

Role of Community Health Workers in Glycemic Control in Hispanic Patients with Type 2 Diabetes

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ABSTRACT

Background: The role of Community Health Workers (CHW) in diabetes control among Hispanic patients with type 2 diabetes is unclear.

Objective: To clarify the impact of CHW on diabetes control in Hispanic patients as reflected by hemoglobin A1c (HbA1c) values in randomized controlled trials conducted in the USA.

Methods: Pubmed search until December 1st, 2021. Search terms are community health workers, peer leaders, diabetes, Hispanics, Latinos, randomized trials, hemoglobin A1c. Pertinent observational studies, meta-analyses, and reviews are also included.

Results: We identified 13 randomized trials of 6-24 months duration that compared the effect of CHW intervention versus standard care on hemoglobin A1c (HbA1c) values. Nine studies showed significant reduction in mean HbA1c values ranging from 0.4 to 1.5% in patients randomized to CHW intervention compared with baseline or usual care groups. There was marked heterogeneity in types, intensity and contents of CHW intervention. Most studies did not demonstrate significant changes in body weight, blood pressure or plasma lipids with CHW intervention. Attrition rates were high and ranged from 15 to 50%. CHW intervention was safe and cost-effective.

Conclusions: In Hispanic patients with type 2 diabetes, CHW intervention is a promising approach for amelioration of glycemic control. Further studies are needed to determine the optimum methods and sustainability of the CHW intervention.

INTRODUCTION

Hispanics living in the USA exhibit a disproportionate burden of type 2 diabetes. We have recently reviewed data showing increase prevalence of diabetes and its complications among Hispanics in the USA compared with non-Hispanics Whites [1]. Furthermore, while diabetes control improved among non-Hispanic Whites, Hispanic patients continue to have suboptimal glycemic control [2]. Reasons for these ethnic disparities include health inequities, low health literacy, language and culture barriers, poor access to health services, and low rates of health insurance among Hispanic patients [1]. CHW are public health workers who received several names in the literature such as lay health educators, promotoras (es) de salud (Spanish terminology meaning health promoters), community health advocates, community health outreach workers and peer educators [3]. By sharing Hispanic patients the same language and ethnic background, CHW can understand the unique cultural beliefs, habits, food

types of their respective communities [3]. In addition, CHW help patients to overcome health, social, financial and cultural barriers. In fact, CHW are considered an alliance or cultural mediators between health care providers and patients to facilitate appropriate utilization of health care services. In a recent survey conducted in New York area by Gore et al [4], primary care physicians, nurse practitioners and registered nurses supported cultural competency and neighborhood reach of CHW. Moreover, respondents found CHW appropriate for diabetes prevention [4]. Meanwhile, the exact contribution of CHW to diabetes management among Hispanics is not well defined. The main purpose of this review is to clarify the role of CHW in glycemic control as reflected by HbA1c levels among Hispanic patients living in the USA based on the best available evidence derived from randomized controlled trials.

TRAINING OF COMMUNITY HEALTH WORKERS

Training of CHW differs in various areas of the US in terms of content, intensity, quality, and accreditation. In the study of Aponte et al [5] conducted in New York area, CHW were accredited CHW certificate program. In the study of Spencer et al [6], CHW were required to have an extensive training formed of 160 h community outreach training and 80 h of diabetes education. In addition, they were trained in empowerment-and motivational-based approaches [6]. Yet, in the study of Perez-Escamillo et al [7], training of CHW was less intense, consisting of 65 h core training + 25 h supplementary training on motivational interviewing and communications skills. Indeed, in the survey conducted by Gore et al [4], clinicians, nurse practitioners and registered nurses expressed concern about adequacy of training of CHW.

METHODS OF INTERVENTIONS BY COMMUNITY HEALTH WORKERS

Types of interventions by CHW vary widely across studies. They include group sessions, home visits, and phone calls or a combination of these methods. Frequency of contacts with patients and follow-up also differ. During interaction with patients, CHW may play the following roles: diabetes education, emotional and social support, empowerment, enhancement of healthy diet and physical activity, facilitation of appointments and referrals to medical providers [8] and advocacy (i.e. helping patients communicate with their

physicians to ensure that they receive adequate service in line with guidelines) [9]. Most studies used a special curriculum that usually includes basics of diabetes and its complications, blood glucose monitoring, and methods for addressing cultural issues [10].

