The Effectiveness of a Community Health Worker Outreach Program on Healthcare Utilization of West Baltimore City Medicaid Patients with Diabetes, with or without Hypertension

Donald O. Fedder, DrPH, MPH;
Ruyu J. Chang, MD, PhD; Sheila Curry, MS;
Gloria Nichols, BSP, PhD

Objectives: Assess impact of community health workers (CHWs) on healthcare utilization of African-American Medicaid patients with diabetes mellitus (DM) with/without hypertension (HTN).

Design: Maryland Medicaid claim files were analyzed to compare utilization of emergency rooms, hospitalization, and costs in a population managed by CHWs (*N*=117).

Setting/patients: Patients were recruited from the discharge rolls of the University of Maryland Medical System (UMMS) and/or the Maryland Diabetes Care Program from March 1992 to June 1994.

Intervention: CHWs alternated weekly home visits and phone contacts to teach patients to understand the need to control their illnesses, to follow both their therapy and behavioral regimens, and to maintain appropriate visits to a primary care practitioner.

Results: Total emergency room (ER) visits declined by 40%; ER admissions to hospitals declined by 33%, as did total hospital admissions; and Medicaid reimbursements declined by 27%.

Conclusions: The CHW program resulted in an average savings of $2,245 per patient per year, and a total savings of $262,080 for 117 patients, with improved quality of life (QOL) indicating cost effectiveness. (*Ethn Dis*. 2003;13:22–27)

Key Words: Community Health Worker, Healthcare Utilization, Case Management

From the University of Maryland, School of Pharmacy, Baltimore, Maryland (DOF, SC); Global Health Economics, Aventis Pharmaceuticals, Bridgewater, New Jersey (RJC); College of Pharmacy, The University of Georgia, Athens, Georgia (GN).

Address correspondence and reprint requests to Donald O. Fedder; 506 West Fayette Street; Suite 201; Baltimore, MD 21201; 410-706-7841; 410-706-0869 (fax); dfedder@rx.umaryland.edu

Introduction

Using community residents with limited training to improve the health and welfare of underserved populations has long been a topic of interest in the healthcare community. Peer health workers have been utilized in developing countries,[1] and the concept may have had its origins with the "barefoot doctors" in the People's Republic of China.[2,3] In the United States, community health workers (CHWs) have been used in promoting prenatal care,[4] hypertension screening and follow-up,[5] and smoking cessation.[6] Indigenous people, familiar with their environment and with firsthand knowledge of the problems of their community are more likely able to counsel and communicate with hard-to-reach patients.[7] Opinions vary as to the value of such social support being used to deal with the physical and emotional consequences of chronic conditions. Some claim that social support represents a valuable adjunct to continuity of medical care,[8,9] while others caution that, although employed widely, the efficacy of such support has not been established. Although health education interventions for diabetic patients have been shown to improve patients' knowledge and some health outcomes,[10–14] no systematic analyses of the utilization of community health outreach programs have been reported. The purpose of this study is to assess the effectiveness of trained community health worker case managers on healthcare utilization of African-American Medicaid patients with diabetes, with or without hypertension, in west Baltimore City.

The CHW Program

In 1991, as a response to the Maryland Medicaid administration's concerns about the escalating numbers of emergency room visits and hospitalizations for preventable complications in patients with diabetes and/or high blood pressure (ie, an insured population), Fedder proposed adapting a third world model as an intervention. With funding from the Maryland Health Services Cost Review Commission, the Office of Community Pharmacy Programs in the School of Pharmacy, University of Maryland, Fedder established the Community Health Worker Outreach (CHW) program. Volunteer CHWs were recruited from the target neighborhoods and trained to serve as patient case managers. They were required to have extensive community experience to demonstrate their commitment to service, and to either reside in, or be able to travel to, the catchment area. Following a thorough interview and review process, CHWs were provided a minimum of 60 hours of training over a 6-month period. They were provided an MTA bus pass and a monthly stipend (from $45 to $75, based on caseload) for incidental expenses incurred. The training sessions were held at the University of Maryland in Baltimore (UMB), and speakers for the training sessions were recruited from the UMB and through the Department of Health and Mental Hygiene Diabetes Control Program. CHWs received training in chronic illnesses, resource identification, and case management. The initial training was 40 hours, and covered many topics related to diabetes (eg, introduc-

