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ORIGINAL ARTICLE

The Impact of Managed Care on Health Care Utilization Among Adults with Asthma[#]

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ABSTRACT

Study Objectives. To compare kinds and amounts of health care used by adults with asthma in managed care and fee-for-service settings. *Design*. Cross-sectional structured telephone survey of Northern California adults with asthma from random samples of pulmonologists, allergist-immunologists, family practitioners, and from a random sample of the non-institutionalized population. *Measurements*. Validated measures of kind of health insurance plans, kinds and amounts of services used for asthma and other reasons, demographic characteristics, severity of asthma, comorbidity, and overall health and functional status. *Results*. Eighty one percent of the 416 adults with asthma studied were in some form of managed care (75% in HMOs and 6% in PPOs). Those in managed care (MC) and fee-for-service (FFS) did not differ substantively in the proportion with a regular source or principal provider of asthma care, with a peak flow meter or action plan, having received instructions in the use of an inhaler, reporting current use of inhaled beta-agonists, home nebulized beta-agonists, or inhaled steroids, or reporting ER visits or flu shots in the year prior to interview. Persons with asthma in MC reported significantly fewer total physician visits (after adjustment, 4.3 MC, 7.1 FFS, difference = 2.8, 95% CI − 5.4, − 0.1), principally because those in MC had many fewer visits to allergist-immunologists (after adjustment 4.9 MC, 21.4 FFS, difference = − 16.5, 95% CI − 27.8 − 5.3). The two groups did not differ significantly in the proportion with asthma-related or nonasthma hospital admissions. *Conclusions*. Persons with asthma in fee-for-service settings reported a greater number of certain kinds of ambulatory visits, particularly visits to

[#]None of the authors has a conflict of interest.

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allergist-immunologists, for their asthma than those in managed care, but did not differ in the use of the hospital for their asthma and in nonasthma care.

Key Words: Asthma; Managed care; Fee-for-service; Health care utilization.

INTRODUCTION

Managed care, encompassing health maintenance organizations (HMOs) of several types, preferred provider organizations (PPOs), and point of service plans, has increased its share of the health insurance market dramatically over the last decade. Between 1988 and 2000, for example, among those receiving insurance coverage through an employer, the share in fee-for-service (FFS) declined from 71% to 8% percent nationally (1,2). More than half of Medicaid beneficiaries in the U.S. were in managed care plans by the late 1990s (3,4), while just under a quarter of Medicare beneficiaries were in such plans (5).

Luft and Miller (6–9) have conducted comprehensive literature reviews of studies of the impact of managed care (and, within managed care, of specific kinds of plans) on health care utilization, costs, and outcomes and report that there is clear evidence that in well populations, the prepaid group practice form of HMO has lower utilization of the hospital and lower costs and at least equal outcomes. However, they are able to draw no firm conclusions about other forms of managed care. In their articles, Miller and Luft also review studies of the impact of managed care on utilization and outcomes among persons with discrete diseases, in general finding no systematic differences between managed care and FFS with respect to utilization, costs, or outcomes. However, in all of the reviews spanning more than two decades performed by Luft and colleagues, no studies of the impact of managed care on persons with asthma that meet minimal criteria for methodological rigor have been found (Miller, personal communication). The present study is designed to redress the lack of such studies by assessing the impact of managed care on health care utilization among a panel of adults with asthma from Northern California, an area in which managed care plans have a particularly large share of the health insurance market.

METHODS

Overview

We analyzed the data from structured telephone interviews with the 2000 wave of the University of California, San Francisco (UCSF) Asthma Disability Study (ADS), a longitudinal study of persons with asthma who were 18 through 50 at the time of enrollment between 1992 and 2000, to ascertain the impact of having insurance in managed care plans vs. FFS on the kinds and amounts of care for asthma and nonasthma reasons. The measures of managed care status were those developed for the Medical Expenditures Panel Survey (MEPS). The measures of health care utilization were adopted from the National Health Interview Survey (NHIS). We use chi-square tests (for the probability of using select services) and t-tests (for the amount of services used) by persons with asthma in managed care and FFS; logistic and ordinary least squares regression were used to assess the impact of managed care status on utilization after adjusting for differences associated with demographic and medical characteristics.

