Diabetes

Outcomes of Project Dulce: A Culturally Specific Diabetes Management Program

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BACKGROUND: Diabetes mellitus is a common and costly chronic disease that increasingly affects minority populations; however, there is little evidence regarding the clinical effectiveness and costs of culturally appropriate disease management programs.

OBJECTIVE: To determine the clinical outcomes and costs of Project Dulce, a combined stepped-care diabetes nurse case management program and culturally oriented peer-led self-empowerment training program.

METHODS: Pre–post clinical outcome and cost analysis of Project Dulce participants were compared with a cohort of historical controls over a one-year period. Subjects included 348 persons with diabetes with coverage under County Medical Services who were receiving services in community health centers in San Diego, CA. Generalized regression models were used to estimate changes in clinical outcomes (hemoglobin [Hb] A_{1c}, blood pressure, cholesterol level) and costs associated with participation in Project Dulce.

RESULTS: Project Dulce participants had significant reductions in HbA_{1c} (0.8%; $p < 0.001$), systolic (5.4 mm Hg; $p = 0.001$) and diastolic (8.0 mm Hg; $p < 0.001$) blood pressure, total cholesterol (28.1 mg/dL; $p < 0.001$), and low-density-lipoprotein cholesterol (15.6 mg/dL; $p < 0.001$). Expenditures for pharmacy ($3157 Dulce vs $1618 control) and disease management ($507 Dulce) increased. Total costs were higher during the first year of disease management ($5711 Dulce vs $4365 control; $p < 0.001$).

CONCLUSIONS: Project Dulce was effective in improving clinical outcomes for control of diabetes and related conditions in a medically indigent, culturally diverse population. Our finding of reduced hospital expenditures, although statistically insignificant, is clinically and economically important and suggests that intervention might provide an immediate benefit to a high-risk population.

KEY WORDS: culturally sensitive, diabetes, disease management.

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Diabetes mellitus is a common and costly chronic disease.[1] The Centers for Disease Control and Prevention estimates that the lifetime risk of developing diabetes for individuals born in the US in 2000 is 32.8% for males and 38.5% for females.[2] These risks are greatest for Latinos, with risks of 45.4% and 52.5%, respectively. This ethnic differential is supported by findings from the University of California at Los Angeles Center for Health Policy that show among Latino adults in California aged ≥50 years, the one-year prevalence of diagnosed diabetes is greatest among those who report Mexican (21.2%) and Puerto Rican (25.0%) ancestry, while among Asian adults prevalence is greatest for those who report ancestry that is Filipino (17.1%) or Vietnamese, Cambodian, or other Southeast Asian (16.3%).[3] Narayan et al.[2] estimated that, among those diagnosed with diabetes, men lose 11.6 life-years and 18.6 quality-adjusted life-years (QALYs; life-years adjusted for health status). Women are estimated to lose 14.3 life-years and 22.0 QALYs to the disease. In light of these ethnic differentials and the substantial estimated losses in life expectancy and QALYs associated with diabetes, it is surprising that few studies have examined the costs of culturally specific programs designed to improve diabetes care.

The Task Force on Community Preventive Services recommends disease management for patients with diabetes

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mellitus.[4] Disease management involves creating systems to ensure proper testing and achieve the goals of clinical management; a common model employs a nurse case manager to screen patients and order appropriate tests. A review of diabetes management programs found them to be effective at improving glycemic control and monitoring of lipids, and at increasing rates of screening for diabetic retinopathy, foot lesions, peripheral neuropathy, and proteinuria.[5] A similar review of self-management training programs found them to be effective in improving self-monitoring of blood glucose, self-reported dietary habits, and glycemic control and suggested that collaborative education programs in which the participants contribute are more effective than didactic (lecture) programs at improving glycemic control, weight, and lipid profiles.[6] Emerging research on group classes shows that these programs can improve psychosocial well-being by reducing diabetes-related stress and self-blame and can improve exercise behaviors and glycemic control.[7,8]

