Expenditures for ambulatory episodes of care: The Michigan Medicaid experience

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It is widely accepted that ambulatory care furnished in hospital outpatient department (OPD) settings is more costly than similar care furnished in office settings, but few researchers have explored whether practice patterns differ between the two settings. Differences in practice patterns may account for differences in the overall cost of care associated with these settings. Diagnosis-specific episodes of care were used to compare the costs of treating disease episodes in OPDs and offices. The findings suggest that OPD care is more costly not only because of price, but also because continuity of care is less common and the likelihood of hospital admission is substantially greater.

Background

It is nearly an axiom of health services research that hospital-based outpatient department (OPD) care is more expensive than ambulatory care rendered in a physician's office. The average cost of an OPD visit is substantially higher than the average cost of a visit to a nonhospital ambulatory care facility, and this cost differential has grown considerably since the early 1970s (Altman and Socholitzky, 1981; Manheim and Friedman, 1982; Fleming and Jones, 1983; Aucona-Berk and Chalmers, 1986).

Part of the reason for the higher cost of OPD care is that it has generally been reimbursed on a cost basis, but physician reimbursement has been constrained by fee screens. Moreover, hospital outpatient departments are inherently more costly than physicians' offices because accepted accounting principles make OPDs bear a share of the costs of hospital physical plants, diagnostic services, and specialty care that is not available in most other ambulatory care settings. Finally, conventional wisdom holds that OPD charges are higher than those of physicians in private practice, because OPDs treat a more complicated case mix.

Despite the high level of interest in ambulatory care expenditures and a general consensus that hospital-based ambulatory care is more costly, past comparisons of spending for ambulatory care in hospital and nonhospital settings have been flawed. These studies typically compared expenditures per visit in the two settings without considering the total expenditures required for an episode of care. Most of these studies have also failed to control for case mix in a meaningful fashion. For example, some studies have considered differences in case mix only at the major diagnostic category (MDC) level, and few have considered differences in severity of illness within diagnoses.

Other research has examined the costs associated with hospital care generally, and has related these costs to the incentives and fee structures that develop when hospital-based ambulatory care is reimbursed on the basis of cost (Berkson, Barrett, and Reinhold, 1981; Manheim and Friedman, 1982). These studies have documented that fees are higher in hospital ambulatory settings and that the rate of increase in spending for hospital-based ambulatory care has exceeded the rate of increase in spending for nonhospital ambulatory care.

These studies also examined the late 1970s trend toward furnishing more ambulatory care through hospital OPDs. Private foundations and the Federal Government sought to facilitate access to medical care for inner-city residents while emphasizing primary care in residency programs. These goals fostered an expansion of hospital-based clinics in central cities, and residents often perceived the quality of care at these clinics as superior to that available at other neighborhood offices and clinics.

This body of literature, as in the studies that focused on the visit as the unit of analysis, does not generally consider variations in case mix or resource consumption during the course of a disease episode. If patients treated in hospitals comprise a more severe case mix, then the higher costs of outpatient hospital treatment may well be justified. Similarly, if higher expenditures per visit are offset by fewer visits per disease episode, then the hospital setting may offer a cost-effective treatment alternative despite higher per-visit expenditures.

Marsha Gold (1981a) addressed these issues by constructing episodes of care for each of six tracer diagnoses, and by comparing resource consumption in hospital-based and freestanding clinics. Data were collected from a health maintenance organization (HMO), and a relative value scale was used to approximate the levels of resource consumption in the two ambulatory care settings. Little difference was found in resource consumption between hospital-based and freestanding clinics.

Gold's methodology is ideal for distinguishing the true costs of care in alternative settings, but the research focused on hospital-based and freestanding clinics operated by an HMO. The financial incentives in an HMO presumably foster similar concerns about the cost of treatment, whether the care is furnished in a hospital or clinic setting. Although the study explores whether the availability of sophisticated equipment and services stimulates their use, a more

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important question in the fee-for-service (FFS) environment is whether the different financial incentives of the reimbursement system foster different levels of resource consumption in the two settings.

Hospitals with low occupancy rates and high levels of staffing and capital investment may be tempted to expand ambulatory services. As with any FFS provider, the hospital will benefit from the provision of additional services as long as the reimbursement system covers the marginal cost of providing these services. As mentioned previously, Medicare and Medicaid have typically reimbursed hospitals on the basis of their costs prior to 1983.

Physician payment, on the other hand, has generally been regulated by a restrictive fee schedule or screen that is not directly related to costs and is subject to greater control by payers. These restrictions, imposed by the Medicare and Medicaid programs, discourage some physicians from participating (Sloan et al., 1977; Garner et al., 1978), and there is evidence that participating physicians respond by increasing the volume of services they provide (Gabel and Rice, 1985; Holahan and Etheridge, 1986).

Apart from reimbursement differences, there are at least two other aspects of ambulatory care in hospital and office settings that may affect program expenditures: continuity of care and the probability of admission to the hospital. It is widely accepted that having a regular source of care is an important component of high-quality care, but knowledge about the relationship between continuity of care and levels of program spending is limited. Some State Medicaid programs include "lock-in" provisions whereby high users are assigned to a primary physician. This primary physician is intended to play a "gatekeeper" role in controlling the patient's use of medical services.

"Gatekeepers" are intended to control utilization, but savings might also result from continuity of care that develops naturally between patients and providers. An ongoing relationship between patient and physician tends to increase the physician's understanding of the patient's medical needs and reduce the duplication of patient medical histories, physical examinations, diagnostic tests, and pharmaceutical prescriptions that can occur when patients seek care from multiple physicians. Many of these same benefits might also be realized when a patient sees multiple physicians at the same treatment facility. When all of the care is provided at the same facility, each physician has access to a centrally maintained medical record.

Although many patients use hospital OPDs as their regular source of care, ambulatory patients in this setting are less likely to receive the benefits of an ongoing relationship with a single physician. OPDs maintain ongoing patient records, but the likelihood of seeing the same physician on repeat visits is often low because of the manner in which these facilities are staffed. There may also be high turnover of physicians in these settings, particularly in those hospitals that offer residencies.

