

Effect of Group Medical Appointments on Glycemic Control of Patients With Type 2 Diabetes

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■ ABSTRACT

Rationale. To evaluate the effectiveness of group medical appointments (GMAs) for patients with type 2 diabetes.

Objective. To compare A1C levels of patients participating in GMAs to those of patients who received usual primary care.

Design and methods. This study was a retrospective electronic chart review comparing GMA care for 52 male patients to usual primary care for 52 male patients. Demographic (age, marital status, and ethnicity/race) and health-related (height, weight, BMI, duration of diabetes, use of alcohol and tobacco, and A1C) variables were analyzed.

Results. A greater proportion of GMA patients (50%) versus usual primary care patients (19.2%) reached target A1C goals ($P = 0.001$). GMA participants also had a significantly faster rate of decline in A1C over time compared to usual primary care patients ($P < 0.001$).

Conclusion. This study demonstrated that the concept of medical management delivered in a group approach had a positive effect on glycemic control in patients with type 2 diabetes. GMAs were found to be an effective approach to achieving patient-centered goals for improving the glycemic control of patients with type 2 diabetes.

Diabetes increases an individual's risk for long-term complications such as heart disease, stroke, blindness, chronic kidney disease, lower-limb amputations, peripheral neuropathy, decreased quality of life, and emotional issues, including depression (1). Reaching clinical targets for glucose, blood pressure, and lipid levels significantly lowers the risk for these complications, but unfortunately, only 57% of adults with diabetes were found to meet widely accepted targets for good control of blood glucose (2).

Diabetes also has a profound impact on medical costs; people with diabetes incur more than twice the costs of care of people without diabetes (1). Improvements in diabetes

care lead to better clinical outcomes and cost savings, but there remains a gap in achieving improved outcomes. This gap in clinical performance suggests that innovative approaches to diabetes management are needed to maximize health gains for patients and reverse the increasing prevalence of diabetes in our society (3).

Group medical appointments (GMAs) have emerged as a novel health service delivery innovation through which multiple patients are seen together by interdisciplinary health care providers in a supportive group setting. GMAs are also referred to as group appointments, group visits, group medical clinics, shared medical appointments, shared appointments, and shared visits. The

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main focus of the GMA approach is the actual delivery of medical care within an interdisciplinary environment utilizing peer-to-peer interactions (4).

The Veterans Affairs (VA) Health-care System in Loma Linda, Calif., implemented GMAs for patients with diabetes in the summer of 2008. The VA Loma Linda Diabetes GMA program serves as a support to the VA's primary care providers (PCPs) in managing patients with poorly controlled diabetes and aims to improve patients' adherence to treatment plans and ability to achieve treatment goals.

Literature Review

GMAs have been implemented for various chronic medical conditions. The focus of this literature review is the effect of GMAs on clinical care outcomes in patients with diabetes.

In a systematic review by Riley and Marshall (5), diabetes-focused group visits, when compared to traditional office visits, did not result in consistent statistical improvements in A1C, blood pressure, or lipid levels. Edelman et al. (6) conducted a randomized, controlled trial comparing a group medical clinic (GMC) intervention with usual care among primary care patients at the VA medical centers (VAMCs) in Durham, N.C., and Richmond, Va. The study included 239 patients with poorly controlled diabetes (A1C $\geq 7.5\%$) and hypertension (systolic blood pressure >140 mmHg or diastolic blood pressure >90 mmHg). In each VAMC, patients were randomly assigned to attend either a GMC or receive usual care. A1C and systolic blood pressure measurements were taken by blinded research personnel at baseline, study midpoint (mean 6.8 months), and study completion (median follow-up 12.8 months). Mean baseline systolic blood pressure and A1C measurements were 152.9 mmHg (SD 14.2 mmHg) and 9.2% (SD 1.4%), respectively. The measurements taken at the end of the study showed a mean systolic blood pressure improvement of

13.7 mmHg in the GMC group and 6.4 mmHg in the usual care group ($P = 0.011$ by linear mixed model), whereas mean A1C improved by 0.8% in the GMC group and 0.5% in the usual care group ($P = 0.159$). The authors concluded that GMCs effectively improve blood pressure but are not reliable models for effectively improving glycemic control in people with diabetes.

Desouza et al. (7) collected electronic medical record (EMR) data for 56 patients during a 24-month period. Of these patients, 26 were in the group diabetes clinic and 27 received usual care from PCPs. Outcomes variables such as A1C, LDL cholesterol, and blood pressure were compared between the two cohorts. The researchers found that the A1C, blood pressure, and LDL cholesterol levels of those in the group diabetes clinic were no different from levels of those receiving usual primary care.