Sampling

The results presented in this paper are based on analyses of data from the 2000 wave of the University of California, San Francisco (UCSF) Asthma Disability Study. The study protocol was approved by the UCSF Committee on Human Research. The UCSF Asthma Disability Study has three components. Details of the sampling for the first two components have been reported previously (10,11). For the first component, random samples of northern California adult pulmonologists (57 from among all 252) and allergist-immunologists (17 from among all 40) maintained logs over a two-month period of all adults with asthma (ages 18 through 50) as they presented to their offices in 1992–1994. Of those named on the physician logs, 453 adults with asthma were subsequently enrolled and administered at least an initial valid structured telephone interview. Interviews were conducted every 18 months thereafter. Of the 453 adults with asthma initially enrolled and interviewed, 283 (62%) were still in the study as of the 2000 (fifth) wave.

For the second component, a random sample of family practice physicians (34 from among all 2041) maintained such logs over a 2-month period in 1996. Of those named on these physician logs, 91 adults with asthma were subsequently enrolled and administered an initial valid interview. Of these, 66 (73%) were still in the study as of the 2000 (the third wave for such persons).

For the third component, a community-based sample of persons with asthma who reported receiving a diagnosis of asthma from their physicians was identified by random-digit dialing in the same northern California counties as the first two components during 1999. One hundred twenty-five adults with asthma were enrolled in the study and administered an initial interview, of whom 90 (72%) were still in the study as of the 2000 wave (the second wave for such persons). Details regarding the sampling methodology for the third component were presented in Blanc and colleagues (12). All told, the present study includes the responses from 439 adults with asthma, of whom 283 derive from the pulmonology/allergist-immunology sample, 66 from the family practice sample, and 90 from the community-based sample. Excluded are all interviews of those respondents from prior waves with data collection or documentation potentially compromised by a single survey worker (n=347). We have previously published the data cleaning protocol that resulted in the deletion of the foregoing interviews (11,13).

Measures

The principal independent variable in the study is the managed care status of the members of the ADS. To ascertain this status, the telephone survey included items developed for and validated in the Medical Expenditures Panel Study (MEPS) (14,15). In the first of these measures, respondents were asked if they had health insurance. Subsequently, they were asked explicitly if they were members of an HMO. Regardless of their responses to this question, they were asked if they were limited to a select panel of physicians, a hallmark of HMO coverage. If they answered that they were not so limited, they were asked if they have an incentive to use a select panel of physicians, a hallmark of coverage in PPOs. Persons who reported being in an HMO, being limited to a select panel of physician, or having an incentive to use a select panel of physicians are defined as being in managed care plans; all others are defined as receiving care in FFS settings.

The principal dependent variables are measures of the kind of care and quantity of services used for asthma and nonasthma reasons and are adapted from the NHIS (16). They include whether the respondent had a regular main source of care and, if so, whether that source was a physician's office, outpatient clinic, emergency room, or other source; the medical specialty of the main provider for asthma; whether the respondent had a peak flow meter, had received an ''action plan'' for asthma management, or had received instructions from a physician, nurse, or pharmacist in the techniques of using an asthma inhaler. Respondents also reported the quantity of visits to each medical specialty and nonphysician providers for asthma care in the year prior to interview and whether they had been admitted overnight to a hospital during this period. Finally, respondents reported the number of visits to all providers for reasons other than asthma as well as whether they have been hospitalized for such reasons.

In addition to standard demographic items adapted from the foregoing data sources and the Current Population Survey (17), the annual telephone survey also collected information on the extent of asthma severity as well as the overall health status of the individual. The asthma severity measures included the self-assessed measure developed by Janson-Bjerklie et al., which has been shown to be correlated with objective measures of severity (18), an asthma-specific quality-of-life measure developed by Marks, Dunn, and Woolcock (19), and a severity of asthma score developed by Blanc and colleagues in an earlier phase of the present ADS study (11,20). The overall health status measures included the SF-12 scale, from which one can calculate overall physical and mental component scores (21); a checklist of chronic conditions, adapted from the National Health Interview Survey (16); and the Center for Epidemiologic Studies Depression Scale (CES-D) (22).

Analyses

The principal analyses are limited to the 416 respondents (94%) who reported having some form of health insurance as of the date of interview. We begin by comparing the demographic characteristics and asthma-specific and general health status of respondents receiving care in managed care and FFS settings, using t-tests for continuous measures and chi-square tests for categorical measures. We also use chi-square tests to compare the two groups for the kinds of care received, such as whether each had a regular source of asthma care or which specific treatments were being used. We report the probability of using that kind of care for those in managed care and FFS, the difference in the two probabilities, and the 95% confidence interval for that difference. We use t-tests to compare the two groups for the number of visits for asthma in the year prior to interview to all providers; all physicians; all specialists and within this category, pulmonologists and allergist-immunologists; and nonphysician providers, as well as to all providers for nonasthma reasons during this time-frame. We report the mean level of use, difference in the mean, and 95% confidence interval for the difference for the two groups. We also report the mean, difference in the mean, and 95% confidence

interval for each utilization measure but limited to those individuals with any utilization of that service.

