;4:1.
9. Menzin J, Korn JR, Cohen J, Lobo F, Zhang B, Friedman M, *et al.* Relationship between glycemic control and diabetes-related hospital costs in patients with type 1 or type 2 diabetes mellitus. J Manag Care Pharm 2010;16:264-75.
10. Dusheiko M, Doran T, Gravelle H, Fullwood C, Roland M. Does higher quality of diabetes management in family practice reduce unplanned hospital admissions? Health Serv Res 2011;46 (1 Pt 1):27-46.
11. Fitch K, Iwasaki K, Pyenson B. The Cost and Quality Gap in Diabetes Care: An Actuarial Analysis. New York: Milliman, Inc.; 2012.
12. Percent of Private Sector Establishments that Offer Health Insurance to Employees: Kaiser Family Foundation; 2012. Available from: http://www.kff.org/other/state-indicator/percent-of-firms-offering-coverage/[Last accessed on 2015 Feb 18].
13. National Business Group on Health. Addressing Racial and Ethnic Health Disparities: Employer Initiatives. Washington, DC: National Business Group on Health; 2009.
14. LaVeist TA, Gaskin DJ, Richard P. The Economic Burden of Health Inequalities in the United States. Washington, DC: Joint Center for Political and Economic Studies; 2009.
15. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2014;37 Suppl 1:S81-90.
16. American Diabetes Association. Standards of medical care in diabetes – 2014. Diabetes Care 2014;37 Suppl 1:S14-80.
17. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, *et al.* Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): Prospective observational study. BMJ 2000;321:405-12.
18. Aetna Inc. 2011 Race/Ethnicity Equality Scorecard, Quality Measures. Blue Bell, PA: Aetna; 2012.
19. Bennett WL, Wilson LM, Bolen S, Maruthur N, Singh S, Chatterjee R, *et al*. Oral Diabetes Medications for Adults With Type 2 Diabetes: An Update. Rockville, MD: AHRQ Comparative Effectiveness Reviews; 2011.