This product was developed by the diabetes self management project at Gateway Community Health Center, Inc. in Laredo, TX. Support for this product was provided by a grant from the Robert Wood Johnson Foundation® in Princeton, New Jersey.

Benefit-to-Cost Analysis & Program Effectiveness Evaluation of Gateway Diabetes Self-Management Project

Submitted to:

Mr. Miguel Treviño Jr., CEO
Gateway Community Health Center

Submitted by:

Alberto Treviño
Treviño & Associates
External Evaluation Consultant

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Abstract

This cost-to-benefit analysis documents benefits associated with providing diabetes self management education and support groups using a promotores-led model working within Gateway Community Health Center along the Texas-Mexico border in Laredo, Texas. Gateway Diabetes Self Management Project's goal is to develop an infrastructure within the community health center which incorporates self management education, support group services and primary care to patients with diabetes.

A comprehensive cost-benefit analysis and patient impact evaluation was conducted. Direct and indirect total cost to provide the education services to patients was analyzed and was compared with the total benefits of reducing blood glucose levels (HbA1c) of patients. Patient clinical impact data was collected and analyzed, focusing on reduced hemoglobin A1c levels. Of the 300 program participants, 203 were patients with diabetes. The intervention consisted of ten sessions on diabetes self management classes and support groups. All sessions and support groups were facilitated by promotores. A total of 18 courses were completed.

The results of this analysis indicate a benefit-to-cost ratio of 1.7:1 for providing diabetes self management education and support groups. That is, for every dollar spent to educate patients with Type 2 Diabetes on self management and provide support groups, 1.7 dollars were saved in health care costs associated with disease complications and hospitalizations. This cost analysis and patient impact evaluation supports the premise that diabetes self management education helps patients reduce blood glucose levels, and therefore, complications associated with diabetes such as cardiovascular disease, lower extremities amputations, blindness, etc.. Quality of life improvement was also reported to be a benefit for patients.

I. Community Profile

Gateway is a community health center funded by the U.S. Department of Health and Human Services, located in Laredo, Texas and within Webb County along the U.S. Mexico border. The Center is a private, non-profit organization. Gateway's mission is "*to improve the health status of the people in Webb County and surrounding areas by providing high quality medical and dental care, health promotion and disease prevention services in a professional, personal, and cost effective manner.*"

All county residents are eligible for services at Gateway. According to the 2000 Census, 36% of the population falls below federal poverty limits. The unemployment rate for Webb County is 13,828 (51% of the U.S. per capita income average). Forty percent of the population does not have health insurance or third party coverage. Sixty-one percent of patients served by Gateway are uninsured, 23% have qualified for Medicaid. Over 95% of the patients served by Gateway are Hispanic.

Patients served by Gateway Community Health Center who have Type 2 diabetes are the target population. A 1999 community survey administered by Gateway revealed that 1 of every 6 adults in Laredo reported that they have Type 2 diabetes. In 2002, Gateway served a total of

14,144 patients, 2,733 patients had diabetes. Diabetes was the top medical diagnosis seen at Gateway in 2002. The projected number of patients with diabetes in 2003 was 3,517, a 29% growth rate. This data reveals a large population with Type 2 diabetes, a large gap in diabetes care, and an intense need for patient diabetes self management.

The goal for Phase I Diabetes Self Management Project is *to build a consistent infrastructure and methodology that will assist patients with diabetes to maintain their HbA1c at or below 7.5% over an extended period of time by implementing and integrating diabetes self management in a culturally sensitive manner.*

II. Literature Review

Diabetes is the sixth leading cause of death by disease, leading cause of blindness and end-stage renal disease, most frequent cause of non-traumatic lower limb amputation, and two to four times more likely to cause heart disease or stroke (Gilbert, Christensen, and Conway, 2001). Long term complications of improper glycemic control include retinopathy, cardiovascular disease, stroke, nephropathy, peripheral vascular disease and neuropathies (2001). Hispanics are three to five time more likely to develop Type 2 diabetes along the Southern Texas border area. Current literature suggests that health disparities continue to grow despite honorable efforts aimed at closing the gap for minority populations. The increase in patient with diabetes, and other chronic disease, continues to puzzle health care providers. The implications of this discomforting reality is that unless society understands the financial and health implications of chronic disease such as diabetes, cardiovascular, HIV, etc, the health care costs associated directly and indirectly with diabetes will be unbearable.

In 1992, it was estimated that the direct and indirect costs of diabetes was a conservative $4.0 billion. This cost significantly increased by the billions in the past 12 years (Ward, 1995). Public health initiatives must understand and accept that traditional approaches to diabetes education which utilize a didactic one-on-one education approach have been a dismal failure when attempting to reach Hispanic patients with diabetes. Literature supports the use of community health workers (promotores), which incorporate non-traditional culturally based approaches to health education, tend to be more effective than those which lack cultural competence and only disseminate education information without a process of helping patients internalize long term behavior change (Kovack, Becker, Worley 2004).

Health education research suggests that the best health care is when patients with diabetes take charge of their own chronic illness. This alone will have a long term significant impact on the growing health crisis. Population census estimates indicate that Hispanics will continue to be the fastest growing minority population becoming the largest minority population within the next 20 years (US Census Bureau). Culturally competent programs that provide the latest information on diabetes care, provide self empowerment, and offer support groups are more likely to be more effective in helping patients prevent complications and improve quality of life for this growing population than those that provide traditional one-on-one diabetes education. Public health officials and policy makers need to recognize the valuable role promotores can play in minimizing diabetes complications, improving quality of life, and reducing overall health costs.

