# Effects of Health Care Cost-Containment Programs on Patterns of Care and Readmissions Among Children and Adolescents

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ABSTRACT

*Objectives.* This study examined the effects of a utilization management program on patterns of medical care among children and adolescents.

*Methods.* From 1989 through 1993, the program conducted 8568 reviews of pediatric patients, ranging in age from birth to 18 years. The program used preadmission and concurrent review procedures to review and certify patients' need for care. This study used multivariate analyses to assess changes in the number of days of inpatient care approved by the program and to determine whether limitations imposed on length of stay affected the risk of 60-day readmission.

*Results.* Concurrent review reduced the number of requested days of inpatient care by 3.2 days per patient. Low-birthweight infants and adolescent patients with depression or alcohol or drug dependence accounted for a disproportionate share of the reduction. Patients classified as admitted for medical or mental health care and whose stay was restricted by concurrent review were more likely ($P < .05$) to be readmitted within 60 days after discharge.

*Conclusions.* By limiting care through its review procedures, the utilization management program decreased inpatient resource consumption but also increased the risk of readmission for some patients. Continued investigation should be conducted of the effects of cost-containment programs on the quality of care given to children and adolescents, especially in the area of mental health. (*Am J Public Health.* 1999;89:1353–1358)

Managed care plans and health insurance companies have adopted aggressive cost-containment strategies in response to competitive pressures and to the demand by health care payers for improved cost control. Little is known about the effects of these strategies on the delivery of medical care among adult patients, and almost nothing is known about their effects among children and adolescents.

Utilization management (UM) is one of the most widely used approaches to health care cost containment. Current estimates suggest that health care for more than 90% of adults enrolled in group insurance plans, including health maintenance organizations and preferred provider organizations,[1–3] is subject to UM procedures, as is care for dependent children covered under these health plans. UM programs provide external review and authorization for inpatient care and for selected outpatient procedures. Common UM program activities include preadmission authorization for hospitalization and concurrent review of the need for continued hospitalization.

The aim of UM is to ensure that treatment provided to patients is clinically appropriate and medically necessary.[4,5] Studies documenting high rates of unnecessary and inappropriate inpatient care,[6–8] including inpatient pediatric care,[9] provided the impetus for the establishment of UM programs during the 1980s. Studies show that UM reduces utilization and health care costs,[10–15] but understanding of its effects on health care delivery remains limited.

This study analyzed data on a case series of privately insured pediatric patients, ranging in age from birth to 18 years, whose care was subject to UM review and approval. The study had 2 objectives: to examine the effects of UM on patterns of pediatric care and to determine whether restrictions imposed on length of stay (LOS) by UM review affected the quality of pediatric care, as measured by early readmission. By analyzing a case series of patients whose care was subject to UM, we obtained information on denials and restrictions resulting from UM-mandated preadmission authorization and concurrent review and were able to examine the effects of these restrictions on readmission. Because we did not have population-based comparison data on groups subjected to UM review and those not so subjected, however, we were unable to examine the sentinel effect of UM on admissions.

## Methods

### *Utilization Management Program*

Utilization management was conducted as part of a managed fee-for-service health care plan offered by a large commercial insurance carrier from 1989 onward. More than 500 groups, located in 47 states, adopted the insurance carrier's program with UM to promote cost containment. Health care for dependent children covered under the groups' respective policies became subject to the review procedures of the UM program. The groups to which the UM program applied had

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the same basic insurance benefit plan, which covered 80% of allowed charges to some designated (stop loss) level, usually $2500, and 100% of charges thereafter. Most of these groups were subject to an individual deductible of $150 or $200 and a family deductible of $450 or $600. Mental health inpatient coverage was more variable but was usually limited to 21 to 30 days of care for each instance of inpatient treatment. Nevertheless, differences in benefit coverage had no direct effect on the action taken as a result of UM review, because the latter was undertaken before and independently of physician or hospital reimbursement, which was done according to a claims-examination process.

Utilization management review was compulsory for all patients. Two primary procedures were used to review and approve care: (1) preadmission authorization, which included an outpatient review for selected diagnostic tests and surgical procedures, authorization for admission, and approval of a specified number of days for a patient's initial hospital stay, and (2) concurrent review, which examined requests for the patient's continued hospital stay beyond the initial treatment cycle. All requests for admission or continued hospital stay, regardless of LOS, were subject to UM review and approval. Information needed to conduct the reviews was provided by telephone and written communication. The UM reviews were conducted by a large, well-known UM firm and were done by trained nurse reviewers and physician advisers. Diagnosis-based criteria were used by the UM program to evaluate the appropriateness of care; regional LOS profile data were used to assign the number of days of care approved.