EFFECT ON CHW ON GLYCEMIC CONTROL

Description of studies

Our literature review revealed 13 randomized controlled trials that examined the impact of CHW intervention on HbA1c levels [5-7,10-19] (Table 1). The duration of follow-up ranged from 6 to 24 months and number of patients ranged from 107 to 360 patients [17,18]. Majority of patients were Mexican-Americans and more than 50% were females (Table 1). Most studies included 2 groups of patients for comparison of CHW intervention with a control group that receives either standard care or enhanced usual care (Table 1). Meanwhile, 2 trials included 3 groups of patients. The first trial conducted by Bamato et al [13] had a third group of subjects randomized to case management run by registered nurses. In the second study of Spencer et al [6], the third group of patients received intervention by both CHW plus peer leaders. One trial did not include a standard care control group but compared CHW versus peer leader intervention [16]. It should be emphasized that peer leaders are different than CHW. Thus, while peer leaders are similar to CHW in being bilingual and share the same cultural background of patients, unlike CHW, peer leaders are volunteers who themselves have diabetes [6,16]. Moreover, peer leaders generally receive less intense training than CHW. In fact, in the study of Spencer et al [6], peer leaders were recruited and supervised by CHW.

Magnitude of HbA1c reduction

Nine trials [5-7,10,11,13-15,19] showed significant HbA1c reduction after CHW intervention compared to standard care, whereas in 4 trials this intervention did not result in significant decrease in HbA1c values [12,16-18]. Mean reductions of HbA1c values at the end of follow-up ranged from 0.45% to 1.5% compared to baseline or control group (Table 1). Interestingly, Tang et al [16] found a trend toward greater reduction in mean HbA1c levels of 0.6% in patients randomized to peer leaders versus a reduction of 0.3% in patients who received care from the more intensively trained CHW. However, this difference did not reach statistical

significance. It is noteworthy that in the study of Bamato et al [13], HbA1c reduction in the CHW intervention group was similar to that observed with the more cost-demanding intervention by registered nurses.

Table 1: Effects of community health workers (CHW) intervention on hemoglobin A1c levels in randomized controlled trials.

Reference, location	Patient characteristics	CHW group	Control group	Trial duration	Changes in mean HbA1c at trial end
1. Lujan et al [11], Texas-Mexican border.	Mexican Americans (n=149), mean age 58 y, 80% females,	Weekly classes + bi-weekly phone calls for 8 weeks, then mailing health cards biweekly for 16 weeks (n=75).	One-on-one diabetes teaching during clinic visits by clinic staff (n=74)	6 months	-0.45% in intervention group and + 0.3% in control group (P <0.001).
2. Sixta et al [12], Texas-Mexican border	Mexican Americans (n=131), mean age 56 y, 71% females,	10 weekly group sessions of diabetes self-management (n=68)	Usual care (n=68)	6 months	No significant difference between groups.
3. Babamato et al [13], Los Angeles, CA	Latinos (n=189), with newly diagnosed type 2 diabetes, mean age 50 y, 64% females.	CHW group (n=75) received average 11 sessions by CHW at home or clinics or phone calls. Case management group (n=60) received individual education by registered nurse monthly in clinic + follow-up phone calls.	Standard care group (n=54)	6 months	Significant decreases in HbA1c in all groups: CHW from 8.6 to 7.2%, Case management group from 8.5 to 7.4%, and in standard care group from 9.5 to 7.4%. Difference between the 3 groups was not reported.
4. Philis-Tsimikas et al [10], San Diego, CA	Mexican-Americans (n=207), mean age 51 y, 70% females	8 weekly *DSM classes followed by monthly support groups (n=104)	Standard care group (n=103)	10 months	-1.5% (P=0.01) vs baseline in the intervention group. No significant change in HbA1c in control group.
5. Prezio et al [14] Dallas, Texas.	Uninsured Mexican Americans (n=180), mean age 47 y, 61% females.	7 sessions (1 hour each) in office followed by individual visit each quarter (n=90)	Usual care (n=90)	12 months	-1.6% in intervention group vs -0.9% in control group (P=0.02).
6. Rothschild et al [15] Chicago, Illinois.	Mexican Americans (n=144), mean age 53 y, 67% females.	36 home visits regarding *DSM (n=73)	36 mailed newsletters covering same DSM of intervention group (n=71)	24 months	HbA1c in intervention group was 0.69% lower than control group (P=0.005)
7. Tang et al [16], Detroit area.	Latinos (70% Mexican-Americans) (n=116), mean age 49 y, 59% females.	**DSME for 6 months (11 group classes + 2 home visits/month + one visit by medical provider) followed by 12-month-phase of monthly support phone calls by CHW + E-mail contacts.	**DSME for 6 months (11 group classes + 2 home visits/month + one visit by medical provider) followed by a 12-month phase of peer leader weekly group sessions supplemented by phone calls	18 months	-0.6% in peer leader group vs -0.3% in CHW group. Difference between the 2 groups was not statistically significant.
8. Palmas et al [17], Northern Manhattan, NY	Latinos (n=360) mean age 57 y, 61% females	At least 4 one-on-one visits, 10 group sessions, and 10 telephone calls (n=181)	Enhance usual care group mailed 4 sets of educational materials + quarterly phone calls (n=179)	12 months	HbA1c decreased from 8.77% to 8.40% in the intervention group and from 8.58% to 8.53% in the control group (P =0.13)
9. Perez-Escamilla et al [7], Hartford, CT	Latinos (n=211), mean age 56 y, 73% females	17 home visits (n=105) for 12 months, then maintenance phase without home visits from month 12 to 18.	Standard of care (n=106)	18 months	HbA1c in intervention group was 0.51% lower than control group (P=0.002)
10. Wagner et al [18], Hartford, CT	Latinos (n=107), 73% females.	One session of diabetes education 2.5 h + 8 group sessions of stress management (n=61)	One session of diabetes education 2.5 h delivered by CHW (n=46)	Not reported	No significant difference between groups.
11. Aponte et al [5], Bronx, NY	Latinos (n=180), mean age 60 years, 60% females	Weekly group sessions for diabetes education for 5 months + 2 home visits/month for 2 months + weekly phone calls for further 2 months (n=60).	2 control groups: Usual care (n=60), and attention control group (n=60) who received ***NDEP materials by mail.	12 months	Percentages of patients with $\geq 1.0\%$ decrease in HbA1c were significantly higher in the CHW group 56.6% and the attention control group 45.7% compared with the control group 20.8% (P<0.05).
12. Carrasquillo et al [19], Miami, FL	Latinos (n=300), mean age 55 y. 55% females.	4 home visit + 12 telephone calls + monthly education classes over 52 weeks (n=150)	Enhanced usual care group (n=150)	12 months	Patients in CHW group had lower HbA1c levels of -0.51% (95% CI, -0.94% to -0.08%) vs control group.
13. Spencer et al [6], Detroit, Michigan	Latinos (n=222), mean age 49 years, 61% females	During the initial 6 months: **DSME 11 classes + 2 home visits/month +1 clinic visit in presence of medical provider (n=149). During subsequent 12 months, patients were randomized to CHW group (n=89) that included phone calls only, or CHW + peer leaders (n=60) that includes weekly group sessions \pm phone calls	Enhanced usual care group (n=73) receiving one 2-h class	18 months	Significant reduction in HbA1c by -0.76% (95% CI, -1.48 to -0.05, P <0.05) in the CHW+ peer leader group vs usual group. No significant effect on HbA1c in the CHW group.