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tion, medications, emergencies and complications, glucose monitoring), and to high blood pressure (eg, introduction, medications, referral levels, myths, and misconceptions). CHWs received an American Heart Association certification in the standardized method for taking blood pressure. They received information about medical assistance, Medicaid, pharmacy assistance, and many other resources available to the community served. The CHWs were further trained in outreach and case management strategies, including topics such as telephone outreach, documentation, resource linkages, and goal setting. Following the initial training, CHWs began working with patients under close supervision. Bi-weekly supervision meetings were held in which new patient assignments were given, forms were distributed and collected, and problems addressed. These sessions rapidly developed into something analogous to grand rounds in that patients were presented, problems were discussed, and input was garnered from participants and invited experts. Learning and growth began to take place here. At the initial supervision meeting, each CHW was assigned one or 2 patients. New assignments were added as both CHW and supervisor felt comfortable with the additions, although no more than 10 patients were assigned to any CHW. A total of 68 CHWs were selected and trained over the 3-year period, and 38 were actively involved in providing services to patients from March 1992 to October 1994. All but one CHW were female, with a mean age of 59, and just under 12 years of education.

CHWs contacted patients at least once a week, alternating in-home visits with phone calls. Their duties included linking patients with appropriate primary care and specialty practitioners (eg, ophthalmologist) by assisting in making and keeping appointments; monitoring patients' self-care behaviors (eg, medication taking and dietary intake); monitoring (eg, blood glucose and blood pressure measurement, and diabetic foot inspections) for signs and symptoms of complications; assisting in establishing and/or sustaining Medicaid eligibility if appropriate; and providing social support to patients, their caregivers, and families.

From March 1992 to June 1994, patients were recruited primarily from the hospital discharge rolls of the University of Maryland Medical System (UMMS) and the Maryland Medicaid Diabetes Care Program. A small number of patients were referred by others (healthcare providers and patients). Patients aged 18 years and older, with a diagnosis of diabetes mellitus (DM) and/or hypertension (HTN), were mailed a recruitment letter explaining the program and inviting participation. In order to participate, each patient had to complete an "Interest Form" and return it in the postage-paid envelope provided. Although recognized as a potential barrier to participation, these steps were necessary to protect patient confidentiality. Upon receipt of the response, patients were assigned to a CHW for an initial telephone screening to verify eligibility and to make an appointment for an in-home visit. A key eligibility determinant was an assessment that the patient had the potential to function independently. Patients were excluded if they were incapable of making their own decisions about their health care or if they had other overwhelming medical problems which would make rendering the service insignificant (eg, end-stage condition). As soon as a patient decided to participate, a consent form was signed.

METHODS

Design

This retrospective comparison study explored the effect the intervention had on patients for whom Medicaid data were available for a one-year period prior to participation in the program. The objective of this study, implemented 2 years after the program had started, was to ascertain the effect that trained CHWs had on the quality of life (QOL) and level of healthcare utilization of Medicaid enrollees with DM, with or without HTN. Healthcare utilization was measured for one year prior to the initial contact (minimally, from receipt of the interest form), and then for 1 year following this contact. Therefore, all respondents to the announcement letter who met the eligibility criteria were included in the study. The study cohort consisted of patients with 5 or more CHW contacts during the study period (N=117).

Patient recruitment began in March 1992. Patients were enrolled over a continuous period from March 1992 through June 1993, fixing the study period from March 1, 1991 through June 1994. All eligible subjects were included in the study analyses, except for those 1) not enrolled in the Maryland Medicaid program; 2) who died during the study period; 3) who were not African-American; or 4) who could not be matched to the Medicaid claims data because of missing or incorrect recipient numbers. As soon as a patient decided to participate, a consent form was signed explaining the purpose of the

program, procedure, risk benefit, confidentiality, right to withdraw, and compensation. This study was approved by the Human Volunteers Research Committee at the University of Maryland.