### *Data and Measures*

From 1989 through 1993, 8568 UM reviews were conducted on patients ranging in age from birth to 18 years. We defined the UM review as the unit of observation for our study and selected all 8568 reviews for analysis. Information routinely gathered by the UM program provided the data for our analysis. This included information on outcomes of preadmission review, which were categorized as follows: (1) request for care denied, (2) outpatient care approved as a substitute for requested inpatient care, or (3) inpatient care authorized. We used data on the number of days requested and approved by concurrent review for continued hospital stay (beyond the initial stay approved at the time of admission) to construct a measure of restriction of LOS, defined as the difference between the number of continued-stay days requested and approved. The total number of days approved by the UM program and the actual LOS were identical in almost all cases (>99.5%). Among the 6300 cases reviewed for inpatient care, only 3 patients stayed in the hospital for fewer days than approved, while 14 stayed for more days than approved.

The UM data used in our study included information on the patient's sex, age, geographic region, and primary admitting diagnosis. We used the diagnostic information for a particular patient to classify cases for descriptive analyses and, along with the other variables, to provide covariates for multivariate analyses. In addition to our UM data, we obtained data from the National Hospital Discharge Surveys of 1991 to 1993 to provide comparative LOS benchmarks for our analysis.

To examine the effect on quality of care of limiting utilization through UM review, we defined a patient's first hospital admission as the index admission and then constructed a binary variable that measured the occurrence of readmission within 60 days after discharge of the patient from this initial hospitalization.

### *Statistical Procedures*

We used descriptive statistics to document denials of admission and LOS restrictions imposed by the UM program. We relied on multiple regression analysis to determine whether UM became more restrictive both in approval of the initial treatment cycle through preadmission review and in authorization of continued hospitalization through concurrent review. We did this by first selecting the most common diagnoses subjected to preadmission and concurrent review and then determining for each diagnosis the change in the number of days approved by the UM program that occurred between 1989–1991 ($T_1$) and 1992–1993 ($T_2$), while controlling for age, sex, and geographic region.

We used logistic regression analysis to determine whether restrictions on LOS imposed by concurrent review affected the risk of readmission. Although the relationship between readmission and quality of care is not fully understood, early readmission is considered an important indicator of quality of care.[16–19] We limited our analysis to medical and mental health admissions because these admission categories had sufficient numbers of readmissions and adequate variability in LOS restrictions to permit analysis. Covariates entered in the logistic regression equations included sex, age, geographic region, total days requested for the treatment episode, total number of reviews performed over the study period, and diagnosis. Diagnoses were grouped and coded in the form of dummy variables. For medical cases, the diagnostic categories used were dehydration, respiratory tract infections, pneumonia, asthma, gastroenteritis or colitis, low birthweight, respiratory distress, and other diagnoses not included in the previous categories. For the mental health analysis, the following broad diagnostic categories were used: depression, alcohol or drug dependence, and other mental health diagnoses.

Length-of-stay restriction, defined as the difference between number of days requested and approved for continued hospital stay, was measured as a continuous variable. We report the adjusted odds ratios and 95% confidence intervals associated with LOS restriction for medical (n = 949) and mental health (n = 510) cases in which there was a request for continued hospital stay through concurrent review.

## *Results*

Descriptive information on the 8568 UM cases subjected to UM review and examined in our study is presented in Table 1. The cases were well distributed among the 3 age groups shown. Medical and surgical admissions accounted for the great majority of the cases. Of the 8568 reviews performed, 6300 (73.5%) represented requests for inpatient treatment and 2268 (26.5%) were for outpatient treatment. Although not shown, the most common diagnosis for infants was low birthweight, which accounted for 10.1% of all cases, followed by insertion of ear tubes (8.4%), jaundice (7.1%), and pneumonia (6.0%). Among children aged 2 to 12 years, the most common diagnoses were tonsillectomy or adenoidectomy (25.3%), insertion of ear tubes (6.5%), and asthma (5.4%). The most common conditions among adolescents were depression (10.4%), tonsillectomy or adenoidectomy (6.1%), and routine delivery (5.1%).

### *Preadmission Review*

Nearly all (99.1%) of the 6300 patients requesting authorization for inpatient treatment were approved for admission. Of the 6300 cases reviewed, authorization for admission was denied in 5 cases and outpatient treatment was required to replace inpatient treatment in 51 cases. The UM program was somewhat more aggressive in denying outpatient treatment than in denying hospitalization. Authorization for outpatient care was denied in 85 (3.7%) of the 2268 outpatient cases. Of these 85 cases, 78% were tonsillectomies and 6% were ear tube insertions.

