Cost and Predictors of Hospitalizations for Ambulatory Care - Sensitive Conditions Among Medicaid Enrollees in Comprehensive Managed Care Plans

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Abstract

Introduction: Preventable hospitalizations are responsible for increasing the cost of health care and reflect ineffectiveness of the health services in the primary care setting. The objective of this study was to assess expenditure for hospitalizations and utilize expenditure differentials to determine factors associated with ambulatory care - sensitive conditions (ACSCs) hospitalizations.

Methods: A cross-sectional study of hospitalizations among Medicaid enrollees in comprehensive managed care plans in 2009 was conducted. A total of 25 581 patients were included in the analysis. Expenditures on hospitalizations were examined at the 50th, 75th, 90th, and 95th expenditure percentiles both at the bivariate level and in the logistic regression model to determine the impact of differing expenditure on ACSC hospitalizations.

Results: Compared with patients without ACSC admissions, a larger proportion of patients with ACSC hospitalizations required advanced treatment or died on admission. Overall mean expenditures were higher for the ACSC group than for non-ACSC group (US$18 070 vs US$14 452). Whites and blacks had higher expenditures for ACSC hospitalization than Hispanics at all expenditure percentiles. Patient's age remained a consistent predictor of ACSC hospitalization across all expenditure percentiles. Patients with ACSC were less likely to have a procedure on admission; however, the likelihood decreased as expenditure percentiles increased. At the median expenditure, blacks and Hispanics were more likely than other race/ethnic groups to have ACSC hospitalizations (odds ratio [OR]: 1.307, 95% confidence interval [CI]: 1.013-1.686 and OR 1.252, 95% CI: 1.060-1.479, respectively).

Conclusion: Future review of delivery and monitoring of services at the primary care setting should include managed care plans in order to enhance access and overall quality of care for optimal utilization of the resources.

Keywords
ambulatory care - sensitive conditions, primary care, hospital expenditure, Medicaid, preventable hospitalizations

Introduction

Prevention of unnecessary hospitalizations and rehospitalizations has become an important area of focus in the era of cost consciousness and accountability in health-care services.¹ Due to the nature and complexity of care involved in inpatient settings, hospitalizations have increasingly been viewed as an aspect of care where efforts for cost containment could be applied with success in cost reductions and continuous quality improvements. For example, the attention paid to the problems of excessive readmission rates and preventable hospitalizations are reflective of this effort and have eventually paved the way

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for new reimbursement policies for providers and systems of care to be considered as part of the strategy for cost savings. Specifically, identification of conditions for which hospitalizations could potentially be avoided has made it possible for investigators to determine factors and cost for these types of hospitalizations. These conditions, technically known as ambulatory care-sensitive conditions (ACSC), are defined as conditions that lead to a hospital admission of which the onset could have been prevented through a more easily accessible ambulatory sector or one that provides better quality care.\textsuperscript{2-4} The Agency for Healthcare Research and Quality (AHRQ) has produced a list of conditions that meet the definition of ACSC.\textsuperscript{5} Patients, providers, and systems of care use information on inpatient service utilization on ACSC as a measure of quality for primary care services.

Previous studies have investigated cost implications of ACSC based on patient populations in hospital settings, community settings as well as in state representative samples and found inpatient service utilization associated with these conditions is likely to increase cost and decrease efficiency in the process of care. A study that investigated the incidence of preventable hospitalizations associated with medication adherence in patients with hypertension found that a total of US$41 million was paid in a span of 8 years for potentially preventable hospitalizations.\textsuperscript{6} A similar study involving diabetic patients revealed that 20\% of hospitalizations that occurred among adults aged 65 years and older were potentially preventable, and the total cost involved was more than US$1 billion.\textsuperscript{7} A statewide study of hospital admissions based on the California State Inpatient Database showed that being black or admitted to the emergency department increased the odds of ACSC admissions. In this study, however, having Medicare decreased the odds of ACSC admission.\textsuperscript{2} In the state of Tennessee, rates of admissions for ACSC were found to be higher than the national average, and the problem was disproportionately affecting the uninsured and those enrolled in the state’s Medicaid managed care program.\textsuperscript{8}

Despite the numerous measures that have been implemented to address the problem of preventable hospitalizations, the health system has not sufficiently examined its interventional strategies to identify any factors which could limit the success of ongoing efforts such as managed care in primary care settings. The current study examines hospitalizations involving ACSC based on the experience of Medicaid populations; the aim of the study is to assess cost and use hospital expenditure differentials to determine predictors of hospitalizations involving ACSC among Medicaid enrollees in comprehensive managed care plans. To our knowledge, this is the first study that has applied this approach in investigating ACSC hospitalizations in a Medicaid population. We focused on ACSC hospitalizations because they may be indicative of deficiencies in access and utilization of primary care services among individuals in the target populations and could be responsible for increased volume of avoidable hospitalizations and preventable cost of care. Moreover, growing trends of ACSC hospitalizations become more alarming when they occur among individuals enrolled in managed care plans that are specifically designed to coordinate care and potentially prevent unfavorable trends of cost and service use.