Data Source

The data source for analyzing utilization was the Medicaid Claims Database in the Maryland Medicaid Management Information System (MMIS), managed by the Policy and Health Statistics Administration, Maryland Department of Health and Mental Hygiene.[15] MMIS provides comprehensive detail on all services reimbursed by Medicaid, including ambulatory visits, inpatient days, drugs, and laboratory tests. In addition, MMIS maintains data for all service providers, as well as keeping recipient demographic characteristics in the eligibility files. The files used for the study were the Claims Based Flat Files, which included Claims History Flat Files, Eligibility Flat Files, and Pharmacy History Claims File. These files are abstracted from the fiscal-based, paid claims history files or eligibility master files of the MMIS.

Outcome Measures

The primary outcomes are health resource utilization, with the secondary being quality of life. The primary outcomes measures are: emergency room (ER) visits, ER admissions, total hospital admissions, length of stay per hospitalization (LOS), and Medicaid reimbursement ($) (see Table 2). ER visits were calculated 2 ways: total number of ER visits over the period (ER Visits [all]) and the number of ER visits resulting in a direct admission to the hospital (ER admissions). Number of hospitalizations was calculated by summing the dates for each in-patient admission to a hospital. Length of hospital stay (LOS) was determined by subtracting the date of admission from the date of discharge. Medicaid reimbursements were the charges incurred for both inpatient and outpatient services, excluding outpatient prescriptions. All the measures were annualized (ie, they were computed as means per Medicaid enrollment day, then multiplied by 365 days). Therefore, if a patient had Medicaid coverage for only 300 days, during which time he had 15 ER visits, his mean ER visit per day was 15/300 (0.05) $\times$ 365 = 18.25; therefore, his ER visits were annualized at 18. This methodology estimates the one year use, permitting the evaluation of all patients, regardless of whether they had full or partial Medicaid coverage during the study period.

Analysis Plan

All statistical analyses were performed with the SAS-6 statistical package,[16] with accepted significance level of $P \leq .05$. Two tailed paired *t* tests were used to test the mean differences in healthcare utilization outcomes one year prior to and post CHW program enrollment. Regression methods (eg, analyses of covariance [ACOVA]) were used to assess the effect of variables on healthcare utilization while controlling for the other variables. In this way, the effects of the independent variable on the dependent variable are assessed after controlling for the effects of one or more covariates. In the model used, the changes from pre- to post-utilization measures are dependent variables. The measures of prior CHW program enrollment utilization are considered covariates. Other covariates are age, gender, diagnosis, and their interactions.

RESULTS

Patient Characteristics

Of the 543 persons who returned an interest form, 238 subjects were identified in the Medicaid files who met all inclusion/exclusion criteria. One hundred seventeen patients had 5 or more CHW contacts, thereby qualifying them to be included in the intervention cohort. Table 1 displays the patients' characteristics. Almost 80% were female with a mean age of 57.6 years (range, 14 to 90). The mean number of CHW contacts was 18.2 (range 5–68).

Table 1. Characteristics of the sample

Characteristics	
Number of (*N*)	117
Age (year, mean ± SD)	57.4 ± 12.0
Gender (%)	
Male	26 (22%)
Female	91 (78%)
Diagnosis*	
Diabetes only	10 (8%)
Hypertension only	32 (27%)
Diabetes + hypertension	75 (64%)
Medicaid eligibility days (Means ± SD)	
Pre intervention	350.1 ± 52.3
Post intervention	349.7 ± 56.6
CHW contacts (mean)	18.2
(Range)	(5–68)

* Only 85 persons had a retrievable diagnosis.

Emergency Room Visits

The baseline totals of emergency room visits (Table 2) decreased significantly (approximately 38%) in the second year, while ER admissions (visits resulting in direct hospitalization) decreased by 53% ($P=.02$).

Hospitalizations

The Intervention cohort had a 30% reduction in the mean number of hospitalizations in the second year (from 1.0 to 0.7). No significant main effects of age, gender, diagnosis, CHW contacts and their two-way and three-way interactions were found.