The key contributor to the success of community health workers is imbedded in a traditional and cultural premise of establishing a "trusting" relationship with the patient (Kovack, Becker, Worley, 2004). This "*confianza*", or "interpersonal trust" as it is known, is reported by many patients to be the reason for 1) agreeing to participate (and attend) in the voluntary educational program, 2) continue their participation even after graduating from the classes, 3) keep up with their behavior change plan (goal setting plan) beyond the program, and 4) keep in touch with project staff by either visiting the clinic staff and/or participating as volunteers in the project, including becoming health educators themselves (Gateway Focus Groups, 2004).

These responses are congruent with Wiggins and Borbon's (1998) community health worker identified roles:

- Bridging cultural mediation between communities and health care systems;
- Providing culturally appropriate and accessible health education and information, often by using popular education methods;
- Assuring that people get the services they need;
- Providing informal counseling and social support;
- Advocating for individuals and communities within the health and social service systems;
- Providing direct services and administering health screening tests; and
- Building individual and community capacity.

There is an emerging body of literature that support the correlation between diabetes self management education and reduced blood glucose levels in patient with Type 2 diabetes. This same literature defends the use of community health workers (promotores de salud) as an effective model for educating patients with diabetes in self management. The effectiveness of this self management education is having a direct impact on decreasing lower-extremity amputation rates, reduced medical costs and fewer emergency room visits (Gilbert, Christensen, Conway, 2001).

The most common and serious complications averted due to improved glycemic control were: retinopathy, cardiovascular disease, stroke, nephropathy, peripheral vascular disease and neuropathies (2001). Most common practices for improved blood glucose control were: regular medical follow-up, diabetes self management education, routine screening for complications, and reduction in cholesterol and blood pressure (2001).

Working with difficult-to-reach populations such as the Hispanic community, the role of the promotores significantly improved patient access and follow-up with medical care visits and medication. Literature supports the use of promotores de salud (community health workers) as an effective method to educating patients on self management techniques (DiClemente, Grady & Kegler 2002). In the last ten years, there has been an increased attention given to the promotores model. It must be noted that its attention has not always come from a positive and supportive purpose. The idea of having these "uneducated" "non-credentialed" health educators disseminate complex health education to patients has brought skepticism and professional nervousness. This negative perception is rapidly changing as is evident in the use of promotores through out the country and abroad. Texas was the first State to pass legislation that officially recognized the contribution of promotores. It is now required for promotores to be State certified as promotores if they are to be compensated for their work. This legislation has officially and

formally placed promotores in the same playing field as other health educators. Evaluation findings such as these and many any others is beginning to raise awareness and recognition of the effectiveness and key roles promotores play in the health care team. Both the patients and medical insurers are the benefactors of their success.

Kovack, Becker and Worley (2004) strongly document the role of the promotores as "playing an important role in the United States since the 1960s in efforts to reach people in underserved or difficult-to-reach communities". In one study, the role of the promotores was concluded to be vital in the health improvement of this difficult-to-reach community by helping people increase self-determination, decision-making, self-sufficiency, and overall empowerment (Kavach, Becker, Worley, 2004). This study further supported the positive impact of the relationship formed between community health workers and their patients. Promotores power is centered on the premise of being well trained in content area and having strong interpersonal and relationship building skills. Gateway patients stated that the love, passion and patience is what made the self management project a success. They further stated this caring treatment is why they kept coming even after the completed the program (retention rate of 88%). This passion is their greatest credential that makes them (promotores) effective health educators (Gateway Focus Group, 2004).

Cost benefit studies seem to indicate a strong correlation between lower glucose level, reduction in complications, and reduced health care costs (Gilbert, Christensen, Conway 2001). It is estimated that medical charges increase significantly for every 1 percent increase above an HbA1c level of 6 percent. The following table reflects increased medical cost per each percent.

Table 1: Increase in Medical Costs as Related to HbA1c Levels

From 6% to	Average Percent Increase in Medical Costs
7%	5%
8%	11%
9%	20%
10%	32%

Gilmer, Todd P, et al. Diabetes Care 1997; Vol. 20, No. 12

Most patients with diabetes average an above HbA1c of eight percent. The reduction in blood glucose levels have a significant impact on increased medical costs. Similarly, the reduction in HbA1c is directly related to health care savings. On average, patients with diabetes only who reduce their HbA1c levels from seven percent to six percent will have a health care savings of $378; similar patients who reduce their HbA1c from eight percent to seven percent will have a health care savings of $601. However, similar patients who have diabetes, hypertension and heart disease will have a cost health care savings of $2,237 for lowering from an eight percent to seven percent and a cost savings of $1,504 for lowing HbA1c levels from seven percent to six percent as indicated in Table 2. A combined savings of $979 per patient for reducing HbA1c levels from eight percent to six percent and a combined savings of $3,741 for reducing HbA1c levels from eight percent to six percent.

Table 2: Health Care Savings

	Dollars Saved			
Changes in HbA1c Levels	**Diabetes Only**	**Diabetes with Hypertension**	**Diabetes with Heart Disease**	**Diabetes with Heart Disease and Hypertension**
10-9%	$1,205	$1,703	$2,796	$4,116
9-8%	$869	$1,260	$2,088	$3,090
8-7%	$601	$897	$1,503	$2,237
7-6%	$378	$588	$1,002	$1,504

Gilmer, Todd P. et al. Diabetes Care 1997; Vol. 20. No.12

Medical cost savings associated with diabetes self management education is not the only favorable impact in glycemic control due to self-management. Research also indicates a correlation with patients feeling better about themselves and self-management education. This "feeling better" or raised self concept seems to be a key influencer in patient's ability to take necessary personal action to control their chronic illness. In their study, Gilbert, Christensen, and Conway (2001) concluded that:

> Quality of life issues are greatly affected by the disease's onset as well as the consequences of treatment recommendations required to manage the disease. In recent years, quality of life has been recognized as an important outcome of medical treatment and has become a core issue in diabetes care. Past research on quality of life has taught health care providers that patients place a high priority on maintaining and improving the way they feel. Quality-of-life issues help predict a patient's capacity to manage his or her disease (p3).

