The Relationship Between Quality and Utilization in Managed Care

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Objective: To examine correlations of commercial health plan performance on Health Plan Employer Data and Information Set (HEDIS®) effectiveness-of-care measures with utilization rates, as a proxy for cost.

Study Design: Cross-sectional study of 254 commercial health plans.

Methods: This report used data reported by commercial managed care plans in the 2003 HEDIS dataset. Utilization measures included access to care (the proportion of adults with at least 1 primary care or preventive visit), outpatient use (the number of outpatient visits per 1000 members per year), inpatient discharges (the number of inpatient discharges for medical conditions per 1000 members per year), and inpatient days (inpatient hospital days for medical conditions per 1000 members per year). A composite quality score was calculated from HEDIS indicators. Estimates of health plan membership demographics were identified from Consumer Assessment of Health Plans (CAHPS) survey data. Of 316 reporting plans, 254 reported sufficient data to be included in this analysis. Bivariate correlations and multivariate regressions (controlling for health plan and membership characteristics) were conducted.

Results: Quality was positively correlated with access to outpatient care ($r = 0.46$, $P < .001$), negatively associated with inpatient days ($r = -0.30$, $P < .001$), and not associated with total outpatient visits ($r = 0.04$, not significant). Regression results controlling for selected plan and member characteristics demonstrated similar findings.

Conclusions: Although the mechanism of this cross-sectional association is unclear, these data provide important starting points for further research on the interrelationships of quality and resource use.

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Recent trends in healthcare costs[1] have raised concerns among purchasers and consumers of care about whether they are getting reasonable value for their increasing healthcare outlays. Studies focusing on the Medicare population demonstrate that there are strong regional[1] differences in healthcare spending and that these differences in spending do not appear to be reflected in better access to or quality of care, nor with improved health outcomes and satisfaction.[2-4] Indeed, recent research suggests that higher spending may correlate with poorer quality of care.[5] Isolated studies in other settings similarly show that more care and more costly care do not always result in higher quality. For example, among Medicaid community-based providers, no relationship between cost and quality was found.[6] In another study involving 18 medical groups, there was no consistent relationship between performance on 21 ambulatory-care, process-oriented quality indicators and case-mix adjusted costs of care.[7] We are aware of only 1 prior published study addressing the issue of costs and quality among commercial health plans: a report using early data from Health Plan Employer Data and Information Set (HEDIS®) found that health plans with higher quality had higher medical expense ratios, indicating that they spent a higher proportion of their premium income on direct services as opposed to administrative expenses.[8]

More detailed information about the relationship between quality and utilization is critical, especially for the employer-sponsored health insurance market where employees are bearing a larger share of healthcare expenses.[1] To examine these relationships for commercially enrolled populations at the health plan level, we used data from commercial HMO plans reporting HEDIS measures to the National Committee for Quality Assurance (NCQA) to explore the relationship between quality and utilization (as a proxy for costs). First, we examined the correlations of performance on effectiveness-of-care measures with measures of outpatient and inpatient utilization for adults aged 20 to 64 years. We then used regression analyses to determine whether the relationship between quality and utilization remained after controlling for a number of patient and plan covariates.

METHODS

Data Sources and Study Group

This reports uses data from the healthcare utilization and quality measures reported by commercial managed

