Do Diabetes Group Visits Lead to Lower Medical Care Charges?

Dawn E. Clancy, MD, MSCR; Clara E. Dismuke, PhD; Kathryn Marley Magruder, PhD, MPH; Kit N. Simpson, DrPH; and David Bradford, PhD

Objective: To evaluate whether attending diabetes group visits (GVs) leads to lower medical care charges for inadequately insured patients with type 2 diabetes mellitus (DM).

Study Design: Randomized controlled clinical trial.

Methods: Data were abstracted from financial records for 186 patients with uncontrolled type 2 DM randomized to receive care in GVs or usual care for 12 months. Mann-Whitney tests for differences of means for outpatient visits (primary and specialty care), emergency department (ED) visits, and inpatient stays were performed. Separate charge models were developed for primary and specialty outpatient visits. Because GV adherence is potentially dependent on unobserved patient characteristics, treatment effect models of outpatient charges and specialty care visits were estimated using maximum likelihood methods.

Results: Mann-Whitney test results indicated that GV patients had reduced ED and total charges but more outpatient charges than usual care patients. Ordinary least squares estimations confirmed that GVs increased outpatient visit charges; however, controlling for endogeneity by estimating a treatment effect model of outpatient visit charges showed that GVs statistically significantly reduced outpatient charges (P <.001). Estimation of a separate treatment effect model of specialty care visits confirmed that GV effects on outpatient visit charges occurred via a reduction in specialty care visits.

Conclusions: After controlling for endogeneity via estimation of a treatment effect model, GVs statistically significantly reduced outpatient visit charges. Estimation of a separate treatment effect model of specialty care visits indicated that GVs likely substitute for more expensive specialty care visits.

(Am J Manag Care. 2008;14:39-44)

For author information and disclosures, see end of text.

During these times of tightly controlled resources, healthcare organizations endeavor to deliver efficient and effective care to patients with type 2 diabetes mellitus (DM) consistent with American Diabetes Association (ADA) standards of care.[1] The group visit (GV) model, initially developed in a managed care setting to improve efficiency and throughput of patients by increasing access and decreasing backlogs of patients awaiting appointments, is promising. Previous studies[2,3] in managed care have shown GVs to be less costly and at least as effective as usual care in terms of quality. However, a recent review of the literature did not find that GVs substantially reduced costs for individuals with DM.[4]

Research on GVs remains in its infancy. Although more than a dozen articles[2,3,5-17] describing GVs have been published, only 6 randomized controlled trials[2,3,5,8,10,16] have been reported on to date. None of the literature regarding GVs for DM has shown notable cost results. Herein, we evaluate whether GVs can lower healthcare utilization outpatient charges for patients with DM. We also investigate whether the lack of statistically significant findings in previous studies could have been due to potential endogeneity of the GV variable in cost models.

METHODS

Study Population

This study was conducted at the Adult Primary Care Center, Medical University of South Carolina, serving approximately 6000 inadequately insured patients (predominantly of minority races/ethnicities) in Charleston. Using previously described procedures,[10-12] patients with uncontrolled type 2 DM, defined as having a glycosylated hemoglobin (A1C) level of greater than 8.0%, were identified and were invited to participate. Willing patients were enrolled in the study after signing institutional review board–approved consent documents.

Research assistants blinded to study assignment contacted patients by mail and telephone for baseline, 6-month, and 12-month data collection, assisting those who needed help. Although patients received modest compensation for transportation and for their time at each data collection point, no patients received compensation for medical care. Visit deposit fees for uninsured intervention patients were decreased such that their annual onsite costs were commensurate with those of uninsured control patients ($180 per year,

In this issue
Take-away Points / p43
www.ajmc.com
Full text and PDF

representing $15 per month for intervention patients and $45 per quarter for ADA guideline–recommended quarterly visits for control patients).

Randomization and Blinding

Following collection of baseline study data, 186 patients were randomly assigned to the intervention state (GVs) or to the control state (usual care), stratified by race/ethnicity and sex. On study completion, data and charges for outpatient visits, emergency department (ED) visits, referral visits, and inpatient stays were blindly abstracted by the outcomes manager for the Department of Medicine from the UB-92 and HCFA-1500 records for each patient.[8]

Intervention

Group visits were modeled after those of the Cooperative Health Care Clinic developed by Beck et al.[2] Participating physicians and nurses received onsite training by a senior internist who previously conducted GV training, and all participating staff members received a 3-hour educational session from the coordinator/trainer for Cooperative Health Care Clinic providers and staff.