In addition to the foregoing analyses, we analyze differences in utilization between adults with asthma in managed care and FFS settings from regression models adjusting for characteristics that could account for part of the effect of the kind of health plan. The following variables are included in the models: age, gender, white vs. nonwhite race, marital status (indicator variables for married and widowed, separated, and divorced, with never married as the reference), household size, education (indicator variables for high school graduate or less, some college, college grad, with more than college as the reference), the self-assessed severity measure of Janson-Bjerklie et al. (18), the SF-12 physical and mental component scores, and the number of comorbid conditions. When the outcome measure is dichotomous, such as whether a hospital admission for asthma occurred within the year prior to interview, we use logistic regression to estimate the impact of managed care on that measure after taking the covariates into account. In the results, below, we present the adjusted probability of each such dichotomous measure for persons in managed care and FFS settings, the difference in these two probabilities, and the 95% confidence interval for the difference as calculated using the method of Pasta, Cisternas, and Williamson (23). When the outcome measure is continuous, such as the number of visits to all physicians for asthma, we use ordinary least squares regression and present the mean, difference in the mean, and 95% confidence interval for the difference between the managed care and FFS groups.

In addition to these principal analyses, we perform a series of sensitivity analyses for the utilization variables. First, we include the 26 individuals without insurance in the FFS group and re-estimate the comparison of those in managed care and FFS. Second, we compare persons who reported being in an HMO or who reported being limited to a select panel of physicians to all others including those in PPOs and FFS settings, in effect comparing the utilization of those in HMOs to the remainder of those with insurance. Third, we add those without insurance to the latter group for the comparison of the utilization of those in HMO and all other kinds of plans. Fourth, we perform a three-way comparison of the utilization of persons who report being in an HMO or report being limited to a select panel of physicians to those in PPOs and to those in FFS settings (with the latter as the reference category). Fifth, we include those without insurance in the FFS group and repeated the comparison of the utilization of those in the three groups. Lastly, we compare the utilization of those in prepaid group practice to that of those in other forms of HMOs and in PPOs; persons in fee-for-service were excluded from the latter analyses.

RESULTS

In the study year, 339 (81%) of the 416 adults with asthma in the study who had health insurance were in some form of managed care plan. Of these 339, 314 were in HMOs (93% of those in managed care); of the 314 in any form of HMO, 250 were in prepaid group practice HMOs (74% of those in HMOs); the remaining 25 that were in some kind of managed care plan were in PPOs (7% of those in managed care).

Table 1, which shows the demographic characteristics of the persons with asthma in managed care and FFS settings with insurance, indicates that there were no statistically significant differences between the two groups in any single measure, although there was a trend for the managed care group to have a larger proportion of nonwhites than FFS (27% vs. 17%, $p=0.07$). Persons with asthma in MC and FFS were remarkably similar in general health and asthma status (Table 2). For example, they reported almost identical mean SF-12 physical and mental component scores, mean levels of depressive symptoms as measured by the CES-D, proportion at each level of self-assessed severity, mean level of severity, and mean asthma-specific quality of life.

In Table 3, we compare persons with asthma in managed care and FFS on several characteristics of their asthma care. Both on an unadjusted and adjusted basis, there were no differences in the proportion of the two groups reporting a single place as their main source of care, a principal provider for their asthma care and, among those with a principal provider, with a specialist or generalist as the principal provider (some individuals who reported having a principal provider of care did not indicate whether this provider was a specialist or generalist). Of note, about a third of both groups indicated that a specialist was the principal provider of their asthma care. In addition, those in managed care and FFS did not differ significantly in the proportion having a peak flow meter prescribed by a physician, receiving an action plan for their asthma care, or receiving instructions from a physician on the use of an inhaler (the point estimates suggest that those in managed care were slightly less likely to have a peak flow meter or an action plan, but were slightly more likely to have received instructions on the technique of inhaler use). Although the persons with

Table 1. Demographic characteristics of study participants, by managed care status.

