

Effect of Third-Party Reimbursement on Use of Services and Indexes of Management Among Indigent Diabetic Patients

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OBJECTIVE — To determine the effect of third-party reimbursement on the use of services and indexes of diabetes-related health management among inner-city diabetic patients.

RESEARCH DESIGN AND METHODS — Adult diabetic patients ($n = 158$; 67% women, 33% men) from an inner-city diabetes clinic were categorized by level of third-party medical coverage: complete reimbursement for all services (full); partial reimbursement (part); and no reimbursement (none). Patients were followed for 13 mo. Use of billable medical services, diabetes clinic visits, emergency room visits, and hospital admissions were recorded. Use of a free, day-time diabetes telephone hot line was also documented. Indexes of diabetes-related health management, HbA_{1c}, blood pressure, and weight were compared from the beginning and the end of the study. Diabetes complications were scored and tabulated.

RESULTS — Univariate analysis showed that patients with full reimbursement were more likely to use services than patients without reimbursement. When the combined effects of reimbursement status, age, sex, type of diabetes, and diabetes complications on use of services were analyzed together in a multivariate analysis, complications was the best predictor of admissions to the hospital and whether a patient called the hot line. IDDM patients and patients with full reimbursement were most likely to have an emergency room visit. Age was the best predictor of diabetes clinic attendance. No difference was noted in blood pressure or weight among the reimbursement groups at the beginning and end of study. However, the trend was toward ($P < 0.05$) an increase in HbA_{1c} in the none group.

CONCLUSIONS — Among inner-city diabetic patients, multiple factors influence use of medical services. Indigent diabetic patients without third-party reimbursement were observed to have a rise in HbA_{1c}. These factors should be taken into consideration when planning strategies to prevent diabetes complications and the most effective allocation of health-care resources.

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IDDM, INSULIN-DEPENDENT DIABETES MELLITUS; NIDDM, NON-INSULIN-DEPENDENT DIABETES MELLITUS; BP, BLOOD PRESSURE; sBP, SYSTOLIC BLOOD PRESSURE; dBP, DIASTOLIC BLOOD PRESSURE; ANOVA, ANALYSIS OF VARIANCE.

Diabetes is a chronic disease that requires a long-term commitment and active participation on the part of the patient to diet, exercise, medicate, self-monitor blood glucose, prevent, and manage acute and chronic complications, as well as psychosocial adjustment to the disease process. The diabetes clinic serves a vital function by providing a setting where positive behavior in diabetes self-management can be reinforced together with medical supervision. A patient's active participation in self-care is enhanced by ongoing interaction with a specialized team of health-care providers, who monitor the patient's progress, and detect and treat acute and chronic complications (1–3). Lack of access to medical services, therefore, might have a detrimental impact on the adherence to self-management of diabetes and health.

Low-income, inner-city diabetic patients have financial constraints on their use of medical services. The purpose of this study was to assess the impact of third-party reimbursement status on the use of medical services by low socioeconomic inner-city diabetic patients, as well as indexes of diabetes-related health status, such as weight, HbA_{1c}, and BP. We hypothesized that patients who had full access to medical services would have better diabetes-related health management indexes than those who were restricted because of lack of third-party reimbursement. We also hypothesized that diabetic patients lacking third-party reimbursement for billable medical services might compensate by increased use of free medical services. The influence of reimbursement was analyzed together with age, sex, diabetes type, and diabetes complications.

RESEARCH DESIGN AND METHODS

The available study population consisted of 173 diabetic patients enrolled for at least 1 yr before the onset of the study in the adult outpatient diabetes clinic at the University of Mary-

land Hospital. Most of the patients resided in low socioeconomic neighborhoods surrounding the clinic. Using the 1992 Baltimore City census tract profiles, the estimated average household income for our patient population ranged from \$5,000–14,000/yr (4). For the study period, patients who died ($n = 6$), transferred to other clinics ($n = 3$), and lost to follow-up ($n = 6$) were excluded from the analysis. Thus a total of 158 subjects were analyzed in this study for the 13-mo period. Information about the patient's third-party reimbursement status and health insurance was obtained from the hospital registration records. Patients were categorized into three reimbursement patterns:

1. Full coverage (full): Patients covered in full by medical assistance for all medical care, medication, blood glucose monitoring material, and transportation.
2. Partial coverage (part): Medical care is partially covered by Medicare or private insurance. Patients may have to pay for medication and blood glucose monitoring material. If these patients qualify for pharmacy assistance, certain medications are covered; but patients have to pay for home glucose monitoring materials and syringes. No coverage is provided for transportation.
3. No coverage (none): Patients are not covered by Medicare, Medicaid, or other third-party reimbursement and therefore, are financially responsible for all charges out of pocket (e.g., clinic visits, emergency room visits, hospital admissions, medication, and transportation to medical facilities).