**TABLE 1—Characteristics of Pediatric Patients for Whom Authorization for Medical Care Was Requested Through a Utilization Management Program (n = 8568)**

| Characteristic | No. of Review Cases (%) |
|---|---|
| Age | |
| Infants (birth–2 years) | 2448 (28.6) |
| Children (3–12 years) | 3214 (37.5) |
| Adolescents (13–18 years) | 2906 (33.9) |
| Sex | |
| Female | 3956 (46.2) |
| Male | 4612 (53.8) |
| Diagnostic category | |
| Obstetric | 171 (2.0) |
| Medical | 4246 (49.6) |
| Surgical | 3445 (40.2) |
| Mental health | 706 (8.2) |
| Requested treatment setting | |
| Inpatient | 6300 (73.5) |
| Outpatient | 2268 (26.5) |
| Region | |
| Northeast | 825 (9.6) |
| South | 2773 (32.4) |
| West | 1262 (14.7) |
| Midwest | 3708 (43.3) |
| Year of review | |
| 1989 | 188 (2.2) |
| 1990 | 963 (11.2) |
| 1991 | 2119 (24.7) |
| 1992 | 2682 (31.3) |
| 1993 | 2616 (30.5) |

*Concurrent Review*

Approximately 37% (2356/6300) of the patients reviewed for inpatient treatment required additional care beyond the initial treatment cycle and had 1 or more concurrent reviews performed for continued stay. In 8% of cases such additional care was denied, and in 38% of cases it was approved for fewer days than were requested. Restrictions imposed on LOS by the concurrent review process resulted in a reduction of requested continued inpatient treatment by 7636 days, or 3.2 days per patient. This average figure (3.2 days) was heavily influenced, however, by substantial restrictions imposed on mental health admissions (Table 2). Mental health admissions, which represented 27% of all admissions, accounted for 80% (6118/7636) of the aggregate reduction in requested days; medical admissions (n = 1400) accounted for 18% (1383/7636) of the reduction. The average per-patient reductions in requested inpatient care were 1.0, 0.4, and 9.8 days, respectively, for medical, surgical, and mental health admissions.

Although not shown in Table 2, restrictions imposed by the UM program affected different age groups differently. The greatest reduction in requested hospital days among medical admitted patients (646/1383 days) was for low-birthweight infants (n = 180). Adolescent patients with depression (*International Classification of Diseases, Ninth Revision*, codes 296.2 or 296.3) accounted for 2301 of the 6118 days of restricted mental health care shown in Table 2; adolescent patients with alcohol or drug dependence diagnoses accounted for an additional 1037 days of restricted treatment.

*Changes in the Restrictiveness of Utilization Management Over Time*

Table 3 shows changes in the number of days approved by the UM program through preadmission and concurrent review for selected common diagnoses. For most of the diagnoses analyzed, the number of days approved by the UM program declined significantly. For example, the average patient with asthma had 2.65 days of inpatient treatment approved through preadmission review during the baseline period (1989–1991). During the comparison period (1992–1993), this same patient had 0.33 (12.5%) fewer days approved ($P = .01$). The relative magnitude of decline in the number of days approved for continued stay through concurrent review was greater for mental health than for medical patients, with the decline for depression averaging 6.7 days from a baseline of 15.6 days ($P = .001$). Exogenous changes in LOS within the general pediatric patient population do not explain the changes shown in Table 3. National Hospital Discharge Survey data indicate that the average LOS for male patients under 15 years of age and discharged between 1990 and 1994 increased from 4.8 to 4.9 days; the LOS for females decreased slightly, from 4.9 to 4.7 days.[20]

*Effects of Utilization Management on Readmissions*

To investigate the effects of UM on readmissions, we analyzed medical and mental health cases in which there was a request for continued hospital stay through the concurrent review process. Of 3151 cases representing index (initial) medical admissions, continued hospitalization was requested through concurrent review in 959 (30%). In 79 (8.2%) of these 959 cases of medical admission, the patient was readmitted within 60 days after discharge. Of the 561 cases representing index mental health admissions, continued hospitalization was requested in 510 (91%), and the patients in 30 (5.9%) of these were readmitted within 60 days after discharge.