Characteristic	Total n = 416 (100%)	Managed care n = 339 (81%)	Fee-for-service n = 77 (19%)	p
Age[a]	44.7 (±9)	44.3 (±8)	46.3 (±9)	0.07
% Female	71%	69%	78%	0.13
% Non-White	25%	27%	17%	0.07
% Hispanic	12%	13%	7%	0.10
Marital status				
% Married	71%	71%	71%	0.93
% Wid, Sep, Div	13%	13%	14%	
% Never married	15%	16%	14%	
Household size[a]	3.0 (±1.6)	3.1 (±1.5)	2.8 (±1.6)	0.18
Education				
% HS grad or less	18%	18%	17%	0.29
% Some college	37%	39%	29%	
% College grad	28%	27%	31%	
%>College grad	18%	17%	23%	
Family income[b]				
% LT 20k	8%	9%	4%	0.24
% 20–40k	14%	15%	11%	
% 40–60k	21%	22%	19%	
% 60–80k	16%	17%	15%	
% GT 80	41%	38%	51%	

[a]Mean (Standard Deviation).
[b]5 % of subjects declined to give income (21 subjects total).

Table 2. General health and asthma status of study participants, by managed care status.

Characteristic	Total n = 416	Managed care n = 339	Fee-for-service n = 77	p
Medical				
Overall health status				
SF12-phys component[a]	44.3 (±10.8)	44.4 (±10.4)	43.8 (±12.6)	0.65
SF12-mental component[a]	45.6 (±8.8)	45.6 (±8.9)	45.5 (±8.5)	0.96
Number of comorbid conditions[a]	0.9 (±1.2)	0.8 (±1.1)	1.1 (±1.3)	0.16
Depression (CES-D) score[a]	12.3 (±11.4)	12.4 (±11.3)	11.9 (±11.9)	0.73
% Ever smoker[b]	38%	39%	35%	0.54
% Current smoker[b]	8%	8%	5%	0.38
Asthma-related				
Self-assessed severity				
% Severe	13%	12%	18%	0.49%
% Moderate	32%	32%	29%	
% Mild	44%	45%	40%	
% w. No symptoms	11%	11%	13%	
Asthma severity score[c]	8.5 (±5.9)	8.4 (±5.7)	9.0 (±6.4)	0.40
Asthma quality of life score (Marks)[d]	16.8 (±14.7)	16.5 (±14.5)	17.9 (±15.3)	0.44

[a]Mean (Standard Deviation).
[b]Note 2 subjects did not indicate if they ever smoked and 6 subjects did not indicate if they smoke now.
[c]Severity of asthma score from Ref. (11).
[d]Asthma quality life score from Ref. (19).

Table 3. Characteristics of asthma care, by managed care status, with and without adjustment for demographic characteristics and asthma and overall health status.[a]

		Unadjusted				Adjusted			
Characteristic	Total n=416	Managed care n=339	Fee-for-service n=77	Difference	95% CI	Managed care	Fee-for-service	Difference	95% CI
% With single place as main source of care	96%	96%	96%	0%	−4%, 5%	96%	96%	1%	−4%, 5%
% With principal provider for asthma care	83%	82%	87%	−5%	−14%, 4%	82%	87%	−5%	−14%, 3%
% With specialist as principal provider	34%	34%	35%	−1%	−13%, 11%	34%	34%	1%	−11%, 12%
% With generalist as principal provider	47%	46%	51%	−5%	−17%, 8%	46%	52%	−6%	−18%, 6%
% With peak flow meter	61%	59%	66%	−7%	−19%, 5%	60%	65%	−5%	−17%, 6%
% With action plan	45%	45%	49%	−5%	−17%, 8%	45%	47%	−2%	−14%, 10%
% Who have received instructions on technique of inhaler use	90%	91%	84%	6%	−1%, 14%	91%	83%	7%	−1%, 17%
% With ER visits in past 12 months	12%	12%	10%	2%	−6%, 9%	12%	10%	2%	−5%, 10%
% With 2 or more ER visits in past 12 months	5%	6%	3%	3%	−1%, 7%	6%	2%	4%	−1%, 9%

[a]Adjusted for age, gender, white vs. nonwhite race, Hispanic vs. not Hispanic status, marital status, household size, education, self-assessed severity,and SF-12 physical and mental component scores.

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Table 4. Asthma treatments, by managed care status, with and without adjustment for demographic characteristics and asthma and overall health status.[a]

		Unadjusted				Adjusted			
Treatment	Total n=416	Managed care n=339	Fee-for-service n=77	Difference	95% CI	Managed care	Fee-for-service	Difference	95% CI
% Currently using inhaled beta-agonist at all	56%	57%	55%	2%	−10%, 14%	56%	59%	−3%	−13%, 7%
% Currently using inhaled beta-agonist daily	48%	47%	51%	−4%	−16%, 9%	46%	54%	−8%	−18%, 3%
% Currently using home nebulizer with beta-agonist	10%	10%	9%	1%	−7%, 8%	10%	8%	2%	−4%, 8%
% Currently using inhaled steroids	54%	53%	61%	−8%	−21%, 4%	53%	60%	−7%	−19%, 3%
% With flu shot in past 12 months	54%	52%	60%	−8%	−20%, 5%	53%	58%	−5%	−17%, 7%
% With moderate or severe asthma, current use of inhaled or nebulized beta-agonists, and no current use of inhaled steroids[b]	8%	9%	7%	2%	−4%, 9%	9%	7%	2%	−4%, 9%