On the other hand, Wagner et al. (8) performed a system-wide randomized trial in which primary care practices were randomized within clinics to either a chronic care diabetes group (intervention) or usual care (control group). Of the 707 study participants, 278 were in the intervention group, and 429 were in the control group. Patients' assessments were taken at baseline and at 12- and 24-month follow-ups. At the 24-month assessment, the intention-to-treat analysis showed patients in the GMA had received significantly more recommended preventive procedures and more helpful patient education. GMA patients had slightly more primary care visits but significantly fewer specialty and emergency room visits compared to usual-care patients. In both the GMA and usual-care groups, improved A1C levels were directly correlated with the number of visits attended.

Kirsh et al. (9) conducted a quasi-experimental design with concurrent but nonrandomized control subjects to evaluate the impact of

shared medical appointments (SMAs) for patients with diabetes. There were 44 patients in the SMA group and 35 in the usual primary care group. There were no significant differences at baseline in terms of age, baseline intermediate outcomes, or medication use between the two groups. The SMA group had greater reductions in A1C and systolic blood pressure levels compared to the control group (1.44 vs. -0.30 , $P = 0.002$, for A1C and 14.83 vs. 2.54 mmHg, $P = 0.04$, for systolic blood pressure). The intervention group also showed greater reduction in LDL cholesterol levels than the usual-care group (16.0 vs. 5.37 mg/dL, but the difference was not statistically significant ($P = 0.29$)).

Clancy et al. (10) examined the effect of group visits on clinical outcomes, as well as concordance rates for 10 American Diabetes Association (ADA) guidelines and 3 U.S. Preventive Services Task Force–recommended cancer screenings. The randomized, controlled trial spanned 12 months, included 186 patients with diabetes, and compared patients in group visits to those receiving usual physician care. Clinical outcome assessments for A1C, blood pressure, and lipid profiles were taken at 6 and 12 months. At both assessment periods, A1C, blood pressure, and lipid levels did not significantly differ between group-visit patients and usual-care patients. At 12 months, group-visit patients showed greater concordance with ADA process-of-care indicators ($P < 0.0001$) and higher screening rates for cancers of the breast (80 vs. 68%, $P = 0.006$) and cervix (80 vs. 68%, $P = 0.019$). The study showed that group visits can improve the quality of care for patients with diabetes and suggested that modifications to the content and style of group visits may be necessary to achieve improved clinical outcomes.

Sadur et al. (11) conducted a randomized trial to determine the effectiveness of a cluster visit, or group visit, model led by a diabetes nurse educator in comparison with

usual primary care for patients with poorly controlled diabetes. Patients aged 16–75 years were selected from Kaiser Permanente's Pleasanton, Calif., clinic and had an A1C $>8.5\%$ or no A1C measured in the previous year. Patients were separated into groups of 10–18 patients. A Diabetes Cooperative Care Clinic—a multidisciplinary outpatient diabetes care team consisting of a diabetes nurse educator, a psychologist, a nutritionist, a pharmacist, and two diabetologists—conducted the cluster visits monthly for 6 months. Post-intervention measures that included change from baseline A1C levels, self-reported change in self-care practices, self-efficacy, satisfaction, and utilization of inpatient and outpatient health care were taken to evaluate the group treatment. The A1C levels of the group-visit patients ($n = 97$) declined by 1.3% compared to 0.2% in the usual-care patients ($n = 88$, $P < 0.0001$). Group-visit patients showed improved self-care practices and improved self-efficacy measures, and their satisfaction with the program was high. Group-visit patients also showed decreased hospital ($P = 0.04$) and outpatient ($P < 0.01$) utilization. The authors concluded that group visits effectively improve glyce-mic control, self-efficacy, and patient satisfaction and reduce health care utilization by participants after the program.

Based on this literature review, results of previous studies on the effect of GMAs evaluating surrogate outcomes of changes in A1C levels, blood pressure, and lipid profiles have been limited and variable. This was the rationale for the present study. In addition, no formal evaluation of the VA Loma Linda Diabetes GMA program had been conducted since its implementation in 2008.

Objective

The purpose of this study was to evaluate the effect of a GMA on the glyce-mic control of patients with type 2 diabetes as assessed by A1C testing.

The specific aim of the study was to compare the A1C levels of patients with type 2 diabetes who participated in a GMA to those of a similar cohort of control patients who received usual care from their PCPs over a 1-year period.