Yet another aspect of ambulatory care that influences overall expenditures for patient care is the probability of admission to a hospital. Physicians are the primary decisionmakers with respect to hospital admission, and it is typically in the ambulatory setting that patients make initial contact with physicians. If physicians in hospital outpatient settings are more inclined to admit patients, then the cost of this additional inpatient care may be a significant hidden cost associated with hospital-based ambulatory care.

A second article by Marsha Gold (1981b) explored this issue in an HMO and found that hospital-based internists were more likely to admit patients than were internists in freestanding clinics. Fleming and Jones (1983) found slightly higher odds of admission for Texas Medicaid patients whose primary source of care was a hospital outpatient setting, but the case-mix controls used in their study were minimal. Held and Swartz (1983) found that California Medicaid patients whose regular source of care was an OPD setting were much more likely to be admitted, but the differences disappeared when pregnancies and deliveries were excluded from the analysis.

To compare total expenditures for ambulatory care furnished in hospital and nonhospital settings, it is necessary to compensate for potential differences in case mix and compare entire episodes of care. To understand the causes of any expenditure differentials, it is essential to consider site-related differences in continuity of care and probability of admission to a hospital.

Data and methods

The Michigan Medicaid claims files, compiled under the Health Care Financing Administration's Medicaid Tape-to-Tape project, furnish an excellent opportunity to examine these issues and avoid some of the shortcomings of previous studies. These claims files furnish a comprehensive account of all medical care furnished to the Michigan Medicaid population, along with diagnostic detail on physician and hospital claims. This comprehensive information allows construction of diagnosis-specific episodes of care for both hospital-based and office-based care. Thus, we can examine not only the cost of ambulatory care, but also the continuity of care, probability of hospital admission, and a variety of other dimensions that might distinguish ambulatory care in hospital and nonhospital settings.

Ambulatory treatment episodes associated with six diagnoses common in the Aid to Families with Dependent Children (AFDC) population are examined in this article. For AFDC children, the diagnoses include otitis media, gastroenteritis, and pneumonia. For AFDC adults, they include acute pharyngitis, urinary tract infection, and essential hypertension. The use of treatment episodes allows us to identify all of the expenditures associated with each occurrence of illness. The use of specific tracer diagnoses in

constructing episodes helps compensate for case-mix differences that may exist between OPDs and physician offices.

Although the treatment episode is conceptually straightforward, implementing the concept requires a mix of clinical judgments and simplifying assumptions. For purposes of this study, a treatment episode begins on the date a tracer diagnosis first appears on an ambulatory care claim and includes all care delivered during the diagnosis-specific treatment interval. To ensure that each treatment episode represents a discrete episode rather than a composite of two episodes, we required that each new episode follow a "clean" period during which the tracer diagnosis did not appear on an ambulatory claim for that patient.

Treatment intervals for each of the six tracer diagnoses were determined by a physician with extensive experience in utilization review. This physician was asked to specify an upper limit for the number of days needed to treat each condition. Then 50 percent was added to the number of days specified for each condition to ensure that treatment associated with even the most severe episodes would be included. Final treatment intervals ranged from 10 to 40 days for the five acute conditions covered in this article. Essential hypertension was also included, and the 6-month treatment interval for this condition reflects its chronic nature. All care delivered during these diagnosis-specific periods was included in calculating utilization and expenditure summary records for each episode of care. Table 1 displays the ICD-9-CM diagnosis codes, treatment intervals, and clean periods used in constructing treatment episodes for each of the tracer diagnoses.

The Michigan Medicaid claims used in this study were taken from calendar years 1981 and 1982. All treatment episodes began during the period July 1, 1981, to June 30, 1982. This allowed compilation of "prior use" profiles for the 6-month period preceding each episode and avoided the potential confounding influences of reimbursement changes that occurred in the Michigan Medicaid program late in 1982.

Table 1

Tracer diagnoses and associated ICD-9-CM codes, treatment intervals and clean periods

Diagnosis	ICD-9-CM codes	Treatment intervals	Clean periods
AFDC adults			
Acute pharyngitis	462	10 days	15 days
Essential hypertension	401	180 days[1]	30 days
Urinary tract infection	599	40 days	45 days
AFDC children			
Otitis media	381-382	20 days	30 days
Gastroenteritis	558, and 009.0-009.1	10 days	15 days
Pneumonia	480-486	20 days	30 days

[1]Because hypertension is a chronic medical condition, the associated utilization and expenditures occur over a lengthy treatment interval. The 6-month treatment interval is intended to capture the full range of services need to treat this illness.

NOTES: ICD-9-CM is *International Classification of Diseases, 9th Revision, Clinical Modification*, 1980. AFDC is Aid to Families with Dependent Children.

SOURCE: McDevitt R: Protocols developed with assistance of physician and nurse consultants, SysteMetrics, Washington, D.C., 1987.

A variety of techniques to control for possible case-mix differences between hospital OPD and physician office settings were used. First, the use of diagnosis-specific treatment episodes ensures that patients treated in the two settings were diagnosed as having the same condition. Second, episodes with more than $500 in spending for conditions not related to the tracer diagnosis were excluded from the analysis to reduce the potential influence of comorbidities. (See the "Technical note"). The threshold was $1,500 for essential hypertension in recognition of its 180-day treatment interval. Third, total expenditures in the 2-month period preceding each episode were used as a proxy measure of health status. The 2-month measure of prior expenditures was believed to be a better proxy for health status at the time of the treatment episode than a measure based on a longer period. Fourth, prescription drugs used in the treatment of hypertension were identified, and the number of such prescriptions associated with each episode of essential hypertension was used as an indication of the severity of this condition. Fifth, demographic variables (age, race, and sex) were included in the multivariate model for expenditures.

Finally, episodes with a hospital stay were dropped from the regression analysis of total expenditures per episode, but other sections of the analysis include such episodes. Inclusion of hospital stay episodes allows us to examine hospitalization as an outcome variable and assess the full costs of treatment episodes initiated in outpatient settings. Their inclusion is based on the assumption that we have compensated sufficiently for potential case-mix differences between the two settings. Exclusion of these episodes allows for a comparison of OPD and office treatment costs based on an alternative assumption that differing admission rates in the two settings reflect differences in severity of illness rather than differences in practice patterns.