The diabetes clinic team consists of two faculty physicians, three fellows in endocrinology, two residents, a diabetes nurse specialist, and a dietitian. At each visit patients are seen by the diabetes nurse specialist, a fellow, or resident, as well as the attending faculty physician. Patients are routinely scheduled every 3

mo for follow-up as part of the ongoing clinic protocol. Patients are contacted by telephone the day before their clinic appointment and reminded of their scheduled clinic visit. Patients who miss their scheduled appointments are rescheduled by mail. Data on clinic visits, BP, weight, and HbA_{1c} for each participating patient on their scheduled visit were collected for 13 mo (1 January 1989–31 January 1990).

A diabetes hot line allowed direct access to the diabetes nurse specialist free of charge, between 0730 and 1600 Monday through Friday for management of any problem. The date, time, and reason for each hot-line call were documented. This hot line has been in service since 1983. At the beginning of the study all patients were given an identification card with the hot-line telephone number.

At the end of the study period, the number of hospital admissions and emergency room visits for any reason was obtained for each patient from the hospital computer registration of the University of Maryland Medical System. HbA_{1c} was measured by using the Isolab Fast Hemoglobin Test System (Isolab, Inc., Akron, OH). Normal range of values is 5.5–8.5%. Patients' charts were reviewed and abstracted for diabetes complications by one author (B.N.) according to chart notes.

A scoring system was used to tabulate complications. Retinopathy: 0, no retinopathy; 1, background retinopathy; 2, proliferative retinopathy. Nephropathy: 0, normal creatinine (26.5–176.8 μM); 1, serum creatinine $>176.8 \mu\text{M}$ $<442 \mu\text{M}$; 2, serum creatinine $>442 \mu\text{M}$. Neuropathy: 0, no complaints, no findings on physical exam; 1, presence of polyneuropathy if at least one of the following criteria was present: 1) symptoms of numbness, dysesthesia and paresthesia, pain, and hypersensitivity to touch, 2) decreased or absent tendon reflex, and 3) signs of sensory loss; 2, two or more of the aforementioned criteria and use of medication. Macrovascular disease: 0, no

signs or symptoms or history of cardiovascular disease; 1, history of angina confirmed by physician and documentation of intermittent claudication; 2, catheterization shows 70% occlusion or myocardial infarction, stroke, and amputation of limb.

Patients with no complications received a score of 0; the maximum score was 8.

Statistical analysis

Distribution of services used was skewed by the large percentage of patients who did not use this particular service. To analyze influences on use effectively, a two-step strategy was used. First, patients were divided according to whether they had ever or never used the patient service during the study period. The influence of use versus nonuse of the particular service was then analyzed by logistic regression (5). The effect of age, complications, reimbursement status, sex, and type of diabetes on use versus nonuse was evaluated for each service. The model included all predictor variables.

In the second step, only patients who had used a particular service were analyzed in a general linear model regression (6). Again, the influence of the variables reimbursement status, sex, diabetes type, complications, and age were analyzed on the number of times the service was used.

Weight, HbA_{1c}, sBP, and dBP, as objective criteria of health status, were also analyzed. Influence of reimbursement groups on these variables was examined from the first and last 3 mo of the study. In cases where multiple values for a variable occurred during the time period considered, the mean value was used for analysis. The difference in these variables from the beginning to the end of the study period was also analyzed by ANOVA. A result was considered statistically significant at the 0.05 level. Results are presented as means \pm SD.

Table 1—Patient profile

Reimbursement groups	Age (yr)	Sex		Race		Type of diabetes	
		Women	Men	Black	White	IDDM	NIDDM
Full	50.2 ± 14.0	48	15	55	8	12	51
Part	58.3 ± 14.9	43	26	64	5	8	61
None	48.9 ± 14.3	15	11	24	2	5	21
Total		106	52	143	15	25	133

Data for age are means ± SE.