[a]Adjusted for age, gender, white vs. nonwhite race, Hispanic vs. not Hispanic status, marital status, household size, education, self-assessed severity, and SF-12 physical and mental component scores.

[b]Used as marker of underutilization of long-acting controller anti-inflammatory medicines.

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Table 5. Asthma-specific and general health care utilization in year prior to survey, by managed care status with and without adjustment for demographic characteristics and asthma and overall health status.[a]

		Unadjusted				Adjusted			
Kind of utilization	Total n = 416	Managed care n = 339	Fee-for-service n = 77	Difference	95% CI	Managed care	Fee-for-service	Difference	95% CI
Asthma-specific care									
Ambulatory care									
Visits to all providers									
% With any	75%	74%	81%	−7%	−18%, 4%	74%	81%	−7%	−4%, 18%
Mean among all	5.8	5.2	8.8	−3.6[c]	−7.1, 0.0	5.3	8.2	−2.8	−6.1, 0.5
Mean among those with visits	7.8	7.0	10.9	−3.8	−8.3, 0.6	7.2	10.3	−3.2	−7.3, 1.0
Visits to physicians									
All physicians									
% With any	74%	73%	81%	−8%	−19%, 3%	73%	81%	−7%	−17%, 2%
Mean among all	4.8	4.2	7.5	−3.3[c]	−6.1, −0.5	4.3	7.1	−2.8[c]	−5.4, −0.1
Mean among those with visits	6.5	5.8	9.3	−3.5[c]	−7.1, 0.0	5.9	9.0	−3.1	−6.4, 0.3
Specialists									
All specialists									
% With any	37%	36%	42%	−6%	−18%, 6%	36%	41%	−5%	−16%, 7%
Mean among all	2.2	1.7	4.5	−2.8[c]	−4.7, −0.9	1.8	4.2	−2.4[c]	−4.3, −0.6
Mean among those with visits	5.6	4.4	10.5	−6.1[c]	−10.4, −1.8	4.7	9.1	−4.4[c]	−8.7, −0.1
Pulmonologists									
% With any visits	25%	24%	32%	−9%	−20%, 2%	24%	30%	−5%	−16%, 5%
Mean among all	1.2	1.1	1.5	−0.4	−1.2, 0.4	1.1	1.3	−0.2	−0.9, 0.5
Mean among those with visits	4.2	4.1	4.5	−0.4	−2.5, 1.7	4.3	3.9	0.3	−1.7, 2.4

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Allergist-Immunologists									
% With any visits	13%	12%	13%	−1%	−9%, 8%	12%	14%	−2%	−10%, 7%
Mean among all	1.0	0.6	3.0	−2.4[c]	−0.8, −3.9	0.6	2.9	−2.2[c]	−3.9, −0.7
Mean among those with visits	7.9	4.6	22.8	−18.2[c]	−28.5, −7.9	4.9	21.4	−16.5[c]	−27.8, −5.3
Generalists									
% With any visits	35%	34%	39%	−5%	−17%, 7%	34%	39%	−5%	−17%, 7%
Mean among all	1.5	1.4	1.7	−0.3	−1.3, 0.7	1.4	1.8	−0.4	−1.3, 0.6
Mean among those with visits	2.9	2.9	3.2	−0.3	−2.1, 1.4	2.8	3.4	−0.5	−2.3, 1.2
Visits to nonphysician providers[b]									
% With any	4%	3%	8%	−5%[c]	−1%, 0%	3%	7%	−4%	−1%, 3%
Mean among all	0.9	0.9	1.1	−0.3	−1.9, 1.4	0.9	1.0	−0.1	−1.8, 1.6
Mean among those with visits	24.0	29.7	14.5	15.2	−13.6, 44.0	34.8	6.1	28.7	−1.7, 59.1
Hospital care									
% With any, in past 12 months	4%	4%	3%	2%	−3%, 7%	5%	2%	3%	0%, 6%
General health care									
Physician visits for nonasthma care									
% With any	84%	83%	84%	−1%	−10%, 8%	83%	85%	−1%	−9%, 8%
Mean among all	7.1	6.6	9.3	−2.7	−6.7, 1.2	6.5	9.7	−3.2	−7.1, 0.7
Mean among those with visits	8.5	7.9	11.0	−3.1	−7.8, 1.5	7.8	11.6	−3.8	−8.5, 0.9
Hospital admissions for nonasthma care									
% With any, in past 12 months	14%	13%	17%	−4%	−12%, 5%	14%	15%	−2%	−10%, 7%