Classification of treatment episodes by site of care requires a classification rule for episodes that include care delivered in both OPD and office settings. The rule used in this study was to define all episodes according to the site of the initial visit for the tracer condition. Thus, some episodes in the OPD category include one or more visits to a physician's office, and some episodes in the physician office category include one or more visits to an OPD.

Continuity of care was calculated in the following manner. For each ambulatory patient, claims in the 6-month period preceding the episode were examined to determine the percentage of visits that were to the provider seen on the initial visit of the treatment episode. A "provider" is defined in terms of a unique provider number (i.e., health care facility). For example, a hospital OPD would appear as a single provider, and an individual physician in private practice would also appear as a provider. Patients

with no visits in the 6-month period preceding the episode were assigned the group mean for patients with the same tracer diagnosis. This seemed more reasonable than assigning a percentage of zero simply because the patient had no visits during this period. Such patients may or may not have a regular source of care.

McCall and Wai (1983) found that elderly Medicare users in Colorado used fewer services during the winter than at other times during the year. They attributed this finding to a likely decrease in consumer-induced demand during the inclement winter months. The multivariate models constructed for this study include dummy variables for the calendar quarter in which the episode of care began. These variables were included in recognition that seasonal fluctuations in consumer-induced demand may differ for patients treated in OPD and office settings.

Limitations

Despite the wealth of detail recorded in Medicaid claims data, this study has limitations in the following areas:

- Associating services with diagnoses.
- Classifying the site of care.
- Measuring continuity of care.
- Measuring health status.
- Distinguishing price from quantity of services.

Associating services with diagnoses is not generally a problem for physician services and hospital inpatient services. These claims record a primary (and sometimes a secondary) diagnosis along with the procedure code. The problem arises with claims that do not include a diagnosis code. Laboratory, radiology, pharmacy, durable medical equipment, and ambulance claims do not include a diagnosis. Although physician and hospital inpatient claims can be easily identified as "related" or "unrelated" to a particular tracer condition, other claims are impossible to classify without clinical judgments concerning each service.

Rather than undertaking such a time consuming and subjective effort, we simply included all services delivered during the treatment episode. Services were then classified as "related," "unrelated," or "other," and episodes with unrelated expenditures greater than $500 were excluded from the study. Thus, it is likely that many of the included episodes retained some treatment for comorbidities, but episodes with high spending for unrelated conditions were excluded. (See the "Technical note.")

Classifying the site of care is a conceptual problem when the episode includes care delivered in more than one setting. The provider information on Medicaid claims is adequate to identify and exclude episodes treated in both OPD and office settings, but this would defeat the purpose of an episode-based analysis. An initial visit to an office-based physician might precipitate a visit to a hospital OPD where more elaborate diagnostic tests are available. Alternatively, a patient in an OPD might be told to schedule a followup visit with the office-based family physician. These kinds of treatment patterns have cost implications that should not be ignored. Nevertheless, it is noteworthy that the majority of the episodes examined in this study required only one visit.

Continuity of care is measured using the health care facility rather than the physician. The provider number recorded on a Medicaid claim may be that of a physician in an individual practice, but it may also be that of a group practice or a hospital OPD. Thus, the claims data used for this study did not allow us to apply the continuity-of-care concept at the physician level.

Health status cannot be measured using Medicaid claims. The ideal measure of health status would be a clinical assessment of the patient's condition. The next best measure would be self-reported health status. Because neither of these measures were available, utilization and expenditure measures were obtained from periods prior to the episode. These prior period measures may be related to prior period differences in OPD and office-based physician practice patterns.

The number of antihypertension prescriptions in the 6 months preceding a hypertension episode was used as a measure of severity for this condition. Although it is generally accepted that more severe cases of hypertension require medication, it is possible that OPD and office-based physicians differ in their prescribing practices. As indicated in the "Findings" section, hypertension patients treated in office settings tended to receive more prescriptions in the pre-period than patients treated in OPDs. That finding is interpreted here as evidence of a more severe case mix in office settings, and the number of pre-period antihypertension prescriptions is used as a control variable in estimating expenditures for hypertension episodes.

The other proxy indicator of health status used is the overall level of spending in the 2 months preceding the treatment episode. We found that OPD patients generally had higher levels of health care spending in the 60 days before their treatment episode. Although it might be argued that these OPD patients made greater use of expensive OPD facilities in the prior period, this study treats the finding as evidence of poor health status among OPD patients. Thus, the 60-day pre-period expenditure variable is used as a health status proxy in models estimating expenditures per episode. This approach may underestimate the true cost of OPD care relative to office-based care.

Price and quantity of services are not distinguished in this study. It would be desirable to compare not only the overall spending in OPD and office settings but also the number of visits per episode, the number of services per visit, and the expenditures per service. This would help to explain whether differences in total expenditures for OPD and office-based episodes are a result of differences in use of services or differences in cost per unit of service.

Unfortunately, it is difficult to make such comparisons because of differences in billing practices between the two settings. For example, a physician visit may or may not produce a "visit" bill in the OPD setting, and some OPDs include professional care in the facility charge. Counting both facility bills and visit bills as visits would inflate OPD visit counts, because some OPD visits include both kinds of bills for the same visit.

In the findings presented later, the emphasis is on differences between OPD and office-based care with respect to cost, continuity of care, and likelihood of hospital admission. The assumptions used generally favor the OPD setting. For example, prior-period spending for OPD patients may reflect the higher cost of OPD care as much as the greater health care needs of these patients, but the multivariate models treat health care spending in the 60 days prior to the episode as a health status indicator. Consequently, the findings that follow tend to give OPDs the "benefit of a doubt."

Findings

Findings are organized into three sections: a simple comparison of mean ambulatory expenditures associated with office and OPD settings; a regression analysis of ambulatory expenditures which controls for differences in case mix, demographic characteristics, and other factors that may differ between the two settings; and a logistic regression analysis of the odds of hospital admission for episodes initiated in OPD and office settings.

Ambulatory spending by setting

The comparisons of OPD and office spending include all spending during the predefined episode periods, and acknowledges potential case-mix differences between the two settings by comparing spending for the treatment of specific conditions. These comparisons yield a profile of the Medicaid program expenditures associated with each of the six episode types, as well as a general sense of the magnitude of differences in program spending that are associated with treatment in OPD and office settings.