RESULTS

Characteristics of study population

The service use of 158 patients was analyzed in the study. Demographic characteristics and third-party reimbursement for the patient group are presented in Table 1. Patients who had all health care completely paid for by third party were classified as full (n = 63, 40%), patients who had partial third-party support were classified as part (n = 69, 44%), and patients with no third-party support were classified as none (n = 26, 16%). Patients in the part group tended to be older than the patients in the two other groups (P < 0.05). NIDDM patients differed from IDDM patients only in average weight (87.7 ± 20.9 vs. 65.5 ± 12.3 kg, respectively, P < 0.0001). Distribution of diabetes complications for the reimbursement groups is presented in Table 2. The full pay group had the largest percentage of patients with a high level of complications.

Table 2—Percentage of patients in each reimbursement group with complications

Complications (score)	Reimbursement groups		
	Full	Part	None
None (0)	16	24	39
Mild (1–3)	42	57	44
Severe (>3)	42	19	17

Variables influencing use of service

The average number of visits or encounters for each service by reimbursement group is presented in Table 3. Without controlling for other predictors patients in the full group tended to have greater use of services than patients in the none group. Table 4 shows the distribution of patients and the number of diabetes clinic visits by reimbursement groups. Here, again, patients in the full group were more likely to have multiple clinic visits.

The combined impact of age, sex, reimbursement group, diabetes type and complications, and whether patients ever used or never used a service was evaluated. Table 5 shows the variables that were found to have a significant influence on whether or not a patient ever or never used the service during the study period. No relationship was found between BP level or HbA_{1c} with use of services within the

Table 3—Use of services by reimbursement groups

	Reimbursement groups		
	Full	Part	None
n	63	69	26
Kept appointments*	6.4 ± 3.6	4.7 ± 2.9	4.7 ± 3.0
Scheduled appointments kept (%)	68.7 ± 22.7	67.1 ± 23.1	60.1 ± 24.9
Hospital admissions per patient*	0.5 ± 0.9	0.1 ± 0.3	0.2 ± 0.5
Emergency room visits per patient*	1.1 ± 1.7	0.7 ± 1.6	0.6 ± 1.2
Hot-line calls per patient*	1.7 ± 3.7	1.8 ± 4.6	0.8 ± 1.7

Data are means ± SE.

*The average number is represented.

Table 4—Frequency of visits to diabetic clinic by reimbursement group

n	Reimbursement groups		
	Full	Part	None
Number of visits (%)			
0	0	3	4
1–5	40	59	54
6–10	54	35	35
11–15	4	3	8
>15	2	0	0

Numbers represent the percentage of total visits for that reimbursement group.

groups. For patients who ever used a service, the degree of use was analyzed. The number of admissions was significantly related to severity of complications (P < 0.0012). The rate of kept appointments increased with patient age (P < 0.03). None of the variables examined were predictors of the degree of use for emergency room visits or hot-line calls.

Impact of reimbursement group on indexes of health

The mean weight, HbA_{1c}, sBP, and dBP at the beginning and end of the study are presented in Table 6. No significant difference was noted in mean values for these variables between the reimbursement groups. The difference of the indexes from beginning to end of the study

Table 5—Factors predicting whether patients ever or never used medical services

Service	Significant factors	P value	Comment
Hospital admissions	Complications	0.0004	More complications→admissions
Emergency room visits	Reimbursement group	0.04	Full coverage→more likely to visit emergency room
	Diabetes type	0.03	IDDM>NIDDM
Hot-line calls	Complications	0.02	More complications→more likely to call hot-line
Diabetes clinic	Age	0.03	Older patients more likely to have kept appointments

For details of analysis, see text.

was evaluated in patients where paired data was available. No significant statistical difference by paired test was found for any of the health indexes according to reimbursement group, with the exception of an increase in HbA_{1c} from beginning to end of the study in the none group compared with the other groups ($P < 0.04$). However, it should be pointed out that the total number of pairs available for analysis was small ($n = 45$), and only 4 patients had paired data from the none group.

CONCLUSIONS— The effect of reimbursement on use of medical services by adult diabetic patients in the inner city has not been previously studied. The results of our study indicated that use of the diabetes clinic and other hospital services by inner-city diabetic patients is influenced by several factors. Patients with full third-party reimbursement were more likely to use services than patients with no third-party support. However, patients in the full group were also more likely to be affected by multiple complications of diabetes. Therefore, a more comprehensive multivariate analysis was performed to assess the influence of reimbursement status, age, sex, diabetes type, and diabetes complications. In this multivariate analysis the chance of being admitted to the hospital was increased by the presence of diabetes complications. IDDM patients and patients with complete third-party coverage were more likely to have an emergency room visit. Patients with complications were more likely to call the free

hot-line service at least once. The most important factor predicting whether or not a patient would attend a diabetes clinic was age, with older patients more likely to keep appointments than younger patients. Thus, in the multivariate analysis reimbursement status appeared only to play a role in whether a patient visited the emergency room. Poorly insured patients were less likely to have an emergency room visit.