Patients randomized to the intervention condition met monthly for 12 months in groups of 14 to 17 patients in the same building as the clinic, with the visits functioning as the patients' primary source of medical care. Physicians provided care for medical needs not amenable to GVs (Papanicolaou smears and rectal examinations) and any care needed between scheduled GVs in one-on-one visits scheduled separately from the GVs.

As with the Cooperative Health Care Clinic model, the schedule provided for each visit to last 2 hours, with 10 to 15 minutes for "warm-up" and socialization, 30 to 45 minutes for presentation of a health-related topic (facilitated by the physician or another team member with special expertise), and 60 minutes for one-on-one consultations with the physician. Physicians performed key preventive measures (eg, pneumonia and influenza vaccinations and foot examinations) at the GVs; mammograms and Papanicolaou smears were performed separately from the GVs. Although study participants guided the GV educational topics, the content included core topics appropriate for patients with DM such as nutrition, exercise, and foot care.

Control Patients

Control patients received care in the clinic as usual, including having access to a dietician and a diabetes educator. The volume of patients at the Adult Primary Care Center, the clinic structure, and the scheduling of patients did not provide for consistency in patients' providers at each visit. Therefore, patients needing to be seen off schedule likely saw providers other than their own.

The clinic staff attempted to follow the ADA standards of care for patients having type 2 DM, with laboratory assessments of A1C levels, quarterly visits (not consistently achievable because of insufficient numbers of providers, staff, and available appointments), ADA recommendations and those of the *Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure*[1,18] for blood pressure control (≤130/80 mm Hg for patients with DM), and US Preventive Services Task Force recommendations[19] for cervical, breast, and colon cancer screening. There were no differences in diabetes-specific treatment between the 2 groups.

Charges

Charges for patients attending GVs and those for patients receiving usual care were identical. Because the institution in our study charges a visit deposit fee for patients without insurance, and because group patients were to come monthly as opposed to quarterly for usual care patients (the minimum recommended by the ADA for patients with type 2 DM), the institution decreased the visit deposit fee for uninsured intervention patients such that it was comparable to what uninsured usual care patients would pay during 1 year. Therefore, neither group paid more in visit deposit fees than the other. Otherwise, charges for the patients were the same, and both groups had to reconcile their accounts accordingly; Medicare, Medicaid, and insured patients did not have to pay the visit deposit fees. All patient charges were based on the time that patients spent with the physician one-on-one, following evaluation and management guidelines. Other healthcare utilization and charges (outpatient visits, ED visits, and inpatient stays) were collected from billing records in the Medical University of South Carolina system.

Procedure

Of 506 eligible patients contacted, 186 met inclusion criteria for the study, agreed to participate, signed informed consent forms, and completed baseline assessments. Reasons for not participating were inability to make the baseline data collection appointment and transportation issues. Of enrolled patients, 96 were randomized to receive care in GVs and 90 to receive usual care for 12 months. During the study, 1 control patient died of unknown causes, and 2 intervention patients died (one of adenocarcinoma of unknown origin and the other of severe electrolyte anomalies due to recently diagnosed DiGeorge syndrome). Of 27 patients who withdrew (13 control and 14 group patients), all but 1 indicated a reason. For these patients, data from the last observation were brought forward for analysis.

Statistical Analysis

Charges (portioned into outpatient visits, ED visits, and inpatient stays) were collected at the end of the study period and included all resources used in the clinic, associated ED, and hospital. Mann-Whitney tests were performed to analyze differences in the mean charges by service (outpatient visits, ED visits, and inpatient stays). If 2 groups tested have the same distribution, the Mann-Whitney test determines the differences in the means and the medians.[20] Separate charge models were then estimated for outpatient visits; ED visits and inpatient stays contained too few nonzero observations to reliably estimate models. Outpatient visit models include controls for payer, Charlson score, and distance to provider, as well as a binary indicator of GV treatment. We included distance to provider in the charge models as binary indicators of whether patients lived within 10, 20, or 30 miles of the provider (with the omitted category being >30 miles) because patients living farther away from the provider may have been more likely to use outpatient services from other providers whose charges were not captured in our data. The Charlson score, a widely accepted measure of illness severity based on *International Classification of Diseases, Ninth Revision, Clinical Modification* diagnosis and procedure codes in claims data, should capture the effects of differences in the severity of illness among patients with DM.[21]