Two recent studies have shown that culturally specific diabetes management programs can be effective at improving clinical outcomes among ethnic groups disproportionately affected by diabetes. The California Medi-Cal type 2 diabetes study group found that providing case management to an ethnically diverse population of Medicaid beneficiaries at clinical sites in southern California resulted in improved levels of glycosylated hemoglobin (HbA_{1c}) at each follow-up visit from 6 to 36 months compared with a control group (differences increased from 0.65% to 0.87%; $p < 0.01$ at each visit).[9] Another study examined the provision of case management and self-management training to a low-income and predominantly Latino population in San Diego County, CA. The investigators observed significant improvements in HbA_{1c} (from 12.0% to 8.3%) and total cholesterol (from 224 to 185 mg/dL) compared with a control group (from 11.5% to 10.4% and 220 to 220 mg/dL, respectively; $p < 0.001$ each) and demonstrated a reduction in misrepresented cultural beliefs and the use of cultural-based remedies (eg, insulin causes diabetes complications, and eating nopales cures diabetes), as well as an increase in diabetes knowledge among intervention patients.[10]

In this paper, we provide an economic evaluation of Project Dulce as provided in community health centers in San Diego County. Nonprofit community health centers are the primary providers of outpatient healthcare services to low-income adults, children, and families in San Diego. The payers of these services include the state Medicaid program, the county's medically indigent adult (MIA) program, and the federal government under a variety of grants and contracts. The San Diego MIA program, County Medical Services (SD-CMS), contracts with community health centers to provide a limited scope of medically necessary services for low-income, primarily single adults on a discounted fee-for-service basis. In July 2000, the SD-CMS contracted with Project Dulce to provide diabetes management and self-management training for adults receiving SD-CMS services at 17 community health centers.

Project Dulce

The clinical component of Project Dulce consists of a nurse-led team with a registered nurse/certified diabetes educator (RN/CDE), bilingual/bicultural medical assistant, and bilingual/bicultural dietitian. The RN/CDE is trained by an endocrinologist to use the protocols in Staged Diabetes Management for stepped-care pharmacologic management of glucose and lipid levels and hypertension.[11] The goals of the project are to meet the American Diabetes Association standards of care and to achieve improvements in HbA_{1c}, blood pressure, and lipid parameters: HbA_{1c} <7%, blood pressure <130/80 mm Hg, and low-density-lipoprotein cholesterol (LDL-C) <100 mg/dL.[12] Patients have an initial (50-min) visit with a nurse and are asked to return for additional (50 or 25 min, as required) visits with the nurse and for a (25-min) visit with a dietitian. On average, participants have 5 visits with the nurse, and 50% consult with a dietitian. Telephone contact is used for appointment reminders and to answer specific questions. SD-CMS provides formulary medications and supplies to all beneficiaries without copayments.

In addition to the one-on-one visits with the Dulce team, patients are encouraged to participate in a group self-management training program: approximately 50% participate in the class and average attendance is 4 classes. The program consists of an 8-week curriculum delivered by trained peer educators (or promotoras). The peer educators are recruited from the patient population, have diabetes themselves, and are of the same cultural/ethnic group as the participants. They complete a 4-month competency-based training and mentoring program. Each is required to complete a series of classes as a patient and instruct a series with an experienced educator. The promotoras teach from the detailed curriculum syllabus that specifies content for each class session. Classes are taught in the patients' native language and cover diabetes and its complications; the role of diet, exercise, and medication; and the importance of self-monitoring. The classes are collaborative, including interactive sessions in which the patients discuss their personal experiences and beliefs about diabetes. An emphasis is made to overcome misrepresented cultural beliefs and encourage patients to take charge of managing their disease.

A unique aspect of Project Dulce is its focus on providing culturally specific peer education and training in the participants' primary language. While diabetes management programs have been shown to be successful in improving glycemic control, these studies occurred in health maintenance organizations serving relatively affluent enrollees and with established systems of chronic care management.[13-15] Project Dulce aims to improve care among low-income, ethnically diverse populations who are disproportionately impacted by diabetes and its complications.[16]

Methods

We compared clinical outcomes and costs among participants in Project Dulce with those of a cohort of historical control patients. All SD-CMS beneficiaries with diabetes were eligible to participate in Project

Dulce during the intervention period. Of 213 persons with diabetes enrolled for one year or more, 91% participated. The only additional inclusion criterion was the availability of laboratory results for HbA_{1c} at enrollment and one year after enrollment ± 6 months (97% had a second test). Thus, the intervention group included 188 SD-CMS beneficiaries who were referred by their physician, participated in Project Dulce, and remained enrolled in SD-CMS for one year between July 2000 and December 2002. Additional clinical data obtained when available included blood pressure (systolic and diastolic) and cholesterol (total, LDL-C, high-density-lipoprotein cholesterol [HDL-C]).