Length of Stay (LOS) in Hospital

The baseline mean hospital length of stay was 6.4 days and increased 5% in the second year (Table 2). However, the distributions of LOS was positively skewed (from 2.9 to 6.8). After logarithmic transformations were performed, the pre/post skewness was reduced to 0.2 and 0.8. Because some of

Table 2. Comparisons of healthcare utilization, one year before and after initial contact

	One Year Before		One Year After		Within Group Change		
Healthcare Utilization Group	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SE**	**Percent**
ER visits (all)	1.49	2.2	0.93	1.8	−0.56	0.2	−38
ER admissions	0.64	1.4	0.32	1.3	−0.32	0.1	−53
Total hospital admissions	0.95	1.5	0.66	1.4	−0.29	0.2	−30
Length of hospital stay	6.35	11.8	6.69	26.2	+0.34	2.6	+5
Medicaid reimbursements (M $)	8266	15	6020	18	−2,246	1792	−27

the observations had a value of zero, a small positive value (0.001) was added to each original value in the distribution so that all values were greater than zero.[17] Transformed data exhibited a 5% decrease in LOS for the cohort (P=.02).

Additional analyses were performed to identify characteristics of the patients (age, gender, diagnosis) and the CHW intervention (number of CHW contacts) which related to the outcomes used in the preceding analyses. No significant main effects of age, gender, diagnosis, or CHW contacts were found.

Medicaid Health Service Reimbursements

The means of Medicaid health service reimbursements were computed for both one year pre- and post-CHW intervention. The mean expenditures for one year after CHW intervention were $8,266. There was a 27% decrease (P=.01) in mean expenditure as compared to expenditure prior to the intervention. Because the distribution was skewed, the mean was not a good indicator of the central tendency of the scores in the distribution, and the median was used for the statistical testing. Square root transformations were performed to reduce skewness. No statistically significant main effects of age, gender, diagnosis, and CHW contact were found after adjustment for covariates, and there were no statistically significant two- or three-way interaction terms.

DISCUSSION

Among the most interesting findings of this study are that emergency room visits and hospitalizations were reduced by 38% and 30%, respectively, resulting in a 27% reduction of Medicaid reimbursement in this patient population. Although *all costs* were not factored in, projecting a caseload of 30 patients, we estimate the gross savings per CHW at $80,000–$90,000 per year. These savings strongly support the value of using peer case managers to deliver health messages and support to an underserved population, as well as validated our conclusion as to the cost effectiveness of the program. If these results are sustained by further study, they indicate a means to generate large scale savings not only for the Medicaid program, but also for other high cost users of health care. Cost savings in this study were calculated using direct costs only.

The objectives of the CHW program were designed to improve patients' health-seeking behaviors (eg, improved compliance with treatment regimens and regular visits to a primary care giver), and to replace more costly ER visits and hospital admissions with regular ambulatory services. ER visits, including those resulting in an admission, declined 38% after one year of CHW enrollment. This decline occurred even though the patients had well-established chronic diseases, the natural history of which would tend to predict steady progression of the disease and deterioration, and increased utilization of high cost services. (This may reflect changes in hospital discharge policies over the study period.) The 53% decrease in the number of ER admissions from one year prior to the CHW intervention to one year after provides further evidence of the effectiveness of the CHW intervention, and supports the hypothesis that consistent contact with a primary care practitioner will result in diminished use of the ER.

The reduction in ER admissions in this cohort indicates more appropriate use of the ER.

As a consequence of the CHW intervention (eg, linking patients with appropriate healthcare providers, monitoring patients' self-care behaviors and signs of complications, helping and monitoring patients' physician appointment keeping), it was expected that this cohort would have fewer hospitalizations. The results support this hypothesis. Patients had a 30% decrease in hospitalizations from one year prior to the CHW intervention to one year after. Based on these findings, it is concluded that the CHW intervention was effective in reducing patient hospitalizations and healthcare expenditures.

The CHW intervention may be effective and useful for people with well-established chronic conditions who are not using a regular source of health care. Such patients can be identified through non-compliance with medication and excessive use of the emergency room due to their uncontrolled disease conditions. They are usually of low socioeconomic status and do not have an appreciation of their own role in controlling their disease. The CHWs would seem ideally suited to communicate empathetically with this difficult patient population, having had similar personal experiences and problems. CHWs can serve as a bridge between healthcare professionals and hard-to-reach patient

populations using existing, available healthcare resources in the current system.