While first estimating the outpatient charge model using ordinary least squares, we also hypothesized that, when unobserved characteristics of the patients correlate with both the intervention (GVs) and the outcome (healthcare costs), a potential problem known as endogeneity can bias ordinary least squares results. In many randomized control trials, treatment assignment, assessment, and termination and dosage are controlled for by the researcher (exogenous). This is necessary for statistical tests of between-group differences in patient outcomes to be unbiased.[22] Patients in our study were randomized to treatment modality (GVs or usual care), but the intensity (dosage) of their treatment is determined largely by the patient, who may choose not to attend all of the GVs or not to stay for the entire duration of the GV. This choice was likely to be affected by the treatment arm to which the patient was randomized, creating endogeneity of the GV variable in the charge model. When endogeneity exists, it can be controlled for by estimating a treatment effect model based on Heckman control function.[23] Endogeneity arises in this case because the treatment (GVs) is correlated with the error term in the outcome (charges) equation. The treatment effect model simultaneously estimates equations for the likelihood of treatment (participation in GVs) and the outcome of the treatment (charges for various health service categories). This simultaneous estimation allows the elimination of endogeneity, although with the trade-off of making the assumption that the error terms are jointly normally distributed. Maximum likelihood techniques were used to estimate the model using STATA 9.0 (StataCorp LP, College Station, Tex), which provides a command (*treatreg*).

To control for potential endogeneity, we reestimated the outpatient charge model using the treatment effect model that simultaneously estimates the likelihood of GV participation and outpatient charges. We initially ran a probit model to determine which factors were likely to affect GV participation and should be included in the GV participation likelihood equation in the treatment effect model. We ran ordinary least squares for the outpatient charge model to do the same for the charge equation in the treatment effect model. We included drive time as a continuous measure in the GV participation part of the model and included payer, Charlson score, and binary indicators for distance to provider in the outpatient charge models. This is a logical specification because patients are likely to be sensitive to distance when choosing an outpatient provider. To further explore our findings relative to outpatient charges in the treatment effect model, we estimated a treatment effect model for specialty care visits.

RESULTS

Mann-Whitney test results show that GV patients had 34.7% higher outpatient expenditures, 49.1% lower ED expenditures, and 30.2% lower total expenditures compared with those of the control group ($P \leq .05$ for all) (**Table 1**). Our initial ordinary least squares with robust standard errors estimates of the unadjusted outpatient charge model showed a statistically significant effect of GV treatment in outpatient care, with a positive marginal effect of $699.52 (**Table 2**). Based on these initial estimates, it seemed that GV treatment increased outpatient costs by $699.52 per patient per year. Although these findings were consistent with previous literature on GVs for patients with DM,[4] we questioned the unbiasedness of the results because of the potential of unobserved patient characteristics to affect adherence to the intervention.

The results from the probit model with robust standard errors of the likelihood of GVs show that only distance to provider was a statistically significant determinant of the likelihood of GVs, with a positive yet extremely small marginal

Table 1. Charges for Services and Number of Specialty Care Visits per Patient per Year*

Variable	Group Visit (n = 96)	Usual Care (n = 90)
Charges for services, $		
Emergency department visits	61.95 (213.57)†	121.81 (259.68)†
Inpatient stays	2152.78 (5158.48)	5577.60 (28 364.67)
Outpatient visits	3654.29 (2874.22)†	2712.49 (2302.09)†
Total	**5869.02** (5986.89)†	**8411.90** (28 623.51)†
No. of specialty care visits	3.33 (3.33)	2.74 (2.89)

*Data are given as mean (standard deviation).
†Significance at $P \leq .05$, Mann-Whitney test for differences in mean.

effect (Table 3). We attributed this unexpected finding to the possibility that patients who live farther from the clinic are getting more "bang for their buck" with GVs than with individual visits and are more likely to adhere to the GVs.

The results for the treatment effect model of outpatient charges are given in Table 2. Although we found a statistically significant and marginally positive effect on GVs in the outpatient cost model that did not correct for endogeneity, the treatment effect model showed a statistically significant marginally negative effect of GV treatment on outpatient charges of $3065.47. To understand how GV treatment reduced outpatient charges, we estimated a treatment effect model of specialty care visits; the results are summarized in Table 4. We found that GV treatment leads to a reduction of 4.15 specialty care visits.

DISCUSSION

In our study of GVs for inadequately insured patients with type 2 DM, we demonstrate that, after controlling for endogeneity of the GV variable, GV treatment statistically significantly lowers outpatient charges by decreasing specialty care visits. This may be because the longer duration of GVs compared with that of a typical primary care encounter gives the provider more time to address process-of-care indicators and screening guidelines than the mean 16.5-minute primary care encounter in the United States.[1] Being seen on a monthly basis provides patients with more frequent contact with their physicians and gives them more opportunities to ask questions, while giving providers more opportunities to address process-of-care indicators in a systematic fashion. In addition, when providers care for patients in groups, they are delivering consistent messages to multiple patients at once rather than giving the same message multiple times.