Pediatric patients with a medical or mental health diagnosis for whom concurrent review reduced LOS were more likely to be readmitted within 60 days. For each day by which concurrent review restricted LOS, the odds of readmission among medical cases increased by 5.8% (odds ratio [OR] = 1.058; 95% confidence interval [CI] = 1.006, 1.113) and among mental health cases increased by 6.9% (OR = 1.069; 95% CI = 1.027, 1.114). Because concurrent review imposed only a small reduction in LOS for the average patient with a medical diagnosis (Table 2), the increased relative risk of readmission for such a patient would translate into only a small increase in absolute risk of readmission. The reduction in LOS for the average mental health patient was larger, at just under 10 days (Table 2), which implies an increased relative risk of readmission of approximately 63%. The baseline readmission rate for the mental health cases analyzed, however, was only 6%, and thus the increase in absolute risk even for these patients would be modest.

Readmissions began occurring shortly after discharge. Approximately half of all readmissions among medical patients whose stay was restricted occurred within 14 days after discharge. Among mental health patients, 45% of readmissions occurred within 21 days after discharge. The great majority of the patients were readmitted for the same diagnosis that led to their initial admission. Among 12 patients with depression who were readmitted, 9 were readmitted with the same diagnosis, while the remaining 3 were readmitted with a diagnosis of drug or alcohol dependency. Among the 18 patients admit-

**TABLE 2—Number of Days Requested and Approved Through Concurrent Review for Pediatric Patients for Continued Inpatient Stay[a]**

| Admission Type[b] | Days Requested[c] | Days Approved[c] | Percentage of Requested Days Approved[c] | Days Reduced[c] | Sum of Reduced Hospital Days |
|---|---|---|---|---|---|
| Medical (n = 1400) | 8.1 (14.2) | 7.1 (13.2) | 89.2 (25.1) | 1.0 (3.8) | 1383 |
| Surgical (n = 319) | 3.8 (4.9) | 3.4 (5.0) | 88.2 (27.2) | 0.4 (0.99) | 135 |
| Mental health (n = 627) | 25.1 (22.1) | 15.3 (17.5) | 58.6 (34.1) | 9.8 (12.5) | 6118 |
| All admissions (n = 2346) | 12.1 (17.8) | 8.8 (14.4) | 80.1 (31.2) | 3.3 (8.2) | 7636 |

[a]Data shown are means, unless otherwise noted; data in parentheses are standard deviations.
[b]Table omits 10 obstetric cases that were subject to concurrent review. All requested continued-stay days were approved for these 10 cases.
[c]Differences among the 3 admission types were statistically significant ($P < .001$).

ted with an initial diagnosis of pneumonia or asthma, 14 (78%) were readmitted with the same diagnosis, 2 were readmitted for surgical procedures involving the middle or inner ear, and the remaining 2 were readmitted for other medical reasons.

## *Discussion*

Health care provided to children and adolescents, like that for adults, has come under intense cost-containment pressure. Although UM has become a key cost-containment strategy of health plans and insurance carriers, there is little understanding of its effects on patterns of care. The UM program we analyzed restricted LOS modestly in relation to requests by physicians for continued inpatient treatment for medical and surgical admissions, by 1.0 days and 0.4 days, respectively. The average restriction in LOS was much greater for mental health admissions, at 9.8 days. On the basis of the reduction in requested hospital days of care, there is little doubt that the UM program promoted cost containment, especially in the area of mental health. In restricting LOS, however, the UM program increased the risk of readmission for patients receiving medical or mental health care. Nevertheless, data relating to the relationship among LOS, readmission, and quality of care are contradictory.[16,21–22] Some studies have reported an increased risk of readmission in association with shorter hospital stays among mental health patients,[23–25] whereas others have reported no effect.[26–28] Further, as noted by Epstein et al.,[29] even if a shorter LOS does increase the risk of readmission, earlier discharge may reflect greater efficiency rather than lower quality if outcomes such as survival, functional status, and return to normal activity are unchanged.

Two important questions arise about the validity of our results: To what extent do patients comply with the UM review decision, and do pediatricians routinely inflate their requested LOS? If physicians do routinely inflate their requests for inpatient care, expecting them to be automatically reduced by the UM process, then our data would have less clinical and policy relevance. Similarly, if patients routinely ignore UM program decisions by staying in the hospital for more days than the program approves, our analysis would be less meaningful. As noted earlier, we found that patients almost always (>99%) adhered to the UM program decision about LOS.