[a]Adjusted for age, gender, white vs. nonwhite race, Hispanic vs. not Hispanic status, marital status, household size, education, self-assessed severity, and SF-12 physical and mental component scores.
[b]Reduced model adjusted for age, gender, race, SF12 physical and mental components only.
[c]$p<0.05$.

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asthma in managed care and fee-for-service did not differ significantly in the proportion with one or more or two or more ER visits for asthma in the year prior to interview, the point estimates suggest that a substantially greater proportion of those in managed care reported ER use, particularly two or more such visits, and the confidence intervals surrounding the difference in such ER use are not sufficiently narrow to rule out a clinically meaningful difference on this measure.

On both an unadjusted and adjusted basis, persons with asthma in managed care and fee-for-service did not differ significantly in the proportion reporting current use of inhaled beta-agonists, daily use of such agents, or current use of beta-agonists delivered via a home nebulizer (Table 4). Although not significant, there was a trend for those in managed care to be less likely than those in fee-for-service to report the current use of inhaled steroids or to have received an influenza vaccination in the 12 months prior to interview. As a marker of potentially adverse care, we compared the proportion of persons with asthma in managed care and fee-for-service self-reporting moderate or severe disease and current usage of inhaled beta-agonists without concurrent use of inhaled steroids. Relatively small but similar proportions of both groups met these criteria (9% among those in managed care, 7% among those in fee-for-service).

Table 5 compares the health care utilization of the persons with asthma in managed care and fee-for-service. On both an unadjusted and adjusted basis, adults with asthma in managed care reported fewer visits for asthma to all physicians, to all specialists, and to all allergist-immunologists. On an unadjusted basis, adults with asthma in managed care reported fewer total ambulatory visits, fewer total visits to specialists among those with specialist visits, and a smaller proportion with any visits to nonphysician providers. Although not meeting the traditional criterion for statistical significance, a smaller proportion of persons with asthma in managed care reported any visits to all providers, to all physicians, to all specialists, to pulmonologists, to allergist-immunologists, and to generalists.

Visits to allergist-immunologists accounted for much of the difference in the level of ambulatory care usage between persons with asthma in managed care and FFS. Among those with such visits, those in managed care reported an average of 4.6 visits a year while those in FFS reported 22.8, for a difference of 18.2 visits. Adjustment did not diminish the difference substantially, suggesting that managed care vs. FFS, rather than demographic characteristics or general health and asthma status, accounted for the greater use by those in FFS settings. Interestingly, although the two groups differed substantially in the number of visits to allergist-immunologists, they did not differ significantly in the proportion with any such visits.

Although persons with asthma in managed care had significantly lower levels of ambulatory care utilization for their asthma, they were no less likely to report hospital admissions for their asthma in the 12 months prior to interview (the point estimates suggest that, in fact, such persons may have been more likely to have asthma-related admissions). They did not differ significantly from those in FFS settings in the number of physician visits for nonasthma care or in the proportion reporting hospital admissions for nonasthma care (although the point estimates suggest lower levels of ambulatory utilization among those in managed care settings, as well as a lower proportion with hospital admissions for nonasthma care).

To ascertain whether the difference in the number of visits to allergist-immunologists was due to higher usage of allergy desensitization shots in the FFS setting, we first compared the frequency with which such shots were reported by respondents in the two kinds of health insurance plans. Adults with asthma in FFS settings were somewhat more likely to report ever having received allergy desensitization shots (58.4% vs. 50.2%, $p<0.20$) and to report currently receiving them (9.1% vs. 4.1%, $p<0.08$) (data on frequency of allergy desensitization shot usage not in table).

We then regressed the number of visits to all physicians on whether or not allergy desensitization shots *were ever reported*, the managed care dichotomy, as well as demographic and health characteristics. In this estimation, the difference between those in FFS and managed care settings in the number of visits to all physicians narrowed from 2.8 (Table 5, above) to 2.5 (95% confidence interval -5.1, 0.1) and no longer met the traditional criterion for statistical significance (latter data not in table). We also regressed this parameter on whether or not allergy desensitization shots *were currently being received*, the managed care dichotomy, and demographic and health characteristics. The difference narrowed further, from 2.8 to 1.9 visits (95% confidence interval -4.4, 0.5), again not meeting the traditional criterion for statistical significance (latter data not in table). Thus, the higher level of usage of allergy shots among persons with asthma in FFS settings may partially account for their higher overall level usage of physician visits relative to those in managed care settings.