The results we obtained were all under the control of the provider team. On the other hand, charge outcomes are much more under the control of the patients and depend on their following lifestyle guidelines and adhering to medication regimens. Therefore, it is necessary to control for unob-

Table 2. Outpatient Visit Charges per Patient per Year

	Ordinary Least Squares With Robust Standard Errors		Treatment Effect Model	
Variable	**Marginal Effect**	***P***	**Marginal Effect**	***P***
Payer, $				
Medicare	1029.13	.02	957.18	.02
Medicaid	709.83	.13	536.90	.29
Commercial insurance	526.67	.27	659.96	.34
Charlson score, $	1584.37	<.001	1495.55	<.001
Distance to provider, miles				
≤10	354.88	.52	–38.12	.95
>10 to ≤20	510.66	.18	220.85	.66
>20 to ≤30	1475.69	.03	947.32	.10
Group visit treatment, $	699.52	.048	–3065.47	<.001

served patient characteristics in estimating the charge model. One of the strengths of this study is that we had 6 different provider teams conducting GVs for 12 months. Because our findings are not the result of a single provider, we can be certain that the effect of GV treatment is not provider dependent.

One possible weakness of our study design is that providers participated in both arms of the study; therefore, there may have been contamination in that providers may have adopted some of the GV strategies (eg, GV educational content and methods for fulfilling process-of-care indicators) for usual care patients. We did not randomize providers (which could have been an alternative study design to prevent contamination) because it was unrealistic and unlikely in an office practice that any provider would only deliver care in GVs. Furthermore, we considered it a fair comparison that the same providers treated patients in both arms. It is noteworthy that, after the 12-month formal study period, all of the GV providers and their patients have chosen to continue with GVs.

Another potential weakness of our study is that only local inpatient outpatient and ED charges were captured in our data. If patients sought providers outside of the system, these were not captured. However, we believe that by controlling for distance to provider in the utilization and charge models, this effect has been reduced.

CONCLUSIONS

This cost study of GVs among inadequately insured patients with type 2 DM showed statistically significant reductions in outpatient charges after controlling for endogeneity of the GV variable in the charge model via a treatment effect model. Because the GV model of care is an intervention that depends on patient adherence, we hypothesized and found evidence of endogeneity of the GV variable. Therefore, we believe that future studies on GVs should consider the potential for endogeneity in estimating the effect of GV treatment on healthcare utilization and charges.

Author Affiliations: From the Departments of Medicine (DEC, DB), Health Administration and Policy (CED, KNS), and Psychiatry and Behavioral Sciences (KMM), Medical University of South Carolina, Charleston.

Take-away Points

Various organizations are using group visits for their patients with chronic diseases. The literature to date has not shown this type of healthcare delivery model to lower the cost of care.

- In this study, by estimating a treatment effect model of charges and specialty group visits, we found a statistically significant savings in outpatient charges due to reduction in the use of more expensive specialty visits among a group visit population with diabetes mellitus.
- This information should be taken into account when considering group visits for an organization.

Table 3. Probit Model With Robust Standard Errors of Likelihood of Group Visits

Variable	Marginal Effect	*P*
Payer		
Medicare	0.014	.87
Medicaid	–0.044	.68
Commercial insurance	0.173	.22
Charlson score	0.129	.08
Distance to provider	0.003	.02

Table 4. Treatment Effect Model of Specialty Care Visits

Variable	Marginal Effect	*P*
Payer		
Medicare	0.26	.62
Medicaid	0.42	.49
Commercial insurance	–0.02	.98
Charlson score	1.93	<.001
Distance to provider, miles		
<10	0.19	.81
>10 to ≤20	–0.52	.40
>21 to ≤30	0.766	.28
Group visit treatment	–4.15	<.001

Author Disclosure: The authors (DEC, CED, KMM, KNS, DB) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (DEC, CED, KMM); acquisition of data (DEC, KMM, KNM); analysis and interpretation of data (DEC, CED, KMM, KNS, DB); drafting of the manuscript (DEC, CED, KMM); critical revision of the manuscript (DEC, CED, KMM); statistical analysis (CED, KNS); and obtaining funding (DEC, KMM).

Address correspondence to: Dawn E. Clancy, MD, MSCR, Maybank Internal Medicine, 3312 Maybank Hwy, Ste A, Johns Island, SC 29455. E-mail: dr_c_maybank_im@bellsouth.net.