**Methods**

**Study Population**

We conducted a retrospective cross-sectional study of service utilizations among Medicaid beneficiaries in 3 large states representing West, South, and Midwest regions of the United States. These states were selected to create a geographical diversity of the enrollees and give the analysis adequate power for generalization of the findings. De-identified CMS Medicaid Analytic eXtract (MAX) data system for the year 2009 was used to investigate the experience of the patients based on hospitalizations reported in the study year. The MAX data contain detailed person-level clinical and nonclinical information on beneficiaries including service utilization and expenditures incurred in any given year of coverage.

**Patients in the Sample**

The data used in our analysis consisted of Medicaid enrollees who received primary care services in managed care plans. In 2009, there were 262 144 cases of hospitalizations in the 3 states included in the study. We excluded patients whose encounters could not be matched with service plans (16 323), patients whose records were not classified as encounter records (210 266), and patients whose managed care status was unknown (334). Eventually, we included in the sample only those hospitalizations occurring among individuals aged between 18 and 64 years old. The final sample for our analysis consisted of 25 581 hospitalizations that occurred among individuals enrolled in comprehensive Medicaid managed care programs.

**Variables and Definitions**

Our primary dependent variable was ACSC-related hospitalizations as assessed by the primary diagnosis codes reported at the time of admission. This variable was treated as a dichotomous variable, measuring occurrence or nonoccurrence of ACSC-related hospitalization in the target population. International Classification of Diseases codes, Ninth Revision, were used to determine ACSC in classes of conditions also defined by the AHRQ as prevention quality indicators. Several clinical and demographic variables were used as covariates. Demographic variables included gender, race, and age. Clinical variables included length of stay (LOS), expenditure level (low expenditure, below 25th percentile; medium expenditure, between 25th and 75th percentile; and high expenditure, above 75th percentile), patient status (whether the patient was discharged or needed further care or died during admission), and procedure (whether or not the patient had procedure on admission).
Table 1. Clinical and Demographic Characteristics of the Sample.

| Variables                  | ACSC Hospitalizations (N = 1918) | Non-ACSC Hospitalizations (N = 26 663) |
|----------------------------|-----------------------------------|---------------------------------------|
| Women, n (%)               | 1410 (73.5)                       | 24 578 (92.2)                        |
| Age, mean (SD)             | 44.49 (12.98)                     | 30.23 (11.58)                        |
| Race, n (%)                |                                   |                                       |
| Whitea                     | 803 (41.9)                        | 9869 (37.0)                          |
| Blacka                     | 798 (41.6)                        | 13 874 (52.0)                        |
| Hispanicb                  | 148 (7.7)                         | 1230 (4.6)                           |
| Mean expenditurea          | US$18 070.47                      | US$14 452.28                         |
| Advanced treatment or death on admissiona | 262 (13.7) | 1493 (5.6) |
| Inpatient procedure on admissiona | 566 (29.5) | 14 263 (53.5) |
| Mean length of stay (days)b | 4.26                              | 3.15                                  |
| State, n (%)               |                                   |                                       |
| West state                 | 1078 (56.2)                       | 7385 (27.7)                          |
| South state                | 493 (25.7)                        | 16 205 (60.8)                        |
| Midwest state              | 347 (18.1)                        | 3073 (11.5)                          |

Abbreviations: ACSC, ambulatory care - sensitive condition; SD, standard deviation. 
*aP < .01. 
bP < .05.

Statistical Analysis

We aimed at examining expenditures associated with ACSC hospitalizations as well as finding predictors of ACSC hospitalizations among Medicaid enrollees in comprehensive care models. Univariate distributions and bivariate associations were used to describe the data. First, they were used for the assessment of clinical and demographic characteristics of the patients for different predefined groups in the sample. Then we examined clinical and demographic differences over the distribution of expenditures to examine how expenditures were distributed based on different patient characteristics in the sample. Percentile expenditure distributions will be used to distinguish levels of expenditure. Multivariate logistic regression was used to identify independent factors associated with ACSC hospitalizations, controlling for all other predictors in the model. Backward elimination was used to retain only those significant predictors in the model.

Results

Patient Characteristics

Sample clinical and demographic characteristics are presented in Table 1. Overall, more women than men were admitted in both ACSC and non-ACSC groups in the study year. Mean age was higher among patients with ACSC hospitalizations. The proportion of whites and Hispanics were higher among patients with ACSC hospitalizations, while