As a comparison group, we identified persons enrolled in SD-CMS for at least one year from January 1999 through June 2000—prior to the implementation of Project Dulce—who received an ICD-9 diagnosis code for diabetes (250xx) and who had HbA_{1c} test values at 2 times approximately one year apart (± 6 mo). We reviewed 474 charts and found 160 persons (34%) with 2 HbA_{1c} test values (18 charts had no HbA_{1c} data and 296 had HbA_{1c} data but not 2 within 18 mo). Those with 2 HbA_{1c} test values within an 18-month window were similar in age to those with a single test (mean ± SD 53 ± 10 vs 52 ± 11 y). Data on blood pressure and cholesterol were collected when available. The research protocol for this project was approved by the institutional review board at the University of California, San Diego.

This analysis was conducted from the perspective of SD-CMS. SD-CMS pays providers on a discounted fee-for-service basis, recording services provided and payments made in an administrative claims system. We used this system to identify SD-CMS claims for intervention and control groups and separately identified those for hospital and emergency department, outpatient, pharmacy/supplies, and diabetes management. SD-CMS initially paid Project Dulce to establish services in the community clinics and, in return, received a discounted price on the services provided. Eventually, this discount was phased out, and SD-CMS now pays a standard rate for services plus a yearly administrative fee. This administrative fee covers program costs not supported by the service payments including administration and overhead, staff, data monitoring, and training of peer educators. We priced diabetes management services in October 2002: $111.52 for an initial visit (50 min) with an RN/CDE and $53.40 for each follow-up visit (25 min), $30.32 and $15.16 for initial and follow-up visits (50 and 25 min, respectively) with a dietician, and $20.24 for attending a 2-hour group class. A yearly administrative fee of $95 was added to the cost of each Dulce participant.

Costs for all other services were priced at the amounts paid by SD-CMS. To account for the different time periods of observation, we adjusted costs by month of service to October 2002 using the medical component of the consumer price index. Person-year observations were created by calculating the amount paid by SD-CMS for services for each person in the time between their baseline and follow-up HbA_{1c} test values, adding the estimated payments for Dulce services in this time period and then annualizing these costs by dividing by the number of days between the 2 tests and multiplying by 365. The administrative payment was then added to the person-year costs of the intervention patients.

The *t*-tests (for continuous variables) or χ^2 tests (for proportions) were used to compare demographic and clinical characteristics between Project Dulce participants and control patients. Linear regression was used to estimate changes in clinical outcomes associated with participation in Project Dulce controlling for age, gender, and baseline values, where observations were weighted by length of enrollment to account for heteroscedasticity. Total costs were substantially skewed (4.7) and kurtotic (30.9) and, for inpatient expenditures, there was a large proportion of non-users (90%). Therefore, nonlinear 2-part cost models were used to estimate the effect of Project Dulce on costs by type (inpatient and emergency department, outpatient, pharmacy, diabetes management) and on total costs adjusting for age, gender, and baseline HbA_{1c} using a nonparametric smearing estimate of the variance.[17,18] We used the parameter estimates from these regressions to calculate the difference in costs attributable to Project Dulce standardized to the age, percent female, and baseline HbA_{1c} of the study population. Standard errors were calculated using the nonparametric bootstrap method with 1000 replications.[19] The a priori level of significance was 0.05. We expected pharmacy to comprise a substantial proportion of costs and therefore conducted an additional exploratory analysis of the difference in per capita pharmacy/supply expenditure by class between Dulce and control groups: antidiabetic, antihypertensive, lipid-lowering, and testing strips.