care plans in the 2003 HEDIS dataset.[9] Plans report on a standardized set of performance measures using detailed specifications and after undergoing an independent audit.[10] This study includes data from all reporting plans (including some plans not accredited by NCQA that submit data but do not allow public reporting of individual plan data). More than 66% of commercial health plans report to NCQA, representing 85% of the commercially enrolled managed care organization (MCO) population. Of the 316 commercial plans that reported in 2003 (for care received during calendar year 2002), a total of 254 representing 83% of commercial MCO enrollees were eligible for these analyses. Sixty-one plans were excluded because of missing values for the dependent variables (n = 28), member characteristics derived from Consumer Assessment of Health Plans (CAHPS®) 3.0H (n = 10), or values for 4 or more quality measures (n = 23); 1 other plan was excluded because of extreme outlier observations. Submission of HEDIS data (including CAHPS surveys) is voluntary, and some plans choose to submit data for only a portion of HEDIS measures. The excluded plans were less likely to be accredited by NCQA (30.6% of excluded plans compared with 70.9% of plans in this analysis) and had fewer members. Plans from the South Central and Pacific regions were more likely to be excluded and plans from Mid-Atlantic were more likely to be in the analysis group. The memberships of plans also differed: excluded plans had a higher proportion of members who belonged to a minority race (25.3% in the excluded group vs 18.6% in the analysis group) or who had poor or fair health status (9.9% in the excluded group vs 8.8% in the analysis group).

Measures

The utilization measures were restricted to adult plan members aged 20 to 64 years because the selected quality measures reported by commercial plans are most robust for the adult population in that age range. Commercial plans generally have small and highly variable numbers of enrollees aged 65 years and over. This group was excluded to avoid one source of potential bias.

Dependent Variables

Utilization. Dependent variables addressed utilization of care. HEDIS utilization-of-care measures include outpatient use, defined as the number of outpatient visits per 1000 members per year; emergency department (ED) visits, defined as the number of ED visits per 1000 members per year; inpatient discharges, defined as the number of inpatient discharges for medical conditions per 1000 members per year; and inpatient days, defined

the number of inpatient hospital days for medical conditions per 1000 members per year. To approximate as closely as possible utilization that represents discretionary variations in care, we focused on inpatient medical care (excluding surgery, maternity, and mental health/substance abuse care) because this category showed the greatest variation across entities and markets in previous studies.[3,4] Likewise, the outpatient-visit measure excluded visits for ambulatory surgery/procedures and observation-room stays that resulted in discharge, as well as visits for mental health or substance abuse care.

Independent Variables

Quality. Health plan quality indicators were limited to those available in the HEDIS 2003 effectiveness-of-care domain. Detailed specifications for these measures can be found in HEDIS volume 2: *Technical Specifications.*[9] Preliminary bivariate correlations (data not shown) indicated a high degree of inter-correlations among a subset of the measures (eg, breast and cervical cancer screening) and within measures with multiple indicators for a single illness (eg, diabetes care, cholesterol management, antidepressant medication management, and follow-up for mental illness). For the measures that were strongly correlated (ie, breast cancer screening and cervical cancer screening, $r = 0.62$), only 1 measure was chosen to be included in the analyses. For the measures with multiple indicators that also were moderately to highly correlated with each another, such as 6 comprehensive diabetes care measures, only 1 indicator was selected for inclusion. Where available, we selected outcome measures (such as a glycosylated hemoglobin level < 9.5% for persons with diabetes) because these capture the full range of measured experience. A total of 10 quality measures were included. An exploratory factor analysis suggested that the items loaded on a single factor. Thus, we developed a single quality composite by taking the mean of scores across the 10 quality measures. To retain as many observations as possible, missing values for the quality measures were substituted with the regional mean. Values were substituted for 2% to 18% of the plans, depending on the quality measure. Missing values occurred when plans did not have enough eligible members to report the measure (n = 42 plans for beta-blocker treatment) or have elected not to collect the information (n = 31 for blood pressure control).

The quality composite had a mean of 67.4% (SD = 5.0%), range 51.2% to 79.0%, and the internal-consistency reliability of the scale was good (Cronbach's alpha = 0.80). Descriptive statistics for the 10 quality measures and the quality composite are shown in **Table 1.**