Table 2 indicates that episodes initiated in hospital outpatient settings are, on average, more costly than those initiated in a physician's office. Spending per episode for the three AFDC children's conditions was 66 to 107 percent higher for episodes initiated in OPDs than for similar episodes initiated in physicians' offices. For AFDC adults, spending per episode was 10 to 25 percent higher for episodes initiated in OPDs. Mean expenditures per episode ranged from $59.50 for otitis media episodes to $465.70 for hypertension episodes. Much of the difference in the levels of spending among the episode types is related to the differing periods of time encompassed in each type of episode (e.g., otitis media episodes cover a 14-day period, and hypertension episodes cover a 180-day period). Because hypertension episodes cover a 6-month period, it is likely that a greater proportion of the spending reported for these episodes is not related to the treatment of hypertension.

The central role hospitalization plays in driving up average expenditures per episode is shown in Table 3. Only a small percentage (0.2 to 10 percent) of all episodes result in a hospital admission, but a large proportion of total spending (4 to 63 percent) is attributable to those episodes that include a hospital stay. Thus, any differences between OPDs and physicians' offices with respect to discretionary admissions could have a strong effect on the average levels of spending per episode associated with care in the two settings.

The probability of a hospital admission during the treatment episode is substantially greater for episodes initiated in OPDs (Table 4). For AFDC children, the probability of admission was 62 to 100 percent greater for those patients initially seen in OPDs. For AFDC adults, the probability of admission was 82 to 150 percent greater for those patients initially seen in an OPD. These differences exist despite case-mix controls that eliminate comparison across episode

Table 2

Expenditures per episode, by site of initial visit and episode type: Michigan Medicaid, July 1, 1981-June 30, 1982

Episode type	Patients	Episodes	Percent of episodes initiated in OPD	Site of initial visit: All episodes	Site of initial visit: Office	Site of initial visit: OPD	Percent difference
				Expenditure per episode			
AFDC children							
Otitis media	61,170	79,393	27.8	$59.50	$50.27	$83.43	66.0
Gastroenteritis	26,259	29,507	37.1	83.46	59.70	123.66	107.1
Pneumonia	15,406	16,968	42.4	210.15	156.42	283.24	81.1
AFDC adults							
Acute pharyngitis	22,428	28,416	12.1	79.50	78.55	86.40	10.0
Urinary tract infection	26,450	26,450	21.3	210.13	200.56	248.39	23.8
Essential hypertension	14,992	17,565	10.5	465.70	453.98	565.63	24.5

NOTES: Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded from the study. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

Table 3

Percent of spending attributable to episodes with a hospital stay and percent of episodes with a hospital stay, by episode type: Michigan Medicaid, July 1, 1981-June 30, 1982

Episode type	Percent of spending associated with episodes including a hospital stay	Percent of episodes with a hospital stay
AFDC children		
Otitis media	11.9	0.7
Gastroenteritis	48.4	4.0
Pneumonia	62.6	9.8
AFDC adults		
Acute pharyngitis	4.0	0.2
Urinary tract infection	25.2	3.3
Essential hypertension	25.7	4.9

NOTES: Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded from the study. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

types, and exclude those episodes with high levels of spending unrelated to the tracer condition. Nevertheless, these OPD and office patient populations may still differ with respect to case mix, and such differences may account for part or all of the difference in admission rates. In particular, more seriously ill patients may tend to select OPD visits over office visits, if they have a choice. The logit models presented in the third section of the "Findings" impose further case-mix controls.

Another way to compare the costs of ambulatory care in OPD and office settings is to exclude those treatment episodes that result in a hospital stay. This exclusion follows from the premise that hospital admission decisions are governed strictly by clinical criteria commonly applied in the two settings. That is, it assumes that physician practice patterns with respect to admissions do not differ across settings. Based on this premise, exclusion of episodes that result in hospital admissions serves to further control for potential differences in case mix between office and OPD settings. If the criteria for admission differ between these two settings, then this approach may unduly favor OPDs.

Average expenditures per episode for episodes with no hospital stay are displayed in Table 5. The average expenditures per episode are much lower when those with a hospital stay are excluded because of the high costs associated with hospitalization. The two exceptions to this are otitis media and acute pharyngitis, because these conditions rarely precipitate a hospital stay.

The expenditure patterns for AFDC children and AFDC adults diverge when examined in this framework. The three episode types examined for AFDC children were far more expensive to treat in the OPD setting (reimbursements were 61 to 112 percent higher for OPD care than for office-based

Table 4

Percent of episodes with a hospital stay, by site of initial visit and episode type: Michigan Medicaid, July 1, 1981-June 30, 1982

Episode type	Site of initial visit		Percent difference
	Office	OPD	
	Percent		
AFDC children			
Otitis media	0.6	1.2	100.0
Gastroenteritis	3.2	5.2	62.5
Pneumonia	7.0	13.7	95.7
AFDC adults			
Acute pharyngitis	0.2	0.5	150.0
Urinary tract infection	2.1	4.2	100.0
Essential hypertension	8.5	8.2	-3.5

NOTES: Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded from the study. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

care). The three episode types examined for AFDC adults exhibited only minor spending differences between the two treatment settings. Ambulatory care for treatment of acute pharyngitis was 5 percent more expensive; urinary tract infection was 7 percent more expensive; and essential hypertension was actually 6 percent less expensive. As noted previously, exclusion of episodes with hospital stays puts OPD expenditures in a favorable light by assuming that higher rates of admission from OPD settings are attributable to more severe case mix. But it is equally plausible that patients with a history of serious medical problems or chronic conditions may be more inclined to seek regular care from an office-based physician, thereby creating a more severe case mix for office-based visits. Other important demographic and case-mix factors influence the demand for services in the two settings. For example, black persons and other minorities tend to use fewer ambulatory services, and they are more likely to seek their ambulatory care in an OPD setting (Davis, 1983). Finally, the long waiting times often encountered in OPDs may discourage Medicaid patients from making followup visits during the episode. The findings of the regression analysis in the next section indicate the importance of including such factors in comparisons of office and OPD spending, particularly for AFDC adults.