Hypotheses

The researchers had two hypotheses:

1. A higher proportion of GMA patients will reach the A1C goal compared to patients followed by usual primary care.
2. The participants in the GMA will have a more rapid A1C reduction rate than patients seen in the usual primary care clinic.

Design and Methods

Design

This was an effectiveness study that involved a retrospective chart review of patients who participated in the Diabetes GMA compared to patients seen by their PCPs alone during the span of 1 year.

Description of the GMA and Usual Care

The Diabetes GMA interprofessional team is composed of a nurse practitioner who is also a certified diabetes educator and is board certified in advanced diabetes management, a pharmacist, a health psychologist, and a licensed vocational nurse. Patients with type 2 diabetes with an A1C $\geq 8\%$ are referred to the GMA mainly by their PCPs.

The Diabetes GMA sessions last for 90 minutes, during which 8–15 patients are seen simultaneously by the interprofessional team. The sessions start with a 3- to 5-minute introduction and welcome that includes explanation of the group ground rules and expectations and discussion of the confidentiality agreement. The introduction is followed by 20–25 minutes of patient education. Patients receive education about diabetes, with emphasis on self-management skills, and the GMAs address topics including medication management, nutrition,

exercise, and psychosocial issues. Planning of care (i.e., therapeutic lifestyle modifications, medication adjustments, and so forth) comes after the patient education session and is the major portion of each group session, taking the final hour.

In comparison, usual-care subjects attended traditional one-on-one visits with their PCPs. The PCPs at VA Loma Linda and its community-based outpatient clinics (CBOCs) are internal medicine physicians and nurse practitioners, and primary care visits for established patients typically last 30 minutes and for new patients 30–60 minutes.

Population and Sample

The study population consisted of ambulatory male patients with type 2 diabetes at the VA Loma Linda Healthcare System and its CBOCs with an A1C of $\geq 8.5\%$. The inclusion criteria for the intervention cohort were patients with type 2 diabetes who participated in the GMA during a 12-month period starting January 2011. Inclusion criteria for the control cohort were patients with type 2 diabetes seen by their assigned PCP during a 12-month period starting January 2011. Patients in both cohorts had at least two medical visits and at least two recorded A1C levels during the study period.

The study sample included data from 104 patients: 52 who were randomly selected from a total of 1,245 patients who were seen in the Diabetes GMA and met the criteria and 52 who were randomly selected from a total of 352 patients who were seen by their usual PCP and met the criteria.

Demographic data, including age, sex, race/ethnicity, and marital status, as well as health factors such as weight, height, BMI, and history of smoking and alcohol use, were abstracted from the VA Computerized Patient Record System EMR for all subjects. Dates of all medical visits and all A1C levels mea-

TABLE 1. Demographic Data

	Usual Primary Care	GMA	Applicable Statistic (degrees of freedom), P
Age (years; mean [SD])	61.40 (6.855)	61.62 (6.988)	t(102) = 0.156, P = 0.876
Marital status (n [%])			$\chi^2(4) = 3.846, P = 0.427$
Married	26 (50)	32 (61.5)	
Divorced	14 (27)	15 (28.9)	
Single	6 (11.5)	3 (5.8)	
Other	6 (11.5)	2 (3.8)	
Ethnicity/race (n [%])			$\chi^2(5) = 5.680, P = 0.339$
White	29 (55.7)	25 (48.1)	
African American	7 (13.5)	13 (25)	
Hispanic/Latino	7 (13.5)	9 (17.3)	
Other	5 (9.6)	1 (1.9)	
Unknown	4 (7.7)	4 (7.7)	

TABLE 2. Health-Related Variables

	Usual Primary Care	GMA	Applicable Statistic (degrees of freedom), P
	(Mean [SD])	(Mean [SD])	
Height (inches)	70.14 (2.85)	69.38 (2.94)	t(102) = 1.340, P = 0.183
Weight (lb)	230.74 (49.77)	231.49 (39.92)	t(97) = 0.085, P = 0.933
BMI (kg/m ²)	34.49 (11.74)	33.89 (6.31)	t(78) = 0.324, P = 0.746
Diabetes duration (years)	11.17 (8.33)	12.19 (8.35)	t(102) = 0.623, P = 0.571
Alcohol use (n [%])			$\chi^2(1) = 0.122, P = 0.727$
Current user	5 (9.6)	4 (7.7)	
Not current user	47 (90.4)	48 (92.3)	
Total	52 (100)	52 (100)	
Tobacco use (n [%])			$\chi^2(1) = 0.000, P = 1.000$
Current user	15 (28.8)	15 (28.8)	
Not current user	37 (71.2)	37 (71.2)	
Total	52 (100)	52 (100)	

sured within the year were collected and recorded.