Table 1. Description of Quality Measures and Rates (n = 254)*

Measure	Numerator	Denominator	Mean ± SD, % (Range)
Advising smokers to quit	Received advice from provider on smoking cessation	Self-identified smokers aged 18 years or older	67.9 ± 5.1 (54.5, 83.4)
Appropriate medications for people with asthma	Dispensed prescription for at least 1 steroidal/anti-inflammatory medication	Persons age 18 to 56 years diagnosed with asthma	68.8 ± 5.6 (45.8, 83.4)
Beta-blocker after heart attack	Received prescription for beta-blocker within 7 days of discharge	Persons aged 35 years or older discharged alive with AMI	93.8 ± 7.6 (8.6, 100.0)
Controlling high blood pressure	Maintained blood pressure of ≤140/90 mm Hg	Persons aged 46 to 85 years diagnosed as hypertensive	58.9 ± 8.0 (26.9, 83.0)
Breast cancer screening	Received a mammogram in past 2 years	Women aged 52 to 69 years	75.9 ± 5.4 (55.5, 88.6)
Cholesterol management	Control of LDL-C level to <130 mg/dL	Persons aged 18 to 75 discharged alive for AMI, CABG, or PTCA	62.4 ± 12.2 (8.8, 91.8)
Comprehensive diabetes care	Control HbA_{1c} level to < 9.5[†]	Persons aged 18 to 75 years diagnosed with diabetes	67.9 ± 11.4 (11.1, 96.7)
Antidepressant medication management	Continued antidepressant medications for 84-day acute-treatment phase	Persons aged 18 years or older diagnosed with depression	60.1 ± 7.8 (30.0, 90.2)
Flu shots	Received an influenza vaccination	Persons aged 50 to 64 years	44.4 ± 7.6 (15.8, 64.9)
Follow-up after hospitalization for mental illness	Received follow-up with mental health practitioner 30 days after hospital discharge	Persons aged 6 years or older hospitalized for mental illness	73.7 ± 9.7 (36.2, 97.6)
Quality composite	Mean of items above		67.4 ± 5.0 (51.2, 79.0)

*AMI indicates acute myocardial infarction; CABG, coronary artery bypass graft; HBA_{1c}, glycosylated hemoglobin; LDL-C, low-density lipoprotein cholesterol; PTCA, percutaneous transluminal coronary angioplasty.
[†]Note: Health Plan Employer Data and Information Set specifications report "poor control" as the proportion of diabetic patients with HbA_{1c} levels of 9.5% or higher. For this study, the poor HbA_{1c} control rate was subtracted from 100 to maintain consistency in scale and direction.

Covariates. A limited number of variables are available to describe the plans and their member populations. The percentage of female members and the age distribution of plan members were derived from health plan enrollment data. We also used data from CAHPS 3.0H as an estimate of member-level characteristics of race, education, and health status. The CAHPS survey is administered via mail and/or telephone surveys to a random sample of health plan members following a standardized protocol, and the average response rate is 42%.[11] Using CAHPS data, we identified the proportion of health plan respondents who reported their race as minority (including black, Asian or Pacific Islander, and other) compared with those reporting their race as white; the proportion with any college education (including those with some college or a 2-year degree, those with a 4-year college degree, and those with a more-than-4-year college degree) compared with those who reported a high school education or less; and the proportion with fair or poor health status (based on a single item self-rating health as excellent, very good, good, fair, or poor).

Other health plan characteristics are collected as part of the NCQA data submission process. Plans indicate whether or not they will allow public reporting of their HEDIS performance data, whether their tax status is for profit or not for profit, and whether they offer a HMO product only versus offering a point-of-service (POS) product only, or both HMO and POS products. The geographic location of the plan's primary business was categorized by census regions. Because a small number of plans included in this report (7.1%) have

Table 2. Characteristics of Plan (n = 254)

Characteristic	Percentage or Mean (SD)
Plan	
Type of plan = HMO only	30.3%
Reporting status = not publicly reporting	8.7%
For-profit status	70.1%
Region	
East North Central	22.8%
Mountain	9.5%
New England	10.2%
Mid-Atlantic	15.8%
Pacific	8.7%
South Atlantic	16.7%
South Central	15.4%
West North Central	8.7%
Member	
Age of membership	
<20 y	30.1%
20-44 y	40.2%
45-64 y	27.4%
≥65 y and older	1.7%
Female	51.8%
Nonwhite	18.6%
Health status fair or poor	8.8%
Education more than high school	34.3%
Utilization rate	
Outpatient visits per 1000 member-years	3905.2 (4214.7)
Emergency department visits per 1000 member-years	188.8 (217.0)
Medical discharges per 1000 member-years	25.6 (6.8)
No. of hospital days per 1000 member-years	91.3 (24.1)

membership in multiple regions, we randomly assigned such plans to a single region.