The concept of community health workers can be traced back thousands of years; however, only recently has health profession begun to recognize the valuable contribution promotores de salud make to public health. These contributions impact significantly the patient's quality of life and overall public health cost savings. Recent emerging literature strongly support the promotores model as a cost benefit solution to the rising costs of health and as an effective model to reaching hard-to-reach populations. The realization that the medical community can control society's diabetes problem through medication has proven to be an overwhelmingly expensive approach. Our society will not be able to afford this approach, and one which will not benefit the patient's health. Incorporating a promotores model into the health care team seems to be not only the best financial investment but also the only logical alternative to helping people with diabetes live longer and healthier lives without the financial taxation to society and patients themselves. The outcome is both financially sound and is one that improves the quality of life for all involved.

III. Intervention

Gateway's Diabetes Self Management Project funded by Robert Wood Johnson Foundation, is a provider referred promoter/a led self management education project. Located within the central clinic, the project team is composed of one full time project coordinator, one data entry specialist, and three promotores de salud educators. A total of 300 people enrolled in the self management classes. A total of 265 participants completed all ten sessions, or graduated from the classes. A total of eighteen (18) courses were held. Of these, 203 were clinic patients diagnosed with diabetes type 2. The remaining participants (35) consisted of spouses and other family members who chose to attend the diabetes classes to support their family member with diabetes. The self management education classes consisted of ten sessions provided on a weekly basis for 10 weeks. Each session was two hours in length. A total of eighteen courses were included in this evaluation.

Services to patients enrolled in the diabetes self management classes include diabetes support groups. This service was voluntary and available to those who had completed all ten classes or were still attending the classes. A total of ten support group classes were made available. In addition to self management classes and support groups, promotores provided patient weekly follow-up phone calls and provided graduation ceremonies including an annual Christmas graduation ceremony which included a dinner and dance. Regular health care service was provided by the clinic's medical team.

Promotores participated in an intensive training program specially designed for the project staff. Project promotores received a total of 300 hours of training. All promotores were trained CDC's Diabetes Education Empowerment Program (DEEP) curriculum developed by the University of Illinois at Chicago in collaboration with Center for Disease Control, Diabetes Translation (CDC). Promotores were also trained in the Mutual Aide Support Group model. Other key training topics included depression and stress management, group facilitation skills training, and other trainings designed to help promotores increase their competency skills.

IV. Methodology

The cost analysis and patient impact evaluation was conduced using a single systems design focusing on two variables, blood glucose levels (HbA1c) and patient knowledge on self management. For the variable HbA1c, measures were recorded at base line, six months, and 12 months post intervention (after completing the ten self management classes).

Patient knowledge on diabetes self management was measured using a self administered Patient Knowledge Questionnaire developed by Starr County. Pre and post-tests were completed before commencement of the self-management classes and immediately after completing the 10 session classes.

Empirical data was used to project medical saving estimates for reducing HbA1c levels from 8.6 percent to 7.4 percent. This total savings was calculated by adding the dollars saved from reducing an HbA1c from 9% to 8% ($3,090) and from 8% to 7% ($2,237) then dividing the

total by two which equals $2,664 dollars saved. These numbers represent the closest values of patient HbA1c reduced levels (See table 2: Health Care Savings).

V. Data Collection & Analysis

All clinic patients, 203 of the 265, were included in the clinical data measures using patient clinic charts. Project staff collected patient's HBA1c levels. Data was recorded in an excel spread sheet. Mean HBA1c levels were calculated and compared with interval data measures at three months, six months and twelve months. Twelve month data represents mean HbA1c levels up for thirteen groups which completed the 10 session classes and had twelve month clinical data. Data for the final five groups was not available during this evaluation. This report will be revised once all eighteen groups have reached the twelve months post measures.

A total of 265 patients were given the Patient Knowledge Questionnaire, a self administered instrument to measure patient's knowledge on diabetes self management. This instrument was developed by Garcia, Villagomez, Brown, Kouzekanani and Craig in their study titled "The Starr County Diabetes Education Study: Development of the Spanish-language diabetes Knowledge Questionnaire" (2001). The 24 item instrument achieved a coefficient (alpha) of 0.78. Base line measures were conducted prior to patients beginning the self-management education classes and post measures were taken after patients completed the ten session course.

Cost-to-benefit analysis included patient data expenses such as average cost of medication, doctor visits, referrals to specialists, and clinic expenses directly associated with operating the self management education program. Total costs of the project's self management education classes, patient follow-up services, and support groups was collected and included in the calculation of the total project cost.

Empirical data was used to calculate the benefits associated with providing diabetes self management education. The main source of data used for calculating medical costs and thus, converting those costs to medical expense savings was derived from Gilbert's, Christensen's, and Conway's "Benefits of Glycemic Control" (2001). This data was used because of its comprehensive analysis of the costs and benefits associated with glycemic control. These authors completed tables indicating costs and savings gained for each percentage point in glucose blood levels.