Data Analyses

For the first hypothesis, the two cohorts (usual primary care and GMA) were compared with respect to the proportion of patients reaching the study’s target A1C goal of <8%. This goal was based on the Protocol in the Management of Diabetes Patients in Ambulatory Care Setting developed by the VA Loma Linda Diabetes

Research Education and Management Team and consistent with current VA guidelines for diabetes management. Pearson’s χ^2 test was applied to test for significance, with the level of significance set for P = 0.05.

For the second hypothesis, the usual primary care and GMA cohorts were compared in terms of how quickly A1C was reduced from baseline (i.e., when the subjects entered the study). The difference in the A1C change per week between

the two cohorts was computed using generalized estimating equations (GEEs) because GEEs 1) allowed the investigators to compute rates that accounted for correlation of repeated A1C measures of each study patient, 2) allowed flexibility in differences of when A1C levels were measured, 3) accounted for baseline differences in A1C when determining change rates, 4) accounted for differences in the length of time patients participated in the study, and 5) accounted

TABLE 3. Proportion of Patients Who Reached or Did Not Reach the A1C Goal

	Usual Primary Care (n [%])	GMA (n [%])	Applicable Statistic (degrees of freedom), P
Reached goal	10 (19.2)	26 (50)	$\chi^2(1) = 10.876, P = 0.001$
Did not reach goal	42 (80.8)	26 (50)	
Total	52 (100)	52 (100)	

TABLE 4. Mean Baseline A1C Levels

	Usual Primary Care	GMA	A1C Difference
Mean baseline A1C (%)	9.8	9.8	0.0
95% CI	9.5–10.2	9.5–10.2	–0.5 to 0.5
Applicable statistic (degrees of freedom), P			$\chi^2(1) = 0.0, P = 0.95$

TABLE 5. A1C Reduction Rate per Week

	Usual Primary Care	GMA	Rate Difference
A1C reduction rate per week (%)	–0.001	–0.031	–0.030
95% CI	–0.019 to 0.017%	–0.040 to –0.022%	–0.050 to –0.011%
Applicable statistic (degrees of freedom), P	$\chi^2(1) = 0.012,$ $P = 0.912$	$\chi^2(1) = 45.679,$ $P < 0.001$	$\chi^2(1) = 9.019,$ $P = 0.003$

for missing values when patients missed a visit when an A1C measurement was to be made (12,13).

Results

Statistical analysis using Pearson’s χ^2 and *t* test suggested that the usual primary care (control cohort) and GMA (interventional cohort) were very similar with regard to demographic data and health-related factors (Tables 1 and 2).

Hypothesis 1

To test our first hypothesis, we sought to determine whether there was a higher proportion of patients reaching the target A1C goal in the GMA than in the usual primary care group. This hypothesis was accepted given that the data from the usual primary care cohort showed 19.2% of the patients reached the A1C goal, whereas in the GMA cohort, 50% reached the A1C goal (Figure 1). This finding was also significant as measured by Pearson’s χ^2 ($\chi^2 = 10.876, P = 0.001$) (Table 3).

Hypothesis 2

To test our second hypothesis—that participants in the GMA would have a faster A1C reduction rate than those

receiving usual primary care—GEEs provided two sets of numbers. The first set was an estimate of baseline differences in mean A1C levels between the two cohorts. As shown in Table 4, the estimated mean baseline A1C for both the usual-care and GMA cohorts was 9.8%, and there were no statistically significant differences between the two cohorts. The second set was the rate of A1C reduction per week between the two cohorts during the course of the 1-year study period. Estimates of A1C rates of reduction were computed on a total of 104 subjects. Each subject had 2–8 A1C measurements, for a total of 420 repeated A1C results. The A1C values ranged from 5.9 to 17.9%, with a mean of 9.4%.

These data showed that the usual-care cohort had a slow and statistically insignificant rate of decline in A1C (–0.001% per week, $P = 0.912$). In contrast, the GMA cohort had a statistically significant rate of decline in A1C over time (–0.031% per week, $P < 0.001$). The difference in rates of decline between the GMA and usual-care cohorts was statistically significant ($P = 0.003$),

based on a Wald χ^2 test (Table 5). Based on this difference in A1C decline between the two cohorts, a clinically meaningful difference of 0.5% in A1C would be attained in 16.7 weeks (95% CI 10.0–45.5) (14) in the GMA cohort.