Analysis

All analyses were conducted using SAS 8.0 software (SAS Institute Inc, Cary, NC). We examined the bivariate relationship between the utilization measures and the quality measures using unadjusted Spearman correlations. Multivariate analyses were conducted to estimate the relationship of quality to utilization while controlling for plan and member characteristics. Covariates include plan region and profit status; we did not include plan accreditation or public reporting status because these measures are known to be related to quality,[12] and we wanted to control for measures that would bias comparisons of utilization and quality but not mask them. Patient covariates included age, sex, minority status, and health status. Due to the skewness of the utilization measures that are typical of utilization distributions, we used a logarithmic transformation of these measures and conducted a linear regression on the transformed dependent variables.[13] To evaluate the overall quality of our models, we calculated McFadden's R^2 statistic, also known as the likelihood-ratio index.[14] It compares the likelihood for the intercept-only model to the likelihood for the model with all the covariates.

RESULTS

Table 2 presents descriptive information on the plans and their membership. Most plans were for profit (70.1%) and had POS or combined HMO/POS products (69.7%), nearly all allowed public reporting of data (91.3%), and the largest numbers of plans came from the eastern regions.

The unadjusted Spearman correlations between individual quality measures and utilization measures are shown in **Table 3**. Several quality measures were positively correlated with outpatient visits, including advising smokers to quit ($r = .22$, $P = .0004$), asthma medication management ($r = 0.19$, $P = .0032$), breast cancer screening ($r = 0.20$, $P = .0019$), and the quality composite ($r = 0.19$, $P = .0032$). Several quality measures were negatively associated with ED visits, including asthma medication management ($r = -0.24$, $P = .0001$), cholesterol control ($r = -0.20$, $P = .0014$), acute-phase antidepressant treatment ($r = -0.22$, $P = .0004$), flu shots ($r = -0.23$, $P = .0003$), and the quality composite ($r = -0.18$, $P = .0034$). All quality measures except blood pressure control were significantly and negatively correlated with both mean inpatient discharges and mean inpatient days per 1000 enrollees. For example, mean inpatient days per year had a correlation of -0.35 ($P < .0001$) with the quality composite and ranged from -0.16 ($P = .014$) for mental health follow-up after hospitalization to -0.42 ($P < .0001$) for antidepressant medication management.

Multivariate regression results controlling for the available plan-level and member-level variables are shown in **Table 4**. Plans with higher quality composites had fewer hospital discharges (beta = -0.6900, $P = .04$) and fewer hospital days (beta = -0.7781, $P = .0207$). The associations of quality with outpatient visits (beta = 0.5702, $P = .13$) and ED use (beta = -0.4735, $P = .37$) were similar in direction but not statistically significant.

Table 3. Unadjusted Correlations Between Utilization Measures and Individual Quality Measures*