Studies in table 1 are presented in chronological order from oldest to most recent.

*DSM: diabetes self-management

** DSME: Diabetes self-management education.

*** NDEP: National Diabetes Education Program

Time course of HbA1c reduction

With respect to the time course effects of CHW intervention on HbA1c levels, no characteristic pattern could be defined. However, in general, the decrease in HbA1c values were sustained till the end of trial. Thus, in the longest-term study by Rothchild et al [15] HbA1c levels exhibited progressive decrease over the 2 years of follow-up. In the study of Spencer et al [6], mean HbA1c reduction of 0.76% was maintained in the group of patients receiving intervention by CHW + peer leaders up to the end of follow-up at 18 months, whereas HbA1c levels returned to baseline in patients randomized to CHW intervention only. Other studies showed an initial reduction in HbA1c at 4 to 6 months followed by a plateau [7] or a rebound [10].

HbA1c reduction in various subgroups of patients

Subgroup analysis of the study of Spencer et al [13] showed that patients randomized to CHW intervention aged 55 years and older had greater HbA1c reduction than those younger than 55 years, -0.83% and -0.34%, respectively ($P < 0.001$) [20]. The reasons for this difference were unclear, but it might be related in part to higher number of participants younger than 55 who reported depressive symptoms [20]. Unfortunately, no studies classified HbA1c results by gender or background educational level.

Effects of CHW on body weight

Most studies did not report any significant impact of CHW intervention on body weight. On the contrary, in the study of Aponte et al [5], there was substantial mean weight gain of 8.8 kg after 12 months in the CHW group compared with control group despite reduction in blood pressure. The latter finding could be attributed to changes in anti-diabetic medications (for example adding insulin) which were not tracked during this study [5]. Nonetheless, few studies reported mild weight loss after CHW intervention [15,16]. For instance, in the study of Rothschild et al [15], patients in the CHW group lost an average of 5 pounds after 2 years versus baseline, whereas patients in the control group did not lose any weight.