Regression analysis of spending

It is necessary to construct a multivariate model to estimate and control for the influence of these additional factors on expenditures per episode. In addition to site of care, the independent variables include: patient demographic characteristics, proxy measures for health status, the calendar quarter in which the treatment episode began, and a measure of provider continuity during the 6-month period preceding the episode. Means and medians for these independent variables by site of initial visit are shown

Table 5

Expenditures per episode without a hospital stay, by site of initial visit and episode type: Michigan Medicaid, July 1, 1981-June 30, 1982

Episode type	Number of episodes	Percent of episodes initiated in OPD	Site of initial visit: All episodes	Site of initial visit: Office	Site of initial visit: OPD	Percent difference
			Expenditure per episode			
AFDC children						
Otitis media	78,792	27.7	$52.84	$45.24	$72.66	60.6
Gastroenteritis	28,338	36.7	44.82	31.80	67.30	111.6
Pneumonia	15,300	40.5	87.08	68.45	114.40	67.1
AFDC adults						
Acute pharyngitis	28,360	12.1	76.46	76.05	79.47	4.5
Urinary tract infection	25,766	20.9	161.75	159.42	170.55	7.0
Essential hypertension	16,704	10.1	363.91	366.11	344.41	-5.9

NOTES: Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

in Table 6. Finally, any treatment episode including an inpatient hospital stay was excluded from the regression analyses to focus on expenditures for ambulatory care. This exclusion also removes many of the most seriously ill patients from the analysis.

The dependent variable, total expenditures per episode, has a highly skewed distribution with a long right tail. Consequently, this variable is logged in the regression models to stabilize the error variance and to make the error distribution more nearly normal. (See the "Technical note.") The regression coefficients that appear in Table 7 have been converted to facilitate their interpretation. They represent the percentage change in total spending that occurs at the intercept with a one-unit change in the independent variable. (See the "Technical note.")

The estimated relationships between the independent variables and total expenditures per episode for each of the six tracer diagnoses are displayed in Table 7. Site of care is a far more powerful predictor of total expenditures than any of the other independent variables. Controlling for all other independent variables, episodes initiated in hospital OPDs tended to cost the Michigan Medicaid

Table 6

Means and medians of demographic and case-mix variables associated with episodes of care in office and OPD settings, by episode type: Michigan Medicaid, July 1, 1981-June 30, 1982[1]

Independent variable	Episode type: AFDC children: Otitis media		Gastroenteritis		Pneumonia		AFDC adults: Acute pharyngitis		Urinary tract infection		Essential hypertension	
	Office	OPD	Office	OPD	Office	OPD	Office	OPD	Office	OPD	Office	OPD
Initial care in OPD	0	1	0	1	0	1	0	1	0	1	0	1
(yes = 1)	0	1	0	1	0	1	0	1	0	1	0	1
Age	4.8	3.3	4.5	4.5	6.0	4.5	29.7	27.4	29.8	27.3	39.2	39.3
	3.4	1.8	2.0	1.9	4.4	2.6	28.4	25.9	28.2	25.4	38.6	38.6
Race	.19	.46	.32	.51	.49	.48	.40	.48	.50	.53	.54	.69
(minority = 1)	0	0	0	1	0	0	0	0	0	1	1	1
Sex	.52	.53	.50	.50	.53	.55	.10	.12	.05	.04	.18	.16
(male = 1)	1	1	1	1	1	1	0	0	0	0	0	0
Spending 60 days prior	47.9	64.0	85.3	87.4	76.4	93.1	130.1	103.9	147.9	179.2	107.7	190.5
	11	11	11	11	11	11	22	11	15	11	11	11
Quarter 2	.26	.23	.22	.17	.26	.22	.24	.18	.24	.21	.21	.21
	0	0	0	0	0	0	0	0	0	0	0	0
Quarter 3	.21	.25	.25	.30	.16	.20	.23	.33	.29	.35	.39	.36
	0	0	0	0	0	0	0	0	0	0	0	0
Quarter 4	.26	.29	.27	.32	.29	.32	.27	.31	.24	.26	.20	.22
	0	0	0	0	0	0	0	0	0	0	0	0
Antihypertension	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.7	7.7
prescriptions	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7	5
Provider continuity	57.3	41.8	52.9	30.4	49.1	29.9	53.2	37.6	51.6	36.2	54.7	46.9
	52.8	44.4	44.3	14.3	40.5	0	51.1	33.3	43.2	30.0	42.9	42.2

[1]Medians are presented below each mean.

NOTES: Episodes with a hospital stay were excluded from these calculations. Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department. NA is not available.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

Table 7

Percent change in expenditures per episode[1] associated with a one-unit change in each independent variable, by episode type: Michigan Medicaid, July 1, 1981-June 30, 1982

Independent variable	Episode type					
	AFDC children			AFDC adults		
	Otitis media	Gastroenteritis	Pneumonia	Acute pharyngitis	Urinary tract infection	Essential hypertension
Intercept	32.89	21.47	48.91	35.27	75.54	145.44
Initial care in OPD (yes = 1)	68	119	81	19	18	8
Age	1	2	2	1	1	*.1
Race (minority = 1)	5	8	13	46	32	20
Sex (male = 1)	3	*.1	*1	*−1	−13	−11
Per $100 spending (60 days prior)	.9	.6	*.3	0	.8	.4
Quarter 2	*−2	*1	*−2	*4	*−2	*−3
Quarter 3	4	5	6	12	*4	*−2
Quarter 4	3	4	5	10	*−2	*−.2
Antihypertension prescriptions	NA	NA	NA	NA	NA	5
Provider continuity	−.2	−.2	−.2	−.3	−.2	−.2
Adjusted R^2	.13	.30	.22	.11	.05	.33

*Not significant at .001 level.
[1]See the "Technical note" for an explanation of the procedures used to convert regression coefficients to percentage terms.