To address the question of whether pediatricians routinely inflate their requested LOS, we examined the median total number

**TABLE 3—Changes in the Number of Inpatient Days Approved for Pediatric Patients by Utilization Management for Selected Diagnoses**

| Type of Review and Diagnosis | Inpatient Days Approved, Baseline Period, 1989–1991 | Change in Inpatient Days Approved, 1992–1993 | 95% CI | *P* |
|---|---|---|---|---|
| **Preadmission review: initial treatment cycle** | | | | |
| Appendectomy (n = 142) | 2.91 | –0.23 | –0.52, 0.57 | .12 |
| Dehydration (n = 182) | 1.83 | –0.46 | –0.71, –0.22 | <.001 |
| Asthma (n = 221) | 2.65 | –0.33 | –0.58, –0.74 | .01 |
| Gastroenteritis (n = 173) | 2.00 | 0.10 | –0.14, 0.35 | .40 |
| **Concurrent review: continued stay, days** | | | | |
| Depression (n = 290) | 15.61 | –6.71 | –10.68, –2.73 | .001 |
| Other mental health diagnoses (n = 234)[a] | 21.84 | –7.13 | –10.65, –3.62 | <.001 |
| Pneumonia (n = 110) | 4.76 | –2.00 | –4.51, 0.14 | .07 |
| Low birthweight (n = 185) | 17.90 | 3.27 | –4.32, 10.86 | .39 |

*Note.* CI = confidence interval.
[a]Includes admissions for adjustment reaction (n = 24), manic depression (n = 23), emotional disturbance specific to childhood (n = 20), and bipolar affective disorder (n = 11).

of days of hospitalization requested by physicians for selected diagnoses and procedures in relation to the LOS of privately insured pediatric patients as reported in the National Hospital Discharge Surveys for 1991 to 1993. These diagnoses and procedures included pneumonia, dehydration, asthma, tonsillectomy with adenoidectomy, appendectomy, routine delivery, depression, and alcohol or drug dependence. To enhance the comparability of the data, we limited selection of cases subjected to UM review and discharge records to groups in the Midwest and South, the two regions in which most of our study population was concentrated.

The median days requested for the diagnoses and procedures examined were reasonably close to the 50th percentile of LOS distribution calculated from the discharge-survey data. The median days requested for pneumonia, dehydration, and asthma were 4, 2, and 3 days, respectively. These figures represent the 65th, 45th, and 56th percentiles for each of the respective LOS distributions. The corresponding values for tonsillectomy, appendectomy, and routine delivery were 1, 3, and 2 days, representing the 50th, 48th, and 50th percentiles, respectively. For patients with recurrent depression or with alcohol or drug dependence, the median days requested represented the 64th and 66th percentiles, respectively. These LOS benchmark comparisons suggest that the pediatricians who treated patients in our study population did not routinely inflate their requests for inpatient care to any significant extent.

The limitations of our study should be noted. First, we had limited information with which to control for differences in severity of illness in our logistic regression analyses. Failure to control for severity of illness would, however, introduce bias into the results only if such severity were correlated with both readmission and LOS restriction. Although severity of illness may be correlated with readmission, one would not expect it to be correlated with limitations on LOS imposed by UM. Key informant interviews conducted by one of us (T.M.W.) among hospital nursing staff members in the Seattle area support this view. The nurses interviewed indicated that it is generally easier to justify the need for continued hospitalization for patients with more severe conditions. Thus, we do not believe that our limited ability to control for differences in severity of illness poses serious problems for our analysis.

Second, our study focused on a single UM program, which may limit the general applicability of our results. A recent study found considerable variability in utilization review procedures used by UM organizations.[30] However, our study population was reasonably large (>8500) and included patients from all 4 census regions of the United States. Indeed, our focus on a single UM firm may actually have increased the internal validity of our study by reducing confounding effects that might have occurred had we studied multiple UM programs with different review procedures. In all of the cases we studied, the patient's care was subjected to the same review procedures, based on a single set of clinical protocols. Nevertheless, caution should be used in generalizing the results of our analysis.

Controlling medical care utilization will remain an important cost-containment objective for both public and private health care payers as well as for health plans and health insurance carriers. Cost-containment programs, such as the UM program we studied, may reduce unnecessary care, thus promoting more efficient resource consumption. Such programs may, however, also have unintended effects on the delivery of health care. Further analyses will be needed to determine the impact of UM and other cost-containment programs on the quality and outcomes of care. Only with a more complete understanding of this effect can judgments be made about the long-term value of current approaches to cost containment. □

## Contributors

T. M. Wickizer planned the study, analyzed the data, and wrote the paper. D. Lessler assisted in designing the study and analyzing the data. J. Boyd-Wickizer conducted the literature review, developed the diagnostic code categories, and assisted in planning the data analysis. Both D. Lessler and J. Boyd-Wickizer contributed to the writing of the paper.

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