

# Effect of Hospital Utilization Review on Medical Expenditures in Selected Diagnostic Areas: An Exploratory Study

## ABSTRACT

Quarterly claims data on 43 insured groups were analyzed through multivariate techniques to explore whether the effects of hospital inpatient utilization review vary across selected broad diagnostic areas. Findings suggest that utilization review was associated with decreases in expenditures of approximately 15 percent for diagnoses within the surgical area, a lesser decrease within the mental health area, and still lesser decrease within the medical area. However, these measurements are imprecise both because of the small numbers and the aggregated diagnoses in each category. (*Am J Public Health* 1991;81:482-484)

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### Introduction

Hospital inpatient utilization review (UR) has assumed a prominent role as a private cost containment activity<sup>1,2</sup>; 65 percent of group insurance plans now operate under some form of UR.<sup>3</sup> UR evaluative research has produced mixed results,<sup>4</sup> with some studies finding large reductions in hospital use associated with UR<sup>5-10</sup> and other studies finding little if any effect.<sup>11-15</sup> Unfortunately, many of the UR evaluations suffer from methodological problems that raise questions about the reliability of the findings.<sup>4,16</sup>

One recently initiated study, conducted by the present author and colleagues, used multivariate techniques to analyze claims data on 223 insured groups. The study found UR was associated with significant reductions in hospital admissions, inpatient expenditures, and total medical expenditures.<sup>17,18</sup> However, the question of whether UR may have different effects across diagnostic categories was not examined, nor has this question been examined by other studies. The purpose of this paper is to report the findings of such an analysis.

### Methods

The UR program analyzed, described in more detail elsewhere,<sup>19</sup> was established in 1983 by CNA Insurance Companies of Chicago and made available to policyholders as a benefit plan option. It consists of preadmission authorization and concurrent review and is compulsory for all employees and dependents. Patients failing to comply with UR procedures are subject to financial penalties. Physicians and hospitals are not subject to penalties.

The unit of observation for the analysis is the insured group. Expenditure data covering the period 1984 through 1986 were collected for selected diagnostic categories on 43 groups that adopted UR after operating without any cost containment program. Well-distributed geo-

graphically and representative of the under-65 population in terms of hospital use, these groups were selected for study because they provide longitudinal data (pre and post-UR data) that permit the use of an efficient method of analysis. (Because of resource limitations, it was not possible to collect claims data by diagnosis for all 223 groups included in the larger study.) The average group includes approximately 1,300 insureds, comprising 550 employees and 750 dependents.

Quarterly claims data on the 43 groups were pooled, making 443 usable and complete observations available for analysis. To examine the effects of UR across diagnostic areas, measures were created representing mental health services, medical services, and surgical services. These measures were constructed by summing expenditures over selected diagnostic categories for which the insurance carrier routinely collected claims data. The term diagnostic area is somewhat imprecise. In general, it represents a set of conditions for several related ICD-9-CM diagnostic categories, but it bears no direct relationship to diagnosis related groups (DRGs) or other diagnostic classifications.

For the *mental health area*, expenditures were summed over alcohol, drug abuse, psychoses, and neuroses. For the *medical area*, expenditures were summed over diabetes, hypertension, infectious and allergy diseases, obstructive pulmonary disease, viral infections, and cutaneous diseases of the skin. For *surgical services*, expenditures were summed over benign neoplasms, diseases of the esophagus and stomach, diseases of the bones and cartilage, and musculoskeletal injuries.

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Descriptive information on the expenditure measures is presented in Table 1. The measures, which capture all inpatient as well as outpatient covered charges, represent services accounting for approximately 40 percent of total nonobstetric expenditures. Surgical services have the largest proportion of cases (28 percent) with quarterly expenditures over \$30 per insured person. Included in the analysis is a set of 16 covariate factors, described in detail elsewhere,<sup>19</sup> representing employee population characteristics, health care market factors, and benefit plan features (see Appendix).

UR is measured by a binary variable that takes on a value of 1 if a group operated under UR during a given quarter, and 0 otherwise. It was not possible to distinguish preadmission authorization from concurrent review for purposes of analysis.

Ordinary least squares (OLS) regression was used to estimate a covariance model, constructed by differencing each observation from its time mean.<sup>19-21</sup> This model, which uses within-group (over time) variance to identify parameters, produces the same estimates as the standard fixed-effects (or least squares dummy variable) model but does not require inclusion of group-specific dummy terms, thereby saving degrees of freedom and improving computational efficiency. Since aggregate data collected over time were being analyzed on groups differing in size, procedures were performed to test for heteroscedasticity<sup>22</sup> and serial correlation.<sup>23</sup> The model's error terms were found to be heteroscedastic, and a standard weighting procedure was performed on the data to correct the standard errors. Specification tests revealed no evidence of serial correlation.

Three equations were estimated, one for each of the three services, with the covariate factors and the UR term included on the right hand side of the equations, in addition to a set of quarter dummy variables included to control for unmeasured temporal factors.

## Results

The results of the analysis are presented in Table 2. As indicated, UR was associated with somewhat lower expenditures ( $p < .07$ ) in the surgical area; after adopting UR the average group's expenditures for this diagnostic area declined by approximately 15 percent. This estimated percentage reduction implies an absolute reduction in surgical expenditures of ap-

TABLE 1—Descriptive Information on Dependent Measures (N = 433)

Measures	<\$10.00 per Insured Person per Quarter <sup>a</sup>	\$10.00 to \$19.99 per Insured Person per Quarter	\$20.00 to \$29.99 per Insured Person per Quarter	>\$30.00 per Insured Person per Quarter
Expenditures on Medical Services <sup>b</sup> (%)	109 (25)	184 (43)	88 (20)	52 (12)
Expenditures on Surgical Services (%)	57 (13)	148 (34)	106 (25)	122 (28)
Expenditures on Mental Health Services (%)	226 (52)	76 (18)	60 (14)	71 (16)

a) Expenditure data were adjusted by the Medical Care Price Index (MCPI) to reflect January 1985 prices.  
b) The means and standard deviations (SD) for the three measures are: 1) Medical Expenditures, mean \$17.78, SD \$12.06; 2) Surgical Expenditures, mean \$25.55, SD \$21.32; and 3) Mental Health Expenditures, mean \$16.16, SD \$20.83.