Table 6 summarizes the results of the sensitivity analyses of the relationship between the kind of health insurance plan and asthma-specific health care utilization. Recall that in the principal analysis (Table 5,

Table 6. Sensitivity analyses of relationship between kind of health insurance and asthma-specific health care utilization in year prior to interview with adjustment for demographic characteristics and asthma and overall health status.[a]

Sensitivity analysis	Statistically significant results
HMO vs. not HMO excluding uninsured	HMO with fewer total physician visits for asthma HMO with fewer total specialist visits for asthma HMO with fewer total allergist-immunologist visits for asthma
HMO vs. PPO vs. fee-for-service excluding uninsured	HMO with fewer total ambulatory visits for asthma than fee-for-service HMO with fewer total physician visits for asthma than fee-for-service HMO with fewer total specialist visits for asthma than fee-for-service HMO with fewer total allergist-immunologist visits for asthma than fee-for-service PPO did not differ from HMO or fee-for-service on any measure
Prepaid group practice HMO vs. remainder of managed care excluding fee-for-service and uninsured	Prepaid group practice with fewer total visits to allergist-immunologists than remainder of managed care Prepaid group practice with fewer total generalist visits than remainder of managed care

[a]Adjusted for age, gender, white vs. nonwhite race, Hispanic vs. not Hispanic status, marital status, household size, education, self-assessed severity, and SF-12 physical and mental component scores.

above), after adjustment, persons with asthma in managed care reported fewer total visits to all physicians, to all specialists, and, among those with any visits, fewer total visits to allergist-immunologists. The results of the sensitivity analyses are broadly consistent with the findings from the principal analysis in showing that those in managed care (or all forms of HMO or the prepaid group practice form of HMO) had fewer visits to many ambulatory care providers for asthma.

DISCUSSION

Managed care has come to dominate the health insurance market over the last two decades (1). At the time that this growth began, the prepaid group practice (PGP) form of HMO accounted for the largest share of managed care (24). Moreover, there was strong evidence—including data from a major randomized trial—that this form of HMO achieved savings of about 25% relative to the fee-for-service sector, principally due to much lower hospital admission rates and similar ambulatory care usage (6). The prepaid group practice form of HMO obtained outcomes at least as good as the FFS sector despite lower utilization and costs.

In the interim, most of the growth in managed care has occurred in the independent practice association form of HMO, in preferred provider organizations, and in such newer forms of managed care as point-of-service plans that combine features of HMOS, PPOs, and fee-for-service (1). Despite the fact that most of the growth in managed care occurred in forms other than the PGP, comprehensive reviews of the literature fail to detect strong effects of these forms on utilization, costs, or outcomes (8,9,25).

The findings of lower utilization and costs in the PGP form of HMO derived from studies of large populations, most of whose members were healthy (6). However, the literature on the impact of managed care now contains numerous studies conducted among persons with discrete chronic conditions (25), including, for example, cancer (26), cardiovascular disease (27–29), mental health conditions (30), diabetes (29), and rheumatic disease (31–33), among others. In these studies, the weight of the evidence is that managed care and FFS provide similar kinds and amounts of care to those with specific conditions (9).

The relative paucity of studies concerning the impact of managed care on utilization among persons with asthma is striking, given the high and growing prevalence of this condition (34,35) and the costs associated with it (36). In two prior analyses based on the Asthma Disability Study (ADS) that were not principally focused on the impact of managed care on utilization (13,37) and in the present one, we attempt to fill this gap in the literature. In the first of these prior analyses, we found that persons in managed care were significantly more likely to receive pneumococcal vaccination, high doses of inhaled steroids, greater than two ER visits, and hospital admissions in the year prior to interview (13). In a later analysis we found that physicians in practices with a high proportion of HMO/PPO patients were less likely to prescribe leukotriene

modifiers and, to a lesser extent long-acting beta-agonists, but that HMO/PPO practice was unrelated to patient perceived health status or asthma-specific quality of life (37).

The sample upon which the present study is based derives from persons with asthma from random samples of northern California pulmonologists, allergist-immunologists, and family practitioners, and from a random sample of the noninstitutionalized population of the same region. The systematic sampling frame was designed to include persons with asthma from a range of social and economic backgrounds and with a range of disease severity.