Discussion

The GMA model is an innovative approach for delivering medical care to patients with chronic conditions as a solution to current health care limitations. The American Academy of Family Physicians and the Agency for Healthcare Research and Quality have described GMAs as an innovative model to improve outcomes in patients with diabetes (15).

The VA Healthcare System in Loma Linda, Calif., implemented its Diabetes GMA for patients with type 2 diabetes to support PCPs in improving the health outcomes of patients with poorly controlled diabetes. The GMAs support of collaborative practices in primary care are consistent with the Patient-Aligned Care Team principles of enhancing access to care and orienting care to the whole person (16).

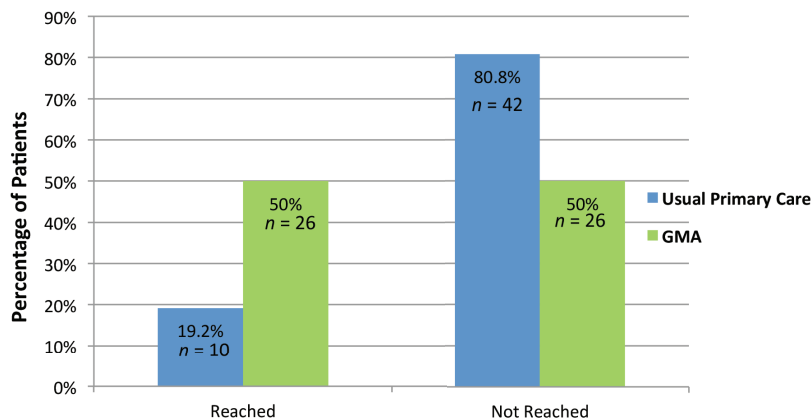


FIGURE 1. Proportion of patients who reached or did not reach A1C goals through either GMA participation or usual primary care.

The results of this study showed that male veterans with poorly controlled type 2 diabetes as indicated by above-goal A1C levels can improve their diabetes control by participating in a GMA. The findings support evidence for GMAs as a useful and effective approach to achieving patient-centered glycemic-control goals in patients with type 2 diabetes in primary care practices.

A number of studies have examined the effect of the group visits compared to usual primary care on glycemic control in type 2 diabetes. These studies have had variable results, and most have been done comparing the A1C decline from baseline to study end.

This study compared both the proportion of patients reaching A1C goals and differences in the rate of A1C reduction of GMA participants compared to those receiving usual primary care. The researchers found that a greater proportion of GMA participants than of usual-care participants reached their A1C goal. In addition, the GMA cohort had a faster rate of A1C reduction than the usual-care cohort.

Limitations

The most important limitation of this study was its design—a retrospective study without randomization. Future studies should have a more robust study design and larger sample size. A

longitudinal, randomized, controlled trial is highly recommended.

Furthermore, the subjects in this study were all male veterans because of the limited number of female veterans seen in both the usual-care visits and the GMAs. Improvement in A1C in the GMA group could also represent a selection bias toward patients who may have been more amenable to change in the group setting.

Generalization of our findings to other centers may be limited because this study was conducted in a single center in a southern California VA Healthcare System. Non-VA PCPs may be reluctant to implement a GMA program because it is a unique form of provider-patient interaction environment and requires a skilled team of professional providers.

We could not describe an optimal profile for patients most likely to benefit from a GMA because some key demographic data such as education level, income, and occupation were not available. In addition, participants’ duration of diabetes, which was calculated from the date of onset as recorded in the EMR, may have been inaccurate because it is based on patient self-report. The benefits of the GMA also may have been secondary to differences in visit frequency and extra visits for GMA participants compared to those patients seen in the usual-care group.

Implications

Findings from this study suggest that the GMA model is a novel intervention for addressing the structural limitations presented by the current health care system. The study demonstrated that the concept of medical management delivered through a group approach has had a positive effect on the management of patients with diabetes.

Group visits also may offer potential benefits to patients with other chronic conditions or in different populations. Thus, GMAs are a potentially valuable option for PCPs to consider in managing chronic medical conditions. Because GMAs have demonstrated improved patient care outcomes, they could be an effective approach in helping primary practices meet clinic performance measures.

If found to be cost-effective, GMAs could be implemented in primary care clinics throughout the country. Finally, the results of this study may provide supporting evidence for further program development to improve the management of patients with diabetes or other chronic health conditions throughout the VA system or at other institutions.

Duality of Interest

No potential conflicts of interest relevant to this article were reported.

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