Quality Measures	Utilization Among Adult Members Aged 20 to 64 y			
	Outpatient Visits per 1000 Member-Years (n = 248)	ED Visits per 1000 Member-Years (n = 251)	Medical Discharges per 1000 Member-Years (n = 252)	No. of Hospital Days per 1000 Member-Years (n = 252)
Advising smokers to quit	0.22[†]	−0.12	−0.26[†]	−0.22[‡]
Asthma medication management	0.19[‡]	−0.24[†]	−0.26[†]	−0.30[†]
Beta-blocker after heart attack	0.09	0.00	−0.21[†]	−0.20[‡]
Blood pressure control	0.08	0.01	−0.06	−0.04
Breast cancer screening	0.20[‡]	−0.07	−0.28[†]	−0.30[†]
LDL-C control	0.12	−0.20[‡]	−0.17[‡]	−0.18[‡]
Diabetic HbA_{1c} control	0.10	−0.10	−0.20[‡]	−0.23[†]
Acute-phase antidepressant treatment	0.01	0.22[†]	−0.46[†]	−0.42[†]
Flu shots	0.09	−0.23[†]	−0.29[†]	−0.30[†]
Mental health inpatient follow-up within 30 days	0.15[§]	−0.06	−0.17[‡]	−0.16[§]
Quality composite	0.19[§]	−0.18[‡]	−0.36[†]	−0.35[†]

*ED indicates emergency department; HBA_{1c}, glycosylated hemoglobin; LDL-C, low-density lipoprotein cholesterol.
[†] $P < .001$.
[‡] $P < .01$.
[§] $P < .05$.

The parameter estimates indicate that an improvement of 5 percentage points in the quality composite (about 1 standard deviation) was associated with an approximately 5% reduction in the average number of hospital days (4 days of care per 1000 enrollees). Although member characteristics were significantly associated with several of the utilization measures, there was not a consistent effect across all of the measures. Regional effects were seen for all utilization measures, with region having the most pronounced effect on the hospitalization rates. For example, the Mountain, Northeast, and Pacific regions were associated with less hospital use.

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DISCUSSION

Commercial health plans that achieved higher performance on measures of quality tended to have lower hospitalization rates. Although plan quality scores were positively correlated with outpatient use and negatively correlated with ED visits in bivariate analyses, these associations were not significant after adjusting for plan and member characteristics in multivariate analyses. The finding of no association between quality and outpatient utilization may reflect our inability to separate

primary care visits from subspecialty care. Subspecialty visits were negatively correlated with quality in the Medicare program.[5] These results suggest that some plans appear to be able to achieve similar levels of quality with lower utilization.

The inverse relationship between health plan quality and hospital utilization is striking and supports the region-level findings of Fisher et al in the Medicare population.[3,4] The mechanism for this relationship is unclear. Strong correlations between quality measures and hospital days were found for several measures that could be expected to directly reduce hospital days, such as medication management for asthma ($r = −0.30$) and flu shots ($r = −0.30$); however, a similarly strong relationship was found for breast cancer screening ($r = −0.30$). The strong relationship between antidepressant medication management and hospital days ($r = −0.42$) is interesting because the inpatient measure focused on medical discharges and did not include stays for mental health and substance abuse care. However, a growing literature documents the negative impact of depression on the outcomes of chronic medical conditions such as diabetes and heart disease, although studies to date have not demonstrated