Effects of CHW on blood pressure and lipids

With few exceptions [5,16], most studies showed no changes in blood pressure after CHW intervention. Likewise, there were no significant changes in plasma lipids between the study groups.

Mechanisms of HbA1c reduction by CHW intervention

Mechanisms underlying amelioration of glycemic control by CHW intervention are not fully elucidated, but they are likely multifactorial. As mentioned earlier, no significant effects on weight reduction were found in most studies. Likewise, changes in physical activity were not monitored in most studies. However, in one study weight loss and increase physical activity may have contributed to HbA1c reduction in the CHW intervention group [15]. It is possible that other factors difficult to measure or capture may have contributed to HbA1c reduction with CHW intervention such as emotional and social support, and increased compliance with provider appointments and medications. Parenthetically, adherence to medications was not different between the intervention and control groups in the study of Rothschild et al [15].

Safety of CHW intervention

Only 2 studies commented on adverse effects of CHW intervention [14,15]. In the first study by Prezio et al [14], the authors mentioned ‘...no adverse effects were noted among participants as result of intervention.’. In the second study, Rothschild et al [15] reported no increase in hospitalization in general or hospital admissions due to hypoglycemia was reported in the group of patients randomized to the CHW intervention.

Cost effectiveness of CHW intervention

Several studies using different methodological approaches have shown that CHW intervention was cost effective on long-term and might result in substantial reductions of diabetes complications [21-23]. Thus, with CHW intervention, Ryabov et al [21] estimated an absolute reduction in projected probability of lifetime occurrence of nephropathy by 5.9%, neuropathy by 3.4%, retinopathy by 2.6%, and coronary artery disease by 3.8%. Moreover, the analysis by Brown et al [22] suggested that CHW strategy was most cost-effective among Latino patients aged 50 to 65 years. As mentioned earlier, Bamato et al [13] showed that HbA1c reduction with CHW intervention was not inferior to that achieved with the

more expensive intervention by registered nurses. Cost-effectiveness of CHW intervention extends to other ethnicities. For example, in a randomized study of 268 patients with type 2 diabetes in American Samoa, Huang et al [24] found that CHW home visits were highly cost-effective.

LIMITATIONS OF AVAILABLE RANDOMIZED TRIALS

Despite the randomized design of the available trials, they suffer from several limitations. First, attrition rates were high reaching 41%-50% in some studies [12,13,16]. These high drop-out rates may influence results, particularly if they were not balanced across the study groups. Second, changes in diabetes medications and their doses as well as drug compliance represent a confounding factor that may affect HbA1c levels. Unfortunately, only few studies monitored medication intensification [12,13] or adherence to medications [13,15]. Third, the duration of trials was relatively of short duration. Fourth, few studies reported adverse effects and patient satisfaction with CHW intervention [14,15].

CONCLUSIONS

Accumulating evidence derived from randomized trials generally suggest that CHW play an effective role in lowering HbA1c levels among Hispanic patients with type 2 diabetes. Such reduction ranges between 0.5 to 1.5% on the average after 6-24 months of intervention. This glycemic benefit may virtually decrease diabetes complications and decrease disparities in diabetes control between Hispanics and non-Hispanic Whites. The mechanisms of amelioration of glycemic control with CHW intervention are likely multifactorial including diabetes education, emotional and social support, and adherence to provider and laboratory appointments. Overall, no significant benefits were demonstrated with respect to other cardiovascular risk factors namely blood pressure and plasma lipids. Similarly, no clear trends in body weight and physical activity were demonstrated after CHW intervention. Nevertheless, CHW approach was safe and cost effective.

FUTURE NEEDS

Great potential still exists to refine the CHW approach for diabetes management of Hispanic patients. First, more attention should be directed towards enhancement of the quality of training and preparation of CHW. Second, it is the time to integrate CHW as part of health care system. In that

respect, the successful experience reported by Perez-Escamilla et al [7] in Hartford, Connecticut is encouraging. Third, the high drop-out rates in randomized trials is concerning. This problem implies that closer patient follow-up at more frequent intervals may be required. Fourth, future trials should focus on finding the optimum methods of patient contacts (e.g. phone calls, home visits, group sessions, one-on-one meetings) that yield the highest benefit in a given Hispanic patient population. Fifth, the sustainability of glycemic control by the CHW strategy should be evaluated in long-term trials. Finally, besides HbA1c levels, studies should evaluate other outcomes of clinical and economic importance such as incidence of hypoglycemia, hospital admissions for hyperglycemic crisis and mortality.

CONFLICT OF INTEREST

The authors do not have any conflict of interest to declare.

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