Results

Table 1 compares the demographic and clinical characteristics of Dulce participants and controls. Mean age was similar between the groups, which also had similar values

Table 1. Demographic and Clinical Characteristics of Project Dulce Participants and Control Patients

Characteristics	Dulce (n = 188)	Control (n = 160)	p Value
Demographic			
age, y (mean ± SD)	51 ± 9	52 ± 10	0.655
female, n (%)	132 (70)	93 (58)	0.019
ethnicity, n (%)			
Latino	70 (37)	48 (30)	0.156
non-Latino white	51 (27)	35 (22)	0.258
Asian	36 (19)	27 (17)	0.583
African American	7 (4)	11 (7)	0.192
other/unknown	24 (13)	39 (24)	0.006
Clinical (baseline)			
blood glucose (mean ± SD)			
HbA_{1c} (%)	8.5 ± 2.4	8.7 ± 2.3	0.414
blood pressure[a] (mm Hg)			
systolic	132 ± 20	130 ± 18	0.355
diastolic	77 ± 11	78 ± 12	0.465
cholesterol[b] (mg/dL)			
total	204 ± 44	214 ± 57	0.119
HDL	50 ± 15	42 ± 13	<0.001
LDL	113 ± 34	122 ± 40	0.059
Days between HbA_{1c} measurements (n)			
mean ± SD	356 ± 51	360 ± 80	0.628

HbA_{1c} = glycosylated hemoglobin; HDL = high-density lipoprotein; LDL = low-density lipoprotein.
[a]Includes 188 Dulce subjects and 158 controls.
[b]Total cholesterol includes 179 Dulce subjects and 95 controls; HDL-cholesterol includes 177 Dulce subjects and 90 controls; and LDL-cholesterol includes 171 Dulce subjects and 70 controls.

for baseline HbA_{1c}, blood pressure (systolic and diastolic), total cholesterol, and days between baseline and follow-up measurements. Dulce participants were more likely to be female and had higher values of HDL-C. The ethnic composition of the groups was similar, although among Dulce participants, ethnicity was less likely to be described as other or unknown.

Table 2 shows pre- and post-values, as well as differences in clinical outcomes between Dulce participants and control patients after adjusting for age, gender, and baseline values. Participation in Dulce was related to significant improvements in HbA_{1c}, both systolic and diastolic blood pressure, total cholesterol, and LDL-C. With respect to American Diabetes Association guidelines, 54% of Dulce participants had HbA_{1c} values <7% at the follow-up measurement compared with 35% of controls ($p = 0.001$); 68% of Dulce participants had blood pressure measurements <130/80 mm Hg compared with 49% of controls ($p < 0.001$); and 54% had LDL-C values ≤100 mg/dL or lower compared with 18% of controls ($p < 0.05$). There were no significant differences in HDL-C.

Table 3 shows the adjusted cost components and adjusted total costs between Dulce participants and control patients after adjusting for age, gender, and baseline HbA_{1c}. Total costs were higher for Dulce participants during the first year of disease management. Total costs, however, mask an interesting offset. While expenditures for pharmacy/supplies and disease management increased under Dulce, expenditures on hospital and emergency department care declined, although the change was not statistically significant. A post hoc analysis showed that the decrease in hospital expenditures was due to a reduction in the probability of admission, rather than costs once hospitalized (data not shown). The primary diagnoses associated with hospitalizations in the intervention and control groups, respectively, were usually diabetes (38% vs 35%) or diabetes-related comorbidities including neuropathy, nephropathy, and cardiovascular disease (41% vs 40%).

Table 4 shows the annual per capita costs of pharmacologic management. Increases in diabetes-related medications and supplies accounted for 88% of the increase in pharmacy expenditure. Of this amount, 48% resulted from diabetes medications, 14% from blood pressure drugs, and 22% from lipid medications; testing strips accounted for 15%.

Discussion

There is a growing interest in defining the costs and potential savings involved in the delivery models of diabetes care that improve health outcomes.[20] Previous studies have assessed the costs of diabetes in mostly middle class managed-care populations.[13,14,21-24] This study demonstrates improvements in clinical outcomes and reductions in hospital costs within the first year after implementation of a culturally appropriate diabetes management program in a low income, ethnically diverse population. Although Project Dulce participants experienced higher total costs in the first year of the intervention, these costs were almost completely attributable to the increased use of medications and diabetes testing supplies. However, in this medically indigent adult population, many drugs were initiated for the first time, contributing to the up-front costs of implementing the program.