Study Limitations

This study assessed the effectiveness of a program funded to provide service to all eligible patients, and was not designed to be an experiment; therefore, a randomized control trial was not appropriate. Both pre- and post-comparisons were conducted on a group of patients who responded to an offer for free care, therefore being self-selected. Selection bias is a major methodological problem when hospital patients are used in retrospective studies,[18] and certainly cannot be ruled out here. Patients who chose to participate may have perceived the program as more beneficial than did others, thus playing a role in self-selection. The individuals who elected to participate may represent a more highly motivated sample of the diabetic population compared to those who chose not to participate. Since highly motivated subjects would probably be better educated about their diabetes before enrollment compared to a random sample of the diabetic population, this selection bias could have resulted in the recruitment of subjects for whom any form of patient education would have added little to their present knowledge and skill level. In addition, diabetic individuals hospitalized with a diabetes-related condition (particularly an acute complication such as ketoacidosis), or uncontrolled diabetes were more likely to have been identified as eligible to participate than those hospitalized with a condition not overtly related to diabetes. Also, the detection of a significant effect was restricted by low hospitalization rates, and the relatively short follow-up period. Self-selection bias cannot be ruled out, and the changes that occurred may represent regression to the mean or secular trends.

Medicaid eligibility status was a concern in the analysis as well. For example, if a patient lost eligibility for Medicaid benefits during the study, all medical claim information (including the outcomes of study interest) on the patient would cease to be incorporated. In most drug utilization studies, the analyses include only subjects who have coverage during the entire study period. However, to exclude this type of patient would have decreased the power of the study. The problem of Medicaid eligibility change was minimized by applying the method of "pro-rating" described earlier, so that everyone who expressed interest in the program was available to be analyzed. One problem in including all patients is that behavioral and economic status differences between those eligible and those ineligible for Medicaid are ignored.

Since severity of disease is associated with healthcare utilization, many measures have been used to ". . . array patients on a continuum of extent of total disease burden," including patient mix, disease severity assessment, and/or comorbidity assessment.[19] Most instruments have been developed to assess differences in utilization of health care, or differences in mortality.[20] Although mean age and prior hospitalizations of the study populations suggest that both groups had well-established disease, the inclusion criterion that participants be capable of self-care complicates the issue somewhat. Since the CHW and Medicaid databases do not contain sufficient information to assess severity, no valid measures could be applied to this situation, short of reviewing each patient's chart, a task not possible in this study. This is, however, an important issue for future study.

Clinical outcome measures such as glucose level, blood pressure, or preventable complications of diabetes, should be figured into the evaluation of the CHW intervention's effect on diabetic patients. However, due to lack of data, the analyses of these important outcomes were not undertaken.

The 12-month period of the evaluation is relatively short, therefore the long-term impact of the intervention on Medicaid patients is unknown, illustrating the need for longitudinal assessment of this program.

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CONCLUSIONS

This study found the Community Health Worker Outreach intervention to be cost-effective with the targeted, underserved population in Baltimore city. The strategy used existing, available local resources to improve the health of patients and to reduce program costs. Our experience suggests that the intervention materials may not need to be "culturally sensitive"; ie, specially prepared for the audience, as long as the interveners are. Using members of the same or similar community and culture assured a "fit" between the message and the messengers, and the results bear out the strategy's effectiveness. The CHWs, recruited primarily from low economic, African-American ethnic neighborhoods, were seen as trustworthy by their patient/clients and thus were able to communicate meaningfully with them.

Although this study is not necessarily generalizable, its results, when added to those of previously published literature regarding community outreach efforts, indicate that the time has arrived to extend the use of the indigenous health worker case manager model more broadly. Medicaid programs everywhere are concerned with increasing costs, and

most have little potential to keep up with growing demand.[21] Faced with these problems, many are seeking creative ways to monitor on-going programs to ensure effectiveness. The CHW case manager can make a significant contribution to both better health outcomes and lower costs. The evaluation methodology developed here also may be considered as a model for community program evaluation and other observational studies.

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AUTHOR CONTRIBUTIONS

Design and concept of study: Fedder, Chang, Curry, Nichols-English
Acquisition of data: Chang, Curry, Nichols-English
Data analysis and interpretation: Chang, Fedder, Nichols-English
Manuscript draft: Chang, Fedder, Nichols-English
Statistical expertise: Chang, Fedder
Acquisition of funding: Fedder
Administrative, technical, or material assistance: Fedder, Curry, Nichols-English
Supervision: Fedder