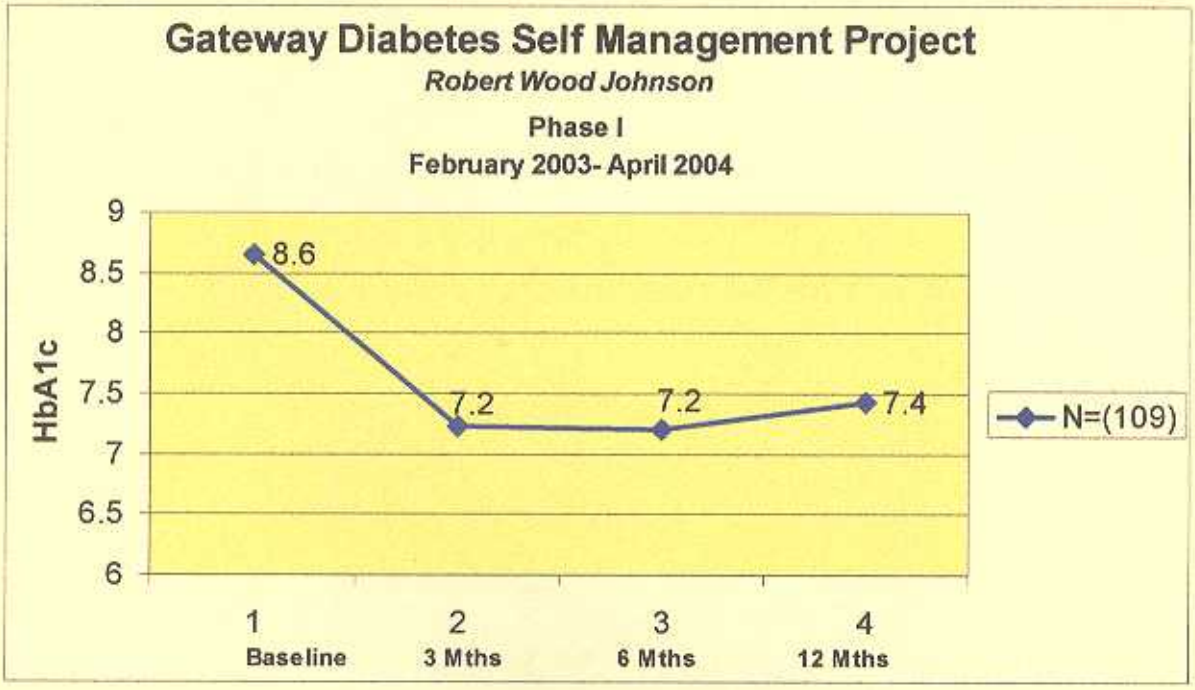
Formula: Total Benefits in Dollars - divided by -Total Costs
Source: "Cost-Benefit Analysis: A Primer for Community Health Workers" Annie E. Casey Foundation

VI. Results

Hemoglobin Improvements

Of the 203 patients who completed the ten week self-management classes and attended diabetes support groups, only 109 patients had actual clinical data and therefore were the only ones included in the HbA1c analysis. HbA1c levels average was reduced from a base line HbA1c mean percent of 8.6 to 7.4 at three months post intervention, 7.2 percent at six months and 7.4 at twelve months post intervention. See figure 1.

Figure 1: Patient HbA1c Level (n=109 at 12 mo.)



The reduction in HbA1c levels for patients who had 8.9 or more at base line experienced a considerable decrease with an average of 7.0 at 3 months., 7.3 at 6 months, and 7.1 at 12 months. At twelve months, these patients decreased their HbA1c levels by 3.9 percent. See figure 2 and figure 3.

Figure 2: Sample Patient with HbA1c Level between 8.9 and 14.8. (n=13)