The study design may lend itself to bias from self-selection of participants to the intervention who are sicker (or

Table 3. Adjusted Cost Components and Total Costs Among Project Dulce Participants Compared with Control Patients[a]

Adjusted Cost, $ (mean ± SE)	Dulce	Control	Difference	p Value
Hospital + ED	501 ± 163	1189 ± 327	–688 ± 366	0.061
Outpatient	1531 ± 111	1540 ± 156	–9 ± 194	0.963
Pharmacy	3157 ± 123	1618 ± 94	1539 ± 155	<0.001
Diabetes management	507 ± 14	NA	507 ± 14	NA
TOTAL	5711 ± 266	4365 ± 446	1346 ± 518	<0.001

ED = emergency department; HbA_{1c} = glycosylated hemoglobin; NA = not applicable.
[a]Estimates adjusted to the underlying distribution of age, gender, and baseline HbA_{1c} using 2-part multivariate models where the probability of use is modeled by logistic regression and cost conditional on positive use is modeled by log-linear regression with a nonparametric heteroscedasic retransformation factor. Standard errors are calculated using the nonparametric bootstrap.

Table 2. Changes in Clinical Outcomes Among Project Dulce Participants Compared with Control Patients

Variable	n	Dulce Pre	Dulce Post	Control Pre	Control Post	Adjusted Difference[a]	SE	p Value
HbA_{1c} (%)	348	8.5	7.3	8.7	8.2	–0.8	0.2	<0.001
Blood pressure (mm Hg)								
systolic	346	131.9	124.8	130.0	129.6	–5.4	1.6	0.001
diastolic	346	76.7	69.2	77.6	77.5	–8.0	1.0	<0.001
Cholesterol (mg/dL)	274	204.1	175.2	213.9	207.3	–28.1	4.9	<0.001
HDL	267	49.7	48.5	42.2	44.1	–1.6	1.4	0.250
LDL	241	112.6	94.4	122.3	114.0	–15.6	4.1	<0.001

HbA_{1c} = glycosylated hemoglobin; HDL = high-density lipoprotein; LDL = low-density lipoprotein.
[a]Differences adjusted for age, gender, and baseline values using linear regression.

healthier) and who are more willing to accept therapeutic changes and follow medical recommendations. Pharmaceutical technology or costs may have changed over the analysis period, with either the introduction of newer, more effective and more expensive medications or with the issuing of generic versions of commonly used brand-name drugs. For example, during the intervention period, the thiazolidinediones were becoming more widely used and a generic version of an angiotensin-converting enzyme (ACE) inhibitor became available. One study of 2 health plans found an increase in multidrug therapy for persons with diabetes from 34% in 1999 to 43% in 2001, with an associated $883 annual increase in pharmacy costs.[25] Our sample was unbalanced with respect to gender, and we were unable to assess adherence to drug therapy. Finally, the brief time period of the economic analysis does not capture the full effect of the intervention on complications and costs over the course of the disease. Studies of longer duration are necessary to determine how disease management affects costs in the long term.

Despite these limitations, this study provides evidence that an effective diabetes education and self-management training program can be conducted by non-physician staff. We expect that a PharmD/CDE could substitute for a nurse case manager if allowed time for patient consultation. A pharmacist case manager would have a thorough understanding of the pharmacologic agents being applied and may be more suited to address issues related to adherence. At a minimum, diabetes management programs should engage pharmacists by including them in strategy sessions that draw upon their expertise in pharmacology and adherence and provide them with an improved understanding of cultural issues that affect self-management.

Table 4. Annual Per Capita Cost of Diabetes-Related Medications and Supplies

Medication	Dulce	Control	Difference[a]
Antidiabetic			
insulin	197	113	84
sulfonylurea	153	133	20
metformin	557	320	237
thiazolidinedione	357	42	315
Antihypertensive			
ACE inhibitor	279	160	119
α-blocker	10	7	4
ARB	51	12	40
β-blocker	15	13	2
calcium-channel blocker	103	82	21
diuretic	18	11	8
Antihyperlipidemic			
fibrate	19	4	15
statin	446	163	282
Supplies			
testing strips	487	279	209
TOTAL	2694	1339	1356

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker.
[a]Differences affected by rounding.

Conclusions

Project Dulce was effective in improving clinical outcomes for control of diabetes and related conditions in a medically indigent, culturally diverse population. Our finding of reduced hospital expenditures, although statistically insignificant, is clinically and economically important and suggests that intervention might provide an immediate benefit for a high-risk population.