NOTES: Episodes with a hospital stay were excluded from these regressions. Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department. NA is not available.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

Table 8

Means and standard deviations of independent variables in Table 7

Independent variable	Episode type					
	AFDC children			AFDC adults		
	Otitis media	Gastroenteritis	Pneumonia	Acute pharyngitis	Urinary tract infection	Essential hypertension
Initial care in OPD	.28	.37	.41	.12	.21	.10
(yes = 1)	.45[1]	.48	.49	.33	.41	.30
Age	4.35	4.48	5.37	29.41	29.30	39.20
	4.22	5.23	5.06	8.01	8.30	9.86
Race	.27	.39	.48	.41	.50	.56
(minority = 1)	.44	.49	.50	.49	.50	.50
Sex	.52	.50	.54	.10	.05	.18
(male = 1)	.50	.50	.50	.31	.21	.38
Spending 60 days prior	$52.40	$86.05	$83.16	$126.96	$154.44	$116.09
($100 units)	282.42	444.06	499.84	494.36	627.65	591.17
Quarter 2	.25	.20	.24	.23	.23	.21
	.43	.40	.43	.42	.42	.41
Quarter 3	.22	.27	.17	.24	.30	.39
	.41	.44	.38	.43	.46	.49
Quarter 4	.27	.29	.30	.28	.24	.20
	.44	.45	.46	.45	.43	.40
Antihypertension	NA	NA	NA	NA	NA	10.60
prescriptions	NA	NA	NA	NA	NA	12.3
Provider continuity	53.0	44.6	41.3	51.3	48.4	10.4
	39.0	38.9	40.8	39.7	40.3	12.2

[1]Standard deviations are presented below each mean.

NOTES: Episodes with a hospital stay were excluded from this table. Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department. NA is not available.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

program substantially more than those initiated in a physician's office. This was true for all six tracer diagnoses. Nevertheless, the spending implications of OPD care were markedly less for the three AFDC adult tracer conditions. OPD care was 8 to 19 percent more expensive than office care for the three adult conditions, compared with 68 to 119 percent more expensive for the three child conditions. Interestingly,

only 12 to 21 percent of the AFDC adult episodeswere initiated in OPD settings, compared with 28 to 41 percent of AFDC child episodes (Table 8).

Several proxy measures for health status were considered for the models, and two were selected. The first proxy selected was total expenditures in the 60 days preceding the episode of care. The 60-day prior-use period was selected rather than a 180-day prior-use period because it was believed to yield a better proxy measure of health status for the patient at the time the treatment episode was initiated. The models for all six tracer conditions estimate a positive relationship between spending in the 60-day pre-episode period and total spending during the episode. For every model except pneumonia, the probability that this relationship occurred by chance was less than .001.

The other proxy measure of health status was used only for essential hypertension episodes. This proxy is an index of the number of antihypertension prescriptions filled during the 6-month treatment episode, and it is used here as a measure of severity of illness. The 180-day prior-use period was used here because hypertension is a chronic condition, and these prescriptions are intended for treatment of this particular condition. Although these prescriptions accounted for only 5 percent of the total costs of treatment for hypertension patients not admitted to the hospital, the number of such prescriptions proved a strong predictor of total expenditures.

Finally, continuity of care was included to explore the hypothesis that having a regular source of care might account for program savings. As described in the methodology section, this variable indicates whether care was being furnished by more than one treatment facility prior to the tracer diagnoses. A value of 1 means that all such care was provided by the facility where the tracer diagnoses were made. Although this provider continuity measure is crude (i.e., it cannot distinguish whether the patient regularly saw the same physician), it demonstrates a consistent pattern of association with lower levels of spending per episode. Because the provider continuity measure and the dependent variable are both presented in percentage terms, we can interpret the continuity measure in terms of its marginal contribution to related expenditures. In general, the models estimate savings in related expenditures on the order of 0.2 to 0.3 percent for every 1-percent increase in provider continuity.

The odds of hospital admission

As discussed previously, a large part of total spending was associated with those few episodes that included a hospital admission, and OPD treatment settings were associated with greater likelihoods of admission. Thus, a critical question is whether the increased likelihood of admission for OPD patients reflects a difference in physician practice patterns or, alternatively, a difference in the case mix of patients seen in OPD and office settings.

This question was addressed using a logit model designed to estimate the odds of hospital admission during a treatment episode. (See the "Technical note.") To control for potential differences in case mix between the two settings, the following proxy measures of case mix were included in the models: age, race, sex, total expenditures in the 60 days preceding the treatment episode, and a series of dummy variables to indicate the calendar quarter of the year in which the episode was initiated. For essential hypertension episodes, the number of antihypertension prescriptions filled during the episode was also included as a measure of case-mix severity.

The logistic models for the six episode types are presented in Table 9. The dependent variable is the natural logarithm of the odds of hospitalization, i.e., the odds of hospitalization versus no hospitalization. The independent variables are not logged. The coefficient values presented in Table 9 have been transformed to represent the effect of a one-unit change in the independent variable on the odds of a hospital admission.

Strong positive associations are indicated between initial treatment in a hospital OPD and the likelihood of hospital admission for each of the six tracer diagnoses (Table 9). Initial treatment in an OPD is associated with a 68- to 103-percent increase in the odds of hospitalization for five of the six tracer conditions. The OPD setting was associated with an increase of 264 percent in the odds of hospitalization for acute pharyngitis and related conditions, although only 34 of the 16,968 acute pharyngitis episodes included a hospital admission.

Several case-mix variables make substantial contributions to the predictive power of the models. For AFDC children, there is a consistent pattern of lowered odds of hospitalization for older children, reflecting the greater risks that infants face. Age is not a significant predictor for AFDC adults. White persons were generally less likely to be admitted, but the association between race and odds of admission was significant at the 0.001 level in only three of the six episode categories. Total expenditures during the 60 days preceding an episode is a powerful predictor of the odds of hospitalization for each of the six tracer conditions examined in this study. Finally, the number of antihypertension prescriptions filled is a strong predictor of the odds of hospital admission during treatment episodes for essential hypertension. The means and standard deviations of the independent variables are presented in Table 10.