We found that 81% of the members of the ADS are in managed care plans of some sort, with most in HMOs. Because of this market penetration of managed care plans, the risk that managed care plans could have selectively enrolled persons with asthma of lower severity has been reduced. Indeed, we could find no substantial or statistically significant difference in the demographic characteristics of the ADS members in managed care and FFS, nor could we find any such difference in their general health or asthma status.

Persons with asthma in managed care and FFS do not appear to receive qualitatively different kinds of care. On both an unadjusted and adjusted basis, the two groups did not differ significantly in the proportion with a single place as their main source of care, with a principal provider of care, with a peak flow meter, with an action plan guiding their care, or with prior instructions from a provider in the use of an inhaler, although there were slight trends for those in managed care settings to be less likely to have a principal provider of care, peak flow meter, and action plan and more likely to have been given instructions in the techniques of inhaler use. There was also a trend toward such persons having higher rates of ER usage, although only 6% and 3% of those in managed care and FFS had two or more ER visits in the year prior to interview. Similarly, the two groups did not differ significantly in the proportion currently using inhaled beta-agonists, home nebulized beta-agonists, inhaled steroids, or having received an influenza vaccination in the year prior to interview.

Although the two groups did not differ in the kinds of services received, persons in managed care reported fewer ambulatory visits for asthma of several kinds than those in FFS, including to all providers (on an unadjusted basis), to all physicians, to all specialists, and to allergist-immunologists. Much of this difference was due to vastly different levels of utilization among those with some visits to allergist-immunologists. On an unadjusted basis, persons in managed care reported 18.2 fewer visits to allergist-immunologists over the year prior to interview than those in FFS; after adjustment, the difference was still 16.5 visits. Persons in managed care were slightly, if not significantly less likely to report ever receiving allergy shots or to be receiving them as of the time of interview. Indeed, when the history of receiving allergy shots was taken into account, the difference in the number of physician visits for asthma between those in managed care and FFS was no longer statistically significant, suggesting that the higher rate with which those in FFS receive allergy shots accounts for some of their higher level of utilization.

Although persons in managed care have lower levels of utilization for several kinds of ambulatory care, they were not significantly less likely to report hospital admissions for asthma; indeed, the point estimates are consistent with higher rates among such persons. Also, they did not differ from those in the FFS sector in the number of ambulatory visits for nonasthma or in hospital admissions for such reasons (although the point estimates are consistent with lower utilization on these parameters).

One limitation of the present study is that the self-report of utilization was not validated by checking other sources of information on health care use, such as data from health insurance plans, medical records, or hospital billing records. Thus, reporting bias may have under-or over-estimated the frequency of services used. However, such bias would not have affected the direction of the relationships observed, unless there was a systematic link between recall and type of health insurance coverage. In the validation of the health care utilization measures developed for the Medical Expenditures Panel Survey, the source of many of the items in the present study, there were no reporting differences as a function of the kind of health plan (14).

Another limitation is that there may be heterogeneity within sectors of care that would affect the results. For example, there may be differences among kinds of HMOs or PPOs that may account for the lack of differences between managed care and fee-for-service plans. However, in the sensitivity analyses we compared utilization among persons with asthma in prepaid group practice and other forms of HMOs, and we sought to determine whether reclassifying such persons in PPOs within the fee-for-service sector would affect the outcomes reported above. The results were not sensitive to the alternate categorization of plans.

Overall, then, the present study revealed that the principal difference in utilization between persons with asthma in managed care and FFS occurs in the number of visits to allergist-immunologists. This finding sug-

gests the possibility that the managed care sector may have stricter requirements for such visits and/or for the provision of allergy desensitization shots, which would be consistent with a study finding limited benefits of such therapy (38). An alternative hypothesis is that in managed care settings, allergy desensitization shots are provided by nonphysicians. However, the difference in the number of visits to allergist-immunologists notwithstanding, persons with asthma in managed care only received 3.3 and 2.8 fewer total physician visits for asthma on an unadjusted and adjusted basis, respectively. Moreover, the two groups did not differ in the kinds of services used, including the most expensive one, hospital care.

Persons with asthma in managed care and FFS had very similar demographic and health characteristics. The former group had substantially fewer visits to allergist-immunologists and there was a trend for such persons to have slightly higher rates of hospital admissions for asthma. With these exceptions, the two groups received similar kinds and amounts of health care. These findings are at odds with the bulk of the evidence from studies of well populations, but are consistent with the studies of those with other discrete chronic conditions (9). For persons with asthma, managed care does not appear to reduce utilization dramatically or, put another way, does not appear to under-provide care.

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