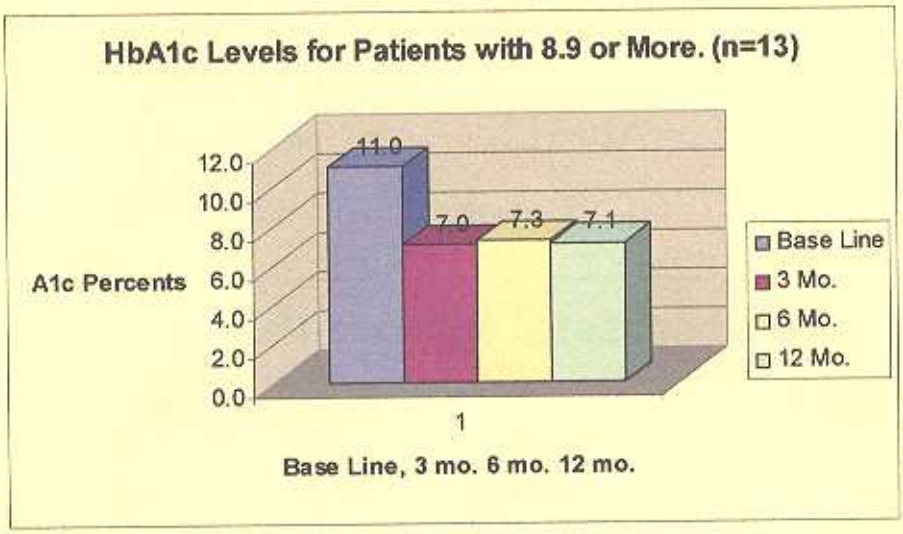
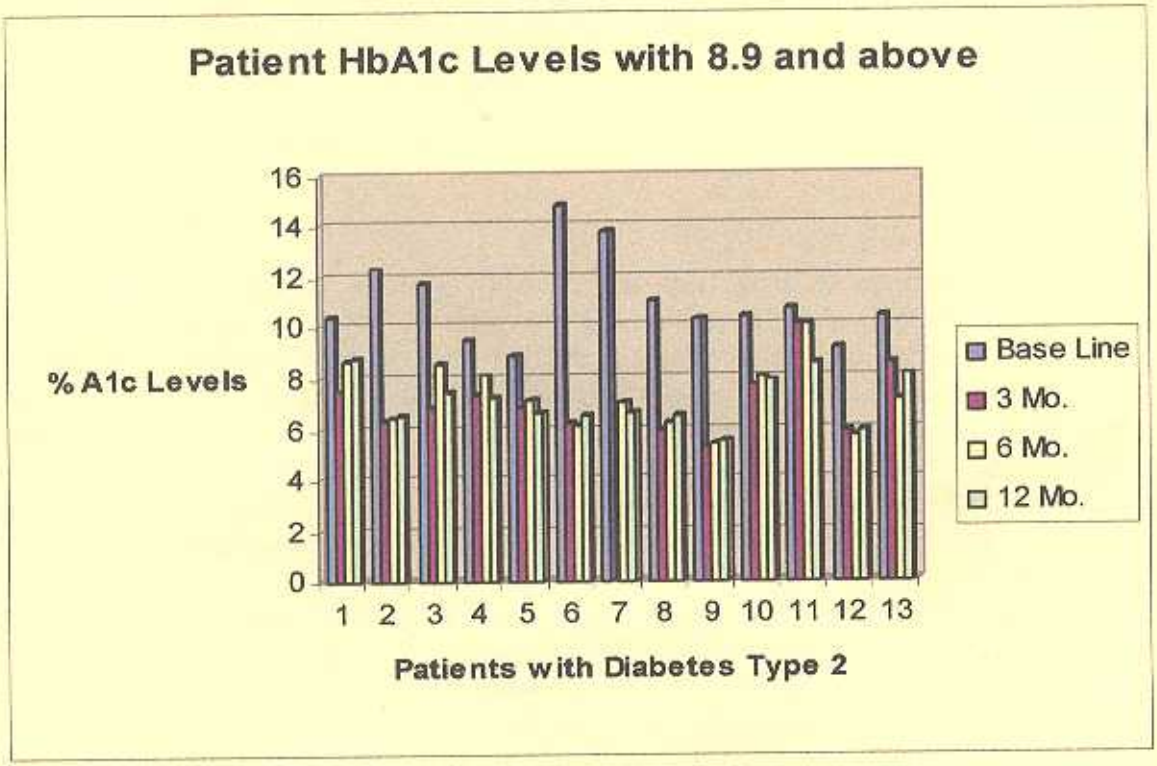


Figure 3: Sample Patient with HbA1c Level of 8.9 or more by patient. (n=13)

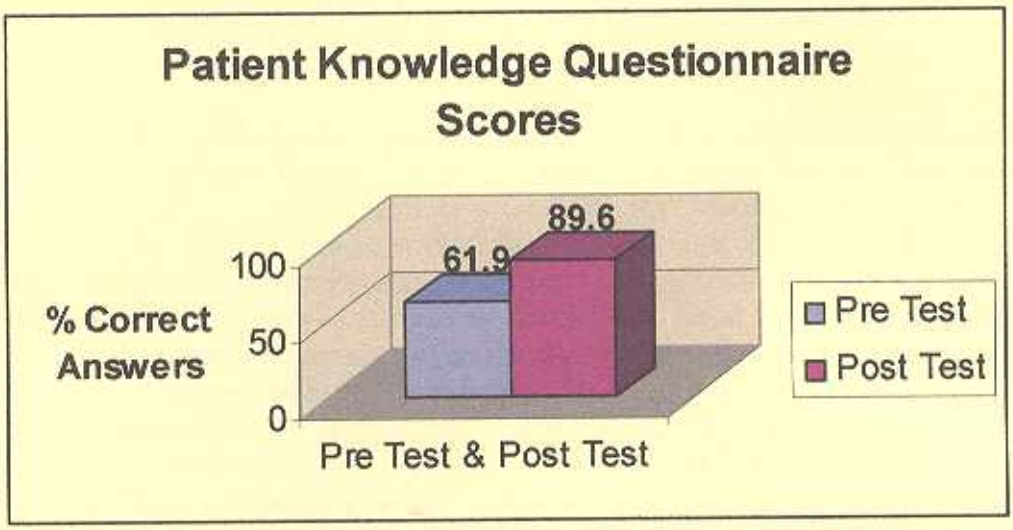


The benefit of reducing 3.9 percent in the glucose blood level yield many health benefits by greatly reducing complications associated with diabetes. These significant changes proportionally parallel the overall HbA1c level reductions for all patients.

Patient Knowledge Results

Results from the Patient Knowledge Questionnaire showed a mean percent increase of 27.6 in diabetes self management knowledge. Patient knowledge pre-test mean score was 61.9 percent correct scores (figure 1.2). Post knowledge scores after completing the ten weeks self management course was 89.6 percent.

Figure 3. Patient Knowledge Pre-Post Test Scores (n=265)



Benefit-to-Cost Analysis

According to clinic financial records, the total cost to operate the diabetes self management program annually at Gateway Community Health Center was estimated at $419,583. Project financial statements indicate a total cost per patient to be $1,583. Total benefits (health care savings) per patient gained by reducing HbA1c levels from 8.6 percent to 7.4 percent are estimated at $2,664 per patient. The ratio of benefit-to-cost for providing diabetes self management education and support group services to patients with diabetes, heart disease, and hypertension is 1.7:1. That is, for every dollars spent on educating and providing support groups, 1.7 dollars were saved in medical expenses.