Discussion

These findings confirm what policymakers have long believed: that ambulatory treatment of patients in hospital settings is substantially more expensive than treatment of similar patients in physicians' offices. Unlike most previous studies, we have attempted to estimate the magnitude of this expenditure difference by identifying the total

Table 9

Percent change in the odds of hospital admission[1] associated with a one-unit change in each independent variable, by episode type: Michigan Medicaid, July 1, 1981-June 30, 1982

Independent variable	Episode type					
	AFDC children			AFDC adults		
	Otitis media	Gastroenteritis	Pneumonia	Acute pharyngitis	Urinary tract infection	Essential hypertension
Intercept	-99	-93	-84	-100	-97	-97
Initial care in OPD (yes = 1)	68	72	87	264	84	103
Age	-13	-8	-9	*1	.08	*1
Race (minority = 1)	*-27	-31	-28	*-45	-25	*-19
Sex (male = 1)	15	*2	*7	*-42	28	34
Per $100 spending (60 days prior)	3	2	1	3	2	2
Quarter 2	-35	*-14	*-13	*49	-12	*-15
Quarter 3	*-21	-32	-20	*42	20	*-7
Quarter 4	*-27	-31	-26	*21	-4	*9
Antihypertension prescriptions	NA	NA	NA	NA	NA	2
Provider continuity	*-.3	*-.2	*-.1	*-.2	-.4	*-.1
R	.17	.17	.21	.14	.12	.16
Somer Dyx	.35	.30	.34	.25	.22	.26

*Not significant at .001 level.
[1]See Logistic model in the "Technical note" for an explanation of the procedure used to convert logistic regression coefficients to percentage terms.

NOTES: Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department. NA is not available.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

Table 10

Means and standard deviations of independent variables in Table 9

Independent variable	Episode type					
	AFDC children			AFDC adults		
	Otitis media	Gastroenteritis	Pneumonia	Acute pharyngitis	Urinary tract infection	Essential hypertension
Initial care in OPD	.28	.37	.42	.12	.21	.10
(yes = 1)	.45[1]	.48	.49	.33	.41	.31
Age	4.34	4.41	5.18	29.41	29.29	39.27
	4.22	5.22	5.02	8.01	8.30	9.88
Race	.27	.39	.47	.41	.50	.56
(Minority = 1)	.44	.49	.50	.49	.50	.50
Sex	.52	.50	.54	.10	.05	.18
(male = 1)	.50	.50	.50	.31	.21	.38
Spending 60 days prior	$53.36	$90.24	$91.29	$128.01	$157.28	$122.57
($100 units)	290.12	457.85	509.46	520.47	632.97	628.62
Quarter 2	.25	.20	.24	.23	.23	.21
	.43	.40	.43	.42	.42	.41
Quarter 3	.22	.27	.18	.24	.30	.39
	.41	.44	.38	.43	.46	.49
Quarter 4	.27	.28	.30	.28	.24	.20
	.44	.45	.46	.45	.43	.40
Antihypertension	NA	NA	NA	NA	NA	10.61
prescriptions	NA	NA	NA	NA	NA	12.27
Provider continuity	53.0	44.4	40.7	51.3	48.2	53.8
	39.1	38.9	40.8	39.7	40.3	38.4

[1]Standard deviations are presented below each mean,.

NOTES: Episodes with more than $500 in expenditures unrelated to the tracer condition were excluded. The cutoff was $1,500 for essential hypertension episodes. AFDC is Aid to Families with Dependent Children. OPD is outpatient department. NA is not available.

SOURCE: Health Care Financing Administration, Office of Research and Demonstrations: Data from the Tape-to-Tape project.

spending associated with entire episodes of care. We have also considered differences in case mix that exist in the populations served in OPD and office settings.

One obvious reason for the greater spending associated with OPD care is that the Michigan Medicaid program paid for OPD care on a cost-reimbursement basis during the period covered by this study. In contrast, physicians were reimbursed using restrictive fee screens that were set at levels substantially lower than those of the Medicare

program. Because of the differences in billing codes between the two settings, and the bundling of OPD services, we have not attempted to estimate differences in the levels of utilization that may occur between OPD and office settings. Consequently, we have not been able to determine whether the primary reason for differences in spending between the two settings is price or quantity of services. Judging from the magnitude of the expenditure differences between OPD and office-based episodes that did not include a hospital admission, reimbursement policies (i.e., prices) are probably sufficient to account for them.

Although office and OPD patient populations differ with respect to case mix and demographic characteristics, we cannot attribute the observed spending differences to these factors. All cross-site comparisons were limited to patient populations with common tracer conditions, and the spending differentials were greatest when additional case-mix controls were included in the regression analysis (Tables 5 and 6).

The divergent findings for AFDC children and adults are intriguing. The spending differential between OPD and office settings was much less for adults than for children. These divergent findings may be related to the relatively low percentage of adult episodes treated in OPDs. Between 10 and 21 percent of adult episodes were initiated in OPDs compared with 28 to 41 percent of the children's episodes (Table 8). It is also noteworthy that the adult population averaged substantially higher levels of prior-period spending than the child population, indicating that the adult population may have included a higher proportion of people with poor health status. People with poor health status may be more inclined to establish a regular source of care independent of the hospital. This could account for additional spending in office settings and a narrowing of the spending between the two settings.

From a policy perspective, the most interesting finding is that delivery of ambulatory care in OPDs is associated with a substantial increase (68 percent or more) in the odds of hospital admission. Hospital admission was not the norm for the conditions studied, but those episodes including an admission accounted for a large share of average expenditures per episode. The findings of previous studies are not strictly comparable to those in this study because of differences in the methodologies employed and the populations studied. Held and Swartz (1983) and Fleming and Jones (1983) both found only slightly higher rates of admission for Medicaid recipients whose regular source of care was an OPD, but tracer conditions and episodes of care to control for case mix were not used in either of these studies. The finding of higher admission rates for OPD patients is consistent with Gold's findings that compared admission rates for HMO patients in hospital-based and freestanding clinics (1981b).

This finding does not necessarily suggest that Medicaid or other third-party payers should restrict access to OPDs. Indeed, much of the expansion in OPD care that has occurred during the last 15 years has been predicated on the knowledge that many poor people have inadequate access to private practice physicians. Nevertheless, it may be prudent to encourage patients to establish a private practice physician as their regular source of care. Continuity of care is widely believed to enhance quality of care, and this article has shown that it is also associated with lower ambulatory expenditures per episode. The hidden benefit of regular office-based care is that it may also reduce total expenditures by reducing the odds of hospitalization.