For patients who had used a service one or more times, again complications remained the best predictor of the number of hospital admissions, and age the best predictor of rate of keeping diabetes clinic appointments. None of the other variables had an effect on the number of emergency room visits or number of hot-line calls. These findings are somewhat different from the results of previous studies in nondiabetic subjects, where it was reported that overall use of health services was inversely related to the out-of-pocket costs to the patient (7–9). These studies did not analyze specific services as in this study, but overall use. Nor were the previous studies adjusted for diagnoses or degree of complications. Gravdal et al. (10) explored use of medical services by hypertensive patients who had three payment mechanisms: public assistance, a health maintenance fee, and fee for service. They found lowest use by fee-for-service patients and highest use by patients on public assistance. When controlled for illness severity, Gravdal et al. also demonstrated that number of chronic diseases was directly related to use of service.

We found a strong relationship between increasing age and diabetes clinic attendance. Factors associated with increased use of medical service by diabetic patients with age may be related to a progressive decline in glucose tolerance and increased perceived vulnerability (11,12). Correlation of age with increased use of services has also been reported previously in patients with diagnoses other than diabetes (8,9). Advancing age, low self-perception of health status and increased numbers of self-reported health problems are correlated with higher use rates of medical services (13,14).

It was anticipated that patients without any third-party reimbursement might compensate by increased use of a free service instead of paying out-of-pocket for clinic visits. Our data did not support this hypothesis. Of those patients without third-party reimbursement (none), only 23% of the patients ever used the free telephone hot line compared with 25% for partial coverage and 28% for full coverage. Except for complications, no other factor was predictive of whether or not a patient would call the hot line. It is also possible that patients without complications did not perceive the hot line as an alternative for other services.

Several studies have reported a worsening of diabetes control for infrequent attenders of diabetes clinics (15,16). In one study, the effect of termination of medical assistance on patients with hypertension and diabetes was examined, and revealed deteriorating BP and blood glucose levels during a 6-mo period for the group without

Table 6—Average BP and HbA_{1c} for reimbursement groups at beginning and end of study

Variable	n	Reimbursement groups		
		Full	Part	None
sBP				
Beginning of study	57	140.1 ± 19.5	56 136.9 ± 17.8	23 137.0 ± 21.0
End of study	46	143.8 ± 25.0	38 138.9 ± 18.8	15 137.7 ± 26.6
dBp				
Beginning of study	57	83.3 ± 9.8	56 83.1 ± 7.9	23 83.8 ± 11.3
End of study	46	83.0 ± 12.0	38 83.7 ± 8.8	15 86.9 ± 12.8
HbA _{1c}				
Beginning of study	48	10.7 ± 2.8	53 10.3 ± 2.8	17 9.4 ± 3.2
End of study	23	10.6 ± 2.7	25 10.0 ± 2.3	5 11.7 ± 5.0

Data are means ± SE.

third-party reimbursement (17). In this study, no difference was noted in diabetes-related health indexes (HbA_{1c}, weight, and BP) between reimbursement groups at the beginning or end of the observation period (unpaired data). However, a trend was detected for worsening of HbA_{1c} (paired samples) from the beginning to the end of the study for those patients completely without third-party reimbursement ($P < 0.04$). Note that paired data for HbA_{1c} was only available from a small subgroup ($n = 45$) of the total clinic population. A longer period of observation and a protocol that would include a methodology for obtaining samples for HbA_{1c} from all patients during the study period could clarify the impact of third-party reimbursement on the health status of indigent diabetic patients. Future studies may be enhanced by a data-retrieving method of patient use of alternative facilities in the community.

These findings suggest several areas for evaluation of health services for indigent diabetic patients. Indigent diabetic patients who already had complications of diabetes were more likely to have complete third-party reimbursement to cover medical services. Patients with complications and increasing age are important

factors that increased use of services. Patients without third-party reimbursement were observed to have an increase in HbA_{1c} that might lead to diabetes complications with time. Thus, prevention of diabetes complications among indigent diabetic patients may involve innovative programs targeted at younger diabetic patients without third-party coverage.

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