A group of patients (13) with a higher than 8.9 HbA1c level, HbA1c levels were reduced from a mean of 11 percent to 7.1 percent representing a 3.9 percent reduction. Medical expenditures incurred by people with diabetes average four times more than for those without diabetes, approximately $10,071 per person with diabetes annually compared to $2,669 for people without diabetes (Source: "Benefits of Glycemic Control" by Gilbert, Christensen, and Conway).

VII. Conclusion

Gateway Community Health Center's logic model of self management education and support group services clearly impacts blood glucose levels. Patient clinic outcome measures indicate a strong reductions in HbA1c levels for patients who attended and graduated the diabetes self management program. The program effectiveness results for patient clinical impact, increased knowledge, and patient's sense of control for their illness were found to be very positive and support the premise that promotores-led self management education and support groups seems to directly influence blood glucose level reductions, which in turn influences decreased diabetes complications, and therefore impacts patient's overall health and quality of life.

Based on the results of the program effectiveness evaluation, benefit-to-cost analysis, patient knowledge increases results, and patient's sense of empowerment over their illness, a conclusion can be supported that Gateway's Diabetes Self Management project is indeed an effective approach to helping patients with diabetes control their illness by lowering their blood glucose level and therefore reducing and/or preventing complications associated to their chronic illness. Benefits of such programs can also be defended in dollar amounts as the benefit gained from promotores-led self management education initiatives are found to be cost effective at a ratio of 1.7 to 1. Glycemic reduction levels from an average of eight percent (8.6 actual) to 7 percent (7.4 actual) has a health care savings cost of $2,664 per patient. These high cost savings due to diabetes education offered by promotores is a clear indication that a promotores-led self management education program can have a reduction in health care costs.

The results of this program evaluation and benefit cost analysis supports the emerging body of literature that suggests a value in the use of Promotores as partners in the health care team both for the patient and public health care cost in general. Promotores are more than health educators. They serve as behavior change agents for patients. Promotores can provide an invaluable service in a well managed and supported clinic setting. The most significant benefit of including promotores de salud in the health care team is their ability to establish a trusting relationship with patients. This relationship is perhaps the most significant connection between a patient's willingness to control their blood glucose levels and actual behavior change that helps them reach their goal and therefore manage their chronic disease. Patients reason for changing their behavior to care for their health can be summarized in this philosophical conclusion: "patients will do what you tell them to do not because of the health information you have given them, but rather because of the relationship you have established with them." That is what the promotores de salud bring to the table – relationships. And with a strong human development process and updated diabetes information, promotores de salud will continue to help patients help themselves. This conclusion is well founded in the positive results of the patient's focus group responses, patient knowledge results, and in their clinical outcomes.

VIII. Recommendations

The compelling evidence that diabetes is on a rise and the fact that we have made no progress in reducing this chronic disease is enough reason to consider alternative prevention and intervention health education programs such as promotores-led diabetes education classes. In order to strengthen the positive results of this evaluation and cost analysis, a broader and more comprehensive cost analysis needs to be performed. The overwhelming positive results of the Gateway Diabetes Self Management Project supports further attention to the evaluation of promotores-led self management education approach to helping people with diabetes manage their chronic disease. It is imperative that we further study the benefits of these non-traditional but effective programs. It may well be our only alternative to reducing this debilitating chronic disease. Equally important is that it may be our only way to help reduce the sky rocketing cost of providing health care to patients with diabetes. As with any chronic disease, patient self care is the most promising practice for both the patient's quality of life and society's health care cost reduction. Therefore, more studies and program evaluations are warranted to further increase the awareness of the effectiveness of promotores-led models.

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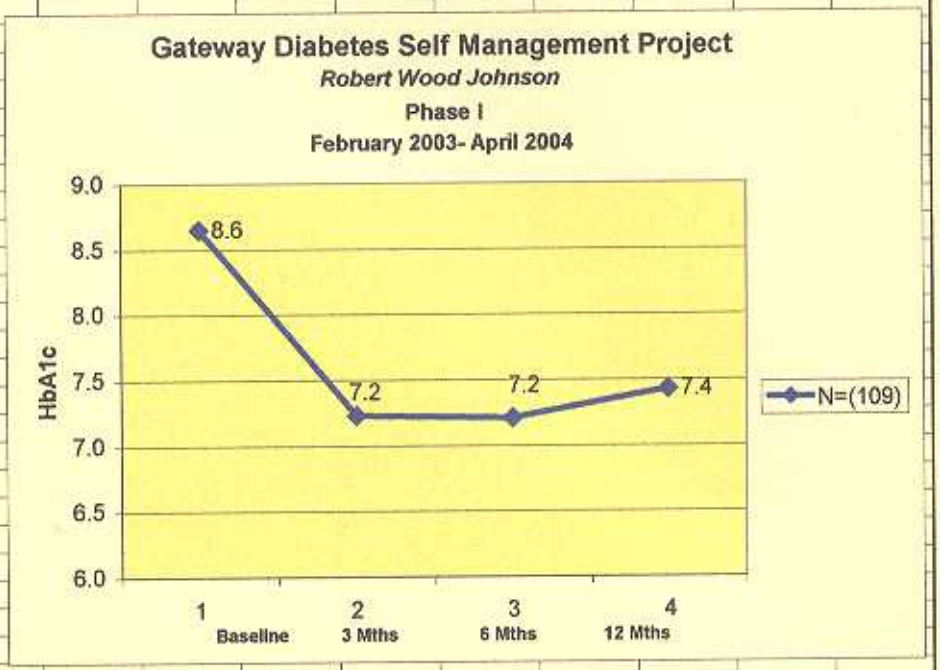
Clinical Outcomes