The implications of these findings are particularly salient in the current prospective payment environment. Many hospitals are searching for alternative sources of revenue to offset reductions in the use of inpatient services. An increased role in the provision of ambulatory care is one obvious strategy for such hospitals to consider. Most third-party payers continue to pay for OPD services at higher rates than allowed for similar services in office settings. This study indicates that hospitals may be using OPDs as a source of additional admissions.

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Technical note

Unrelated care

"Related care" includes not only services that appear on claims with a tracer diagnosis, but also services associated with diagnoses that our consulting physician classified as related to the tracer diagnosis. "Unrelated care" is care that was billed on claims that carried a diagnosis not related to the tracer diagnosis. Some claims, such as ambulance and drug claims, could not be classified as "related" or "unrelated" because a diagnosis was not included on the claim. Episodes with high levels of unrelated care were dropped from the analysis in order to compensate for potential differences in the case mix of populations treated in office and OPD settings. This reduced the number of episodes in each group (Table 11).

Table 11

Percent of episodes excluded because of high levels of care unrelated to tracer diagnosis

Tracer diagnosis	Percent of episodes removed
AFDC children	
Otitis media	1.1
Gastroenteritis	1.7
Pneumonia	2.2
AFDC adults	
Acute pharyngitis	1.3
Urinary tract infection	7.5
Essential hypertension	10.5

SOURCE: McDevitt, R.: Protocols developed with assistance of physician and nurse consultants, SysteMetrics, Washington, D.C., 1987.

Error variance

Error variance in the regression model tends to increase with expenditures in an unlogged model (i.e., as mean expenditures increase, the variation of individual expenditures about the mean increases). If the standard deviation tends to increase with the mean, as it does in this case, then logging the dependent variable is appropriate. A fundamental assumption of the regression model is that of constant variance. This log transformation also makes the error distribution approximate a normal distribution. A normal distribution is necessary for valid t-tests.

Regression coefficients

The regression coefficients of this log-linear model are converted to percentage terms as follows:

$$\text{Log}(Y) = a + b_1x_1 + b_2x_2 + E$$

exponentiate both sides:

$$Y = (e^a)\,(e^{b1x1})\,(^{b2x2})\,(e^E)$$

If $b_1x_1 > 0$ then

$e^{b}1x1_{-1}$ = percentage increase

If $b_1x_1 < 0$ then

$e^{b1x1}{}_{-1}$ = percentage decrease

Logistic model

The logistic model is stated in mathematical terms as follows:

$$\log\left(\frac{P}{P-1}\right) = \text{logit}\,(p)$$

To help interpret the logit model, we calculate the anti-logs of the models' coefficients. These converted coefficients can then be interpreted as the multiple of the odds of hospital admission that is associated with a one-unit change in the independent variable. We then subtract 1 form this coefficient, and the resulting value is the percent change in the odds of hospital admission that is associated with a one-unit change in the independent variable. The values presented in Table 7 were calculated in this fashion. For small p, p approximates $p/(1\text{-}p)$ and the model can be interpreted as change in the probability of hospitalization as well as change in the odd of hospitalization. The conversion of coefficients to percentage terms is similar to that described in Table 6.

References

Aucona-Berk, V. A., and Chalmers, T. C.: An Analysis of the Costs of Ambulatory and Inpatient Care. *American Journal of Public Health* 76(9):1102-1104, Sept. 1986.

Altman, S. H., and Socholitzky, E.: The Cost of Ambulatory Care in Alternative Settings: A Review of Major Research Findings. *Annual Review of Public Health* 2:117-143, 1981.

Berkson, Rita D., Barrett, D. and Reinhold, R. B.: Ambulatory Care in the Cities: A Shift to the Hospitals. *Journal of Ambulatory Care Management* 4(1):43-48, Feb. 1981.

Davis, K.: Public-Policy Implications. In S. H. Altman's *Ambulatory Care*. Lexington, Mass. Lexington Books, 1983.

Fleming, N. S., and Jones, H. C.: The Impact of Outpatient Department and Emergency Room Use on Costs in the Texas Medicaid Program. *Medical Care* 21(9):892-910, Sept. 1983.

Gabel, J. R., and Rice, T. H.: Reducing Public Expenditures for Physician Services: The Price of Paying Less. *Journal of Health Politics, Policy and Law* 9(4):595-609, Winter 1985.

Garner, D. D., Liao, W. C., and Sharpe, T. R.: Factors Affecting Physician Participation in a State Medicaid Program. *Medical Care*. 17(1):43-58, Jan. 1979.

Gold, M.: Effects of Hospital-Based Primary Care Setting on Internists' Treatment of Primary Care Episodes. *Health Services Research* 16(4):383-405, Winter 1981a.

Gold, M. and Greenlick, M.: Effect of Hospital-Based Primary Care Setting on Internists' Use of Inpatient Hospital Resources. *Medical Care* XIX(2):160-171, Feb. 1981b.

Held, P. J., and Swartz, K.: Medicaid Costs, Ambulatory-Care Setting, and Hospital Use. In S. H. Altman's *Ambulatory Care*. Lexington, Mass. Lexington Books, 1983.

Holahan, J. F., and Etheridge, L. M.: *Medicare Physician Payment Reform: Issues and Options*. Washington, D.C. The Urban Institute Press, 1986.

Manheim, L. M., and Friedman, B.: Factors Contributing to the Phenomenal Growth of Medicare Expense for Hospital-based Ambulatory Care. *Inquiry*, 19:295-307, Winter 1982.

McCall, N., and Wai, H. S.: An Analysis of the Use of Medicare Services by the Continuously Enrolled Aged. *Medical Care*, 21(6):567-581, June 1983.

Public Health Service and Health Care Financing Administration: *International Classification of Diseases, 9th Revision, Clinical Modification*. 2nd ed. DHHS Pub. No. (PHS) 80-1260. Public Health Service. Washington. U.S. Government Printing Office, Sept. 1980.

Sloan, F., Cromwell, J., and Mitchell, J. B.: *A Study of Administrative Costs in Physicians' Offices and Medicaid Participation*. Contract No. SSA-600-75-0212. Prepared for Social Security Administration. Cambridge, Mass. Abt Associates, Inc., June 1977.