TABLE 2—The Effects of UR on Expenditures for Three Diagnostic Areas: Mental Health, Medical, and Surgical Services (N = 433)

Measures <sup>a</sup>	Medical Expenditures	Surgical Expenditures	Mental Health Expenditures
Intercept	0.142* (0.087) <sup>b</sup>	0.131 (0.095)	0.261 (0.244)
% Female Employees under Age 30 <sup>c</sup>	0.100 (0.173)	0.134 (0.193)	-0.204 (0.489)
% Male Employees Ages 30 to 50	0.023 (0.046)	0.058 (0.051)	0.157 (0.131)
% Female Employees Ages 30 to 50	0.005 (0.137)	-0.105 (0.152)	0.428 (0.386)
% Male Employees over Age 50	0.012 (0.029)	0.024 (0.032)	-0.015 (0.081)
% Female Employees over Age 50	-0.155 (0.300)	0.033 (0.332)	-0.597 (0.845)
% Childbirth/Pregnancy Expenditures	-0.901* (0.563)	-0.277 (0.623)	-0.086 (1.585)
% Heart Disease Expenditures	-0.298 (0.635)	-0.164 (0.703)	0.648 (1.789)
HMO Penetration Rate	0.015 (0.026)	0.037 (0.028)	-0.015 (0.072)
Office-Based Physicians per 1,000 Population	1.265 (0.917)	-0.822 (1.014)	-1.466 (2.584)
% General Practice Physicians	-2.246 (1.956)	-1.397 (2.164)	-0.841 (5.511)
Hospital Occupancy	-0.028** (0.013)	-0.029* (0.015)	-0.038 (0.037)
% Charges Covered for Semi-Private Room	0.001 (0.002)	-0.001 (0.003)	0.010 (0.007)
% Charges Covered for Hospital Outpatient Services	0.004 (0.003)	-0.000 (0.004)	-0.021** (0.010)
% Charges Covered for Physician Office Services	0.002 (0.005)	-0.001 (0.006)	-0.014 (0.016)
Deductible	-0.014 (0.017)	0.034* (0.019)	0.084* (0.049)
Utilization Review <sup>d</sup>	-0.062 (0.097)	-0.157* (0.108)	-0.146 (0.274)

NOTE: R<sup>2</sup> is not shown because this does not provide a meaningful indication of the model's explanatory power for mean-differentiated equations.  
a) The coefficients of the quarter dummy variables are not included in Table 2 for economy of presentation.  
b) Standard errors are shown in parentheses.  
c) The reference variable is % Male Employees under age 30.  
d) Since the dependent variable is measured in logarithms, the coefficients of the utilization review (dummy) variables can be interpreted as approximate percentage differences. The actual percentage difference in expenditures pre- versus post-UR is slightly lower than indicated by the coefficients. For example, the coefficient -0.157 for the surgical expenditure equation implies a 14.7 percent reduction in expenditures.  
\* $p < .10$ ; \*\* $p < .05$

proximately \$17.25 per insured person per year. Although the estimated UR coefficient for the mental health area is almost as large, it is not statistically significant due to the large standard error estimate. It appears UR has a less important effect on medical expenditures. As Table 2 shows, with few exceptions the covariate factors are not statistically significant.

**Discussion**

This exploratory analysis has sought to contribute to an improved understanding of an important question regarding the effects of hospital UR. The findings suggest UR's effects vary across diagnostic areas, and that UR may be more effective in reducing expenditures on diagnoses likely to involve surgical services than other services, especially medical services. One plausible explanation for this finding is that UR protocols may be better developed for surgical cases than for other cases. To work effectively, UR must have clinical protocols that can be followed and used to establish the need for hospital care. Such protocols may be better developed for surgery than other areas, which may explain, in part, why UR appears to be more effective for cases likely to involve surgical services. However, given the limitations of the data, these findings should be considered preliminary. Future research should conduct analyses using more complete and detailed data to examine this question in greater depth. □

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APPENDIX—Descriptive Information on Covariates Included in the Analysis (N = 433)	
Measures	Mean (Standard Deviation) %
% Female Employees under Age 30	10.1 (8.0)
% Male Employees under Age 30	11.9 (6.8)
% Male Employees Ages 30 to 50	35.2 (9.2)
% Female Employees Ages 30 to 50	18.6 (9.8)
% Male Employees over Age 50	17.3 (10.0)
% Female Employees over Age 50	6.5 (3.7)
% Childbirth/Pregnancy Expenditures <sup>a</sup>	8.1 (7.4)
% Heart Disease Expenditures <sup>a</sup>	4.1 (5.6)
HMO Penetration Rate	11.5 (13.7)
Office-based Physicians	2.3 (1.2)
% General Practice Physicians	13.4 (11.2)
Hospital Occupancy	67.2 (8.7)
Deductible	\$130 (\$52)
% Charges Covered for Semi-Private Room	86.5 (24.3)
% Charges Covered for Physician Office Services	83.7 (16.4)
% Charges Covered for Hospital Outpatient Services	88.2 (20.4)
Utilization Review	0.75 (0.44)

a) Measured as a percentage of total expenditures.