REFERENCES

1. American Diabetes Association. Standards of medical care in diabetes:2007. *Diabetes Care.* 2007;30(suppl 1):S4-S41.

2. Beck A, Scott J, Williams C, et al. Cooperative health care clinics: a group approach to individual care. *J Am Geriatr Soc.* 1997;45: 543–549.

3. Trento M, Passera P, Borga E, et al. A 5-year randomized controlled study of learning, problem solving, and quality of life modifications in people with type 2 diabetes managed in group care. *Diabetes Care.* 2004;27:670–675.

4. Jaber R, Braksmajer A, Trilling JS. Group visits: a qualitative review of current research. *J Am Board Fam Med.* 2006;19:276-290.

5. Sadur CN, Moline N, Costa M, et al. Diabetes management in a health maintenance organization. *Diabetes Care.* 1999;12:2011–2017.

6. Scott J, Robertson B. Kaiser Colorado's Cooperative Health Care Clinic: a group approach to patient care. *Manag Care Q.* 1996;4:41-45.

7. Trento M, Passera P, Tomalino M, et al. Group visits improve metabolic control in type 2 diabetes. *Diabetes Care.* 2001;24:995-1000.

8. Wagner EH, Grothaus LC, Sandhu N, et al. Chronic care clinics for diabetes in primary care: a system-wide randomized trial. *Diabetes Care.* 2001;24:695–700.

9. Trento M, Passera P, Tomalina M, et al. Lifestyle intervention by group care prevents deterioration of Type II diabetes: a 4-year randomized controlled trial. *Diabetologia.* 2002;45:1231-1239.

10. Clancy DE, Cope DW, Magruder KM, Huang P, Wolfman T. Evaluating Concordance to American Diabetes Association Standards of Care for Type 2 Diabetes through Group Visits in an Uninsured or Inadequately Insured Patient Population. *Diabetes Care.* 2003;26: 2032-2036.

11. Clancy DE, Cope DW, Magruder KM, Salter K, Huang P, Fields AW. Evaluating Group Visits in an Uninsured or Inadequately Insured Patient Population with Uncontrolled Type 2 Diabetes. *Diabetes Educator.* 2003;29:292-302.

12. Clancy DE, Cope DW, Magruder KM, Brown S, Huang P. Group Visits in Medically and Economically Disadvantaged Patients with Type 2 Diabetes and Their Relationships to Clinical Outcomes. *Topics in Health Information Management.* 2003;24:8-14.

13. Scott JC, Conner DA, Venohr I, et al. Effectiveness of a group outpatient model for chronically ill older health maintenance organization members: a 2-year randomized trial of the cooperative health care clinic. *J Am Geriatr Soc.* 2004;52:1463-1470.

14. Bronson DL, Maxwell RA. Shared medical appointments: increasing access without increasing physician hours. *Cleve Clin J Med.* 2004; 71:369-370.

15. Davis KS, Magruder KM, Lin Y, Powell CK, Clancy DE. Trainee Provider Perceptions of Group Visits. *J Gen Intern Med.* 2006;21: 357-359.

16. Clancy DE, Huang P, Okonofua E, Yeager D, Magruder KM. Group visits: promoting adherence to diabetes guidelines. *J Gen Intern Med.* 2007; May;22:620-624.

17. Clancy DE, Yeager DE, Huang P, Magruder KM. Further evaluating the acceptability of group visits in an uninsured or inadequately insured patient population with uncontrolled type 2 diabetes. *Diabetes Educ.* 2007;33:309-314.

18. Chobanian AV, Bakris GL, Black HR, et al. and the National High Blood Pressure Education Program Coordinating Committee. Seventh report of the joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension.* 2003;42: 1206–1252.

19. U.S. preventive services task force. Preventive Services Resource Links. Agency for healthcare research and quality, Rockville, MD. September 2003. www.ahrq.gov/clinic/uspstf/resource.htm. Accessed 15 June, 2005.

20. Hart A. Mann-Whitney test is not just a test of medians: differences in spread can be important. *BMJ.* 2001;323:391-393.

21. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chron Dis.* 1987;40:373-383.

22. Feaster DJ, Newman FL, Rice C. Longitudinal analysis when the experimenter does not determine when treatment ends: what is dose-response? *Clin Psychol Psychother.* 2003;10:352-360.

23. Dor A, Sudano J, Baker DW. The effect of private insurance on the health of older, working age adults: evidence from the Health and Retirement Study. *Health Serv Res.* 2006;41:759-787.

24. Bindman AB, Forrest CB, Britt H, Crampton P, Majeed A. Diagnostic scope of and exposure to primary care physicians in Australia, New Zealand, and the United States: cross sectional analysis of results from three national surveys. *BMJ.* 2007;334:e1261. ■