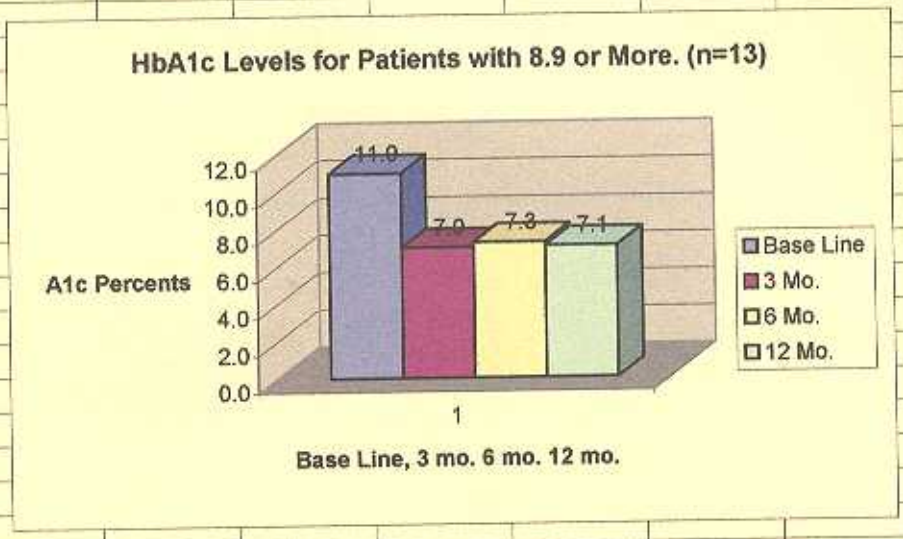
(Database)

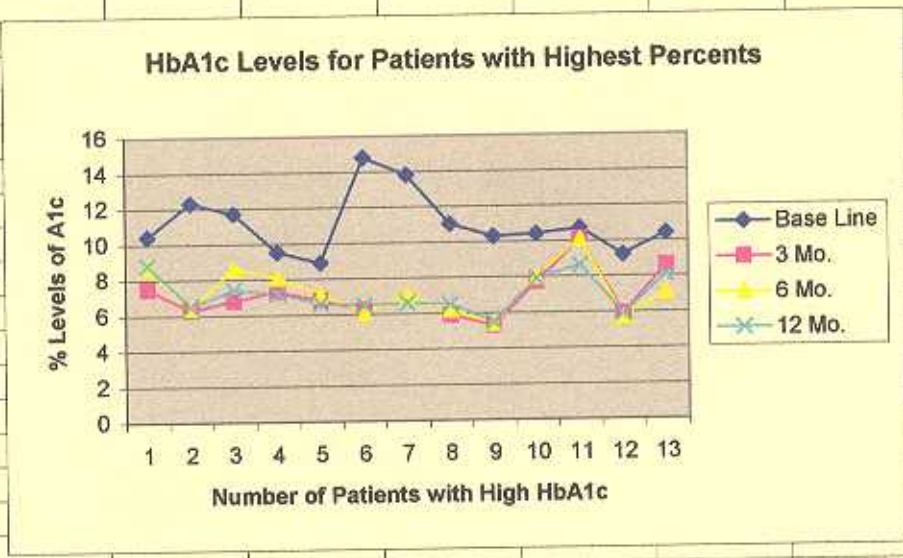
Patient #	Baseline	3 Mths	6 Mths	12 Mth
1	6.7	6.2	6.8	7.3
2	8.4			8
3	7.2	8.3	8	7.8
4	7	6.4	6.5	7.2
5	8.4		8.1	8.5
6	5.5		6.8	7.8
7	6.1	5.6	5.6	6
8	10.4	7.5	8.7	8.8
9	7.6	6.1	6.6	7.3
10	5.3	6.1	5.9	5.3
11	7.6	7.3	7.3	7.3
12	12.3	6.3	6.4	6.5
13	6.4	6.9	6.6	7.8
14	8.5	7	7.3	7.6
15	8.8	5	5.7	6.7
16	9.2	7.9		7.6
17	8.7		6	6.9
18	6.5		6.3	7
19	8	7.1	7	6.6
20	11.7	6.8	8.6	7.4
21	7.1	7.8	6.3	7.1
22	6.6	6.7	7.1	7.2
23	11.2	8.4	11	11.8
24	6.7	5.7	5.7	5.8
25	9.5	7.3	8.1	7.2
26	6.7	6.1	5.8	6.2
27	8.9	6.2	6.3	7.1
28	8.2		7	7.3
29	7.2	6.6	6.5	6.7
30	6.8		6.9	6.9
31	6.9	6.2	6.1	6
32	5.5	5.8		5.7
33	4.8	4.7	4.8	5
34	6.8	6.7	6.4	7.8
35	7.8		6.9	7.3
36	8.9	6.8	7.1	6.6
37	7.7	8.2		7.9
38	7.5	9.1	7.2	7.4
39	8.4	7.1	8.1	7.5
40	8.1		6.8	7.3
41	9.2	7.2	6.9	10.2
42	10.8	11	9.9	12
43	14.8	6.2	6.1	6.5
44	13.8		7	6.6
45	11	5.9	6.2	6.5
46	9.6	7.6	9.1	8
47	10.3	5.3	5.4	5.5
48	10.4	7.7	8	7.9
49	10.7	10.1	10.1	8.6
50	8.3	7.9	7.1	6.8
51	9.2	5.9	5.7	5.9
52	10.4	8.6	7.1	8.1
53	7		6	6.7
54	7.3		6.7	6.8