Table 4. Regression Results: Relationship of Quality to Utilization Measures

Parameter	Outpatient Visits per 1000 Member-Years (n = 248)		Emergency Department Visits per 1000 Member-Years (n = 251)		Medical Discharges per 1000 Member-Years (n = 252)		No. of Hospital Days per 1000 Member-Years (n = 252)	
	Estimate	P Value	Estimate	P Value	Estimate	P Value	Estimate	P Value
Intercept	6.4121	<.001	4.6808	<.001	3.1607	<.001	3.3488	<.001
Quality Composite	0.5702	.1275	−0.4735	.3677	−0.6900	.0365	−0.7781	.0207
Member characteristics								
% Poor health status	1.3648	.0425	1.9264	.0432	0.8331	.1634	0.3897	.5236
% Minority	0.0071	.9557	0.2260	.2158	0.3769	.0010	0.4721	<.001
% Age 45–64 y	0.8354	.0866	0.7269	.2852	2.0605	<.001	2.1659	<.001
% Female	1.9803	.1059	0.3895	.8252	−0.8340	.4510	0.9465	.3958
% Education beyond high school	0.1097	.7063	0.4726	.2601	1.1149	<.001	1.3808	<.001
Plan characteristics								
HMO only	−0.0679	.0258	−0.1234	.0035	−0.0326	.2247	−0.0095	.7269
For-profit status	0.0029	.9190	0.0307	.4461	−0.0411	.1088	−0.0210	.4155
Region								
East North Central	−0.0342	.5874	0.2382	.0038	−0.0727	.1557	0.0154	.7732
Mid-Atlantic	0.0794	.1500	0.0827	.2851	0.009	.8443	0.1816	.001
Mountain	−0.0749	.2728	−0.1352	.1739	−0.2226	.0002	−0.1976	.0016
New England	0.1370	.0251	0.2697	.0022	−0.1711	.0020	0.0353	.5325
Pacific	−0.0599	.3453	−0.0999	.2551	−0.4903	<.001	−0.4323	<.001
South Atlantic	0.0841	.1342	0.1472	.0577	0.0091	.8437	0.0801	.0966
South Central	0.0561	.3786	0.1575	.0676	0.0229	.6565	0.1676	.0017
West North Central	Referent		Referent		Referent		Referent	
R^2	0.208		0.242		0.589		0.641	

whether improving depression treatment leads to improved outcomes.[15-18]

Importantly, although this cross-sectional study demonstrated correlations between higher quality care and reduced hospital days, it did not identify a causal relationship between these measures. There are several competing explanations for these findings based on plan management and patient selection. It may be that health plans achieving high levels of performance on HEDIS quality measures are better organized, both in their management of hospitalization days and in the processes that contribute to high scores on HEDIS measures of clinical effectiveness. Organized systems that allow plans to identify patients in need of preventive services, to assist patients with chronic conditions in obtaining appropriate follow-up, and to plan and coordinate care for patients at risk of hospitalization could enable plans to deliver better quality care and avoid costly inpatient days. In addition, these findings may reflect the selective enrollment of healthier patients at health plans that achieve higher quality scores. Because HEDIS data are aggregated at the health plan level, we relied on CAHPS data as a proxy for the socioeconomic and health status of the health plan membership. This approach offered only limited ability to control for differences in case mix. Further research is needed to identify potential mechanisms that might explain the relationship between quality and utilization seen here.

Regional differences in utilization reported here are consistent with prior research that has demonstrated great variation in use of hospital care. Residence in areas with greater per capita numbers of hospital beds is associated with higher hospitalization rates without positive benefits for mortality rates.[19] Although our analysis controlled for health plan region in isolating the effect of quality on utilization, further work to disentangle a potential "quality effect" from the "supply effect" on utilization would help inform the policy debate on strategies to reduce

unnecessary utilization and costs without sacrificing quality.

These results have several limitations. The cross-sectional analyses cannot sort out the temporal relationship between quality and utilization. Given the limited data available on utilizations, we cannot conclude that lower utilization rates lead to lower costs of care because intensity of care may differ. Although 19.6% of plans reporting HEDIS data were ineligible for this analysis due to insufficient data, these exclusions had small impact on the overall proportion of the managed care population represented and likely limited the range of quality scores, making it more difficult to find a significant relationship between quality and utilization.

These findings, despite their limitations, demand additional attention to determine whether some plans are able to achieve high levels of quality for similar populations with less resource utilization, and if so, what distinguishes these plans from others, so that we can work to encourage efficient, high-quality practices. If supported through further research and replication, there is the potential to obtain the benefits anticipated by the Institute of Medicine in *Crossing the Quality Chasm,* which envisioned restructuring the healthcare system to address both quality and costs simultaneously.[20] Certainly, the HEDIS performance data used in this report demonstrate ample room for improving quality, with health plans achieving high-quality performance only about two thirds of the time. Although achieving higher quality may not be free,[21] these data give hope that improvements in effectiveness of care may reduce both the human costs of poor care and their financial implications as well.

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