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EXTRACTO

ANTECEDENTES: La diabetes es una enfermedad común crónica y costosa que afecta cada vez más a poblaciones minoritarias; no obstante, hay pocas evidencias científicas sobre la eficacia y los costos clínicos de los programas de diseño cultural apropiado para el manejo de esta enfermedad.

OBJETIVO: Determinar los resultados clínicos y costos asociados con Proyecto Dulce–un programa escalonado que combina el manejo de casos de diabetes por enfermeras y un programa de entrenamiento orientado culturalmente y conducido por promotores que también son diabéticos usando el poder de manejo propio.

MÉTODOS: Resultados clínicos recolectados antes y después de la intervención y análisis del costo de los participantes en el Proyecto Dulce comparado con un grupo de control histórico durante un año. Los participantes fueron 348 personas con diabetes con cobertura en los servicios médicos del condado que recibían servicios en centros de salud en San Diego, California. Se utilizaron modelos generalizados de regresión para estimar cambios en los resultados clínicos (A1c, presión arterial, y colesterol) y los costos asociados con la participación en el Proyecto Dulce.

RESULTADOS: Los participantes en el Proyecto Dulce tuvieron una reducción significativa de la A1c (0.8%, $p < 0.001$), presión sistólica (5.4 mm Hg, $p = 0.001$) y diastólica (8 mm Hg, $p < 0.001$), colesterol total (28.1 mg/dL, $p < 0.001$), y LDL (15.6 mg/dL, $p < 0.001$). Los gastos asociados con medicamentos y el manejo de la enfermedad aumentaron ($3.157 Dulce frente a $1.618 el grupo de control). Los costos totales eran más altos durante el primer año del manejo de la enfermedad ($5711 Dulce frente a $4365 el grupo de control, $p < 0.001$).

CONCLUSIONES: El Proyecto Dulce fue eficaz para mejorar los resultados clínicos del control de la diabetes y su patología relacionada en una población indigente y con diversidad cultural. Nuestro hallazgo de reducción de los gastos hospitalarios, aunque no fue estadísticamente significativo, sugiere que una intervención puede proporcionar una ventaja inmediata a una población de riesgo elevado.

Carlos da Camara

RÉSUMÉ

ÉTAT DES CONNAISSANCES: Le diabète est une maladie chronique fréquente et coûteuse qui affecte de plus en plus les minorités ethniques; par contre il existe peu de données concernant l'efficacité clinique et les coûts de programmes de gestion de la maladie adaptés aux patients de culture différente.

OBJECTIF: Déterminer les résultats cliniques et les coûts du projet Dulce—à la fois un programme de gestion par pallier du diabète géré par les infirmières et un programme de formation par les pairs, adapté à la culture des patients, et qui conduit à une prise en charge personnelle.

MÉTHODOLOGIE: Les résultats cliniques pré et post intervention et l'analyse des coûts pour les participants du projet Dulce ont été comparés à une cohorte de cas contrôles historiques sur une période d'un an. Les 348 participants au projet sont des personnes souffrant de diabète qui reçoivent leurs soins dans des centres de santé communautaires de la région de San Diego, Californie, sous le couvert du County Medical Services. Des modèles de régression ont été utilisés pour estimer les changements dans les résultats cliniques (A1c, pression sanguine, et cholestérol) et les coûts associés à la participation au projet Dulce.

RÉSULTATS: Les participants au projet Dulce ont eu des diminutions significatives de l'A1c (.8%, $p < 0.001$), de la pression systolique (5.4 mm Hg, $p = 0.001$) et diastolique (8.0 mm Hg, $p < 0.001$), du cholestérol (28.1 mg/dL, $p < 0.001$), et du LDL (15.6 mg/dL, $p < 0.001$). Les dépenses en pharmacie ($3157 Dulce vs $1618 contrôle) et celles de gestion de la maladie ($507) ont augmenté. Les coûts totaux ont été plus élevés durant la première année de gestion de la maladie ($5711 Dulce vs $4365 contrôle, $p < 0.001$).

CONCLUSIONS: Le projet Dulce a été efficace pour améliorer les résultats cliniques au niveau du contrôle du diabète et des conditions associées chez une population indigente de culture différente. La découverte d'une diminution des dépenses hospitalières bien que statistiquement non significative est cliniquement et économiquement importante et suggère qu'une intervention peut produire un bénéfice immédiat chez une population à risque élevé.

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