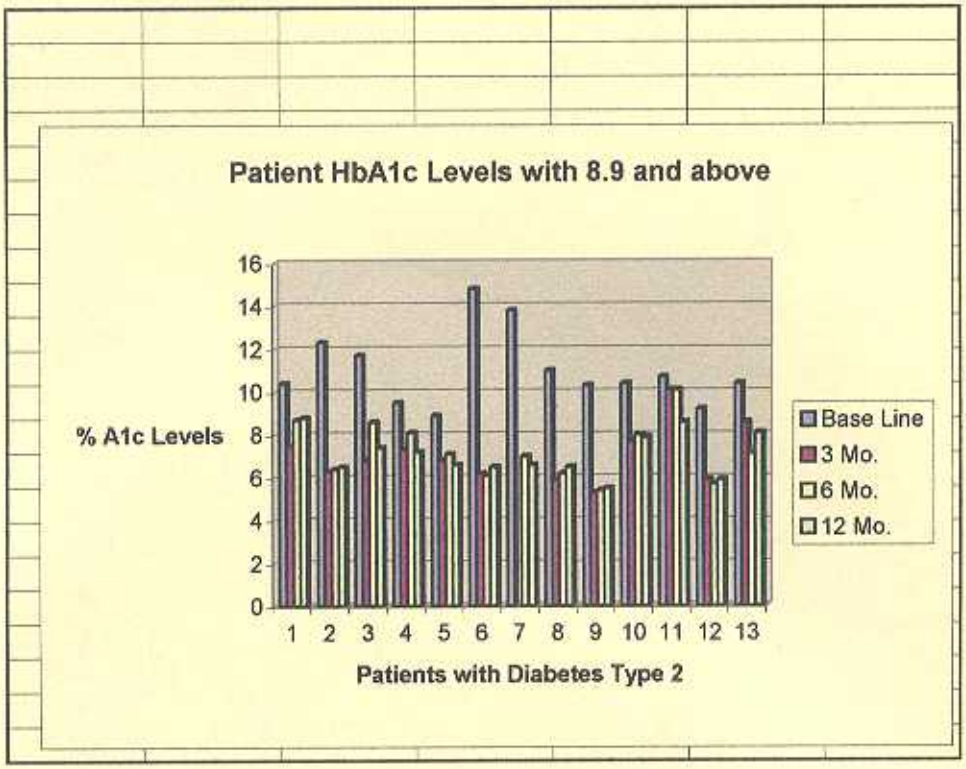


55	9.5		7.2	6.2
56	7.5	6.9	6.8	7.3
57	9.8	7.5	10.6	9.2
58	9.6		8.1	7.4
59	9.1	8.1	8.1	8.8
60	6.3	6.8	6.5	6.4
61	7		7.2	7.6
62	7.3	6.2	6.7	7.1
63	10.2		7.5	6.4
64	6.7		6.7	6
65	6.3	5.9	5.9	6.2
66	8.4	7.7	7	7.4
67	8.8		7	7.5
68	10.5			11.7
69	7.3	7.2	7.2	8.5
70	12.3	9.4		8.4
71	12.1	11.8	8.2	7.6
72	7.9	7.2	7.5	6.7
73	12.1		10.4	8.9
74	11.6	9	8.8	8.5
75	9.4	7.7	6.6	7.1
76	9.4	6.9	8	7.3
77	10		6.8	9.6
78	6.3	6.5	5.6	5.8
79	7.1	6.4	6.2	5.9
80	8.1	7.8		7.9
81	10.8	11.1	6.8	8.3
82	8.2		7.6	9.7
83	6.5	6.1	6.6	6.9
84	6.6	6.1	7.5	7.7
85	12.9		10.3	9.6
86	10.8		7.9	7.5
87	8.7	7.8	7.3	8.1
88	9.2	7.9	7.8	8.4
89	6.4	6.9	6.5	7.1
90	7	5	6.1	6
91	8.5	6.8	6.2	6.9
92	10.8	8.3	9.5	8.1
93	8.6	7.7	7.4	8.6
94	7.2	6.3	7.3	7
95	8.1	7.6	7.1	8
96	12.5	11.7	9.8	7.9
97	11.8	6.7	6.9	6.8
98	9.9	5.6	5.4	5.4
99	8.8	7	6.9	7.7
100	6.4	5.5	6.2	6.4
101	11.8	7.7	8.3	8.6
102	7.9	9.3	8.6	6.8
103	7.8	6.9	6.1	6.8
104	8.3		9.5	8.3
105	6.9	6.8	6.6	7.9
106	7.1	6.7	6.8	6.8
107	9.7	9.1	7.2	7.2
108	7.5	7.3		7.3
109	11.1		7.8	7.5
Average	**8.6**	**7.2**	**7.2**	**7.4**

Base Line	3 Mo.	6 Mo.	12 Mo.
10.4	7.5	8.7	8.8
12.3	6.3	6.4	6.5
11.7	6.8	8.6	7.4
9.5	7.3	8.1	7.2
8.9	6.8	7.1	6.6
14.8	6.2	6.1	6.5
13.8		7	6.6
11	5.9	6.2	6.5
10.3	5.3	5.4	5.5
10.4	7.7	8	7.9
10.7	10.1	10.1	8.6
9.2	5.9	5.7	5.9
10.4	8.6	7.1	8.1
11.0	**7.0**	**7.3**	**7.1**






Patient HbA1c Levels with 8.9 and above
% A1c Levels
16
14
12
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12 13
Patients with Diabetes Type 2
Base Line
3 Mo.
6 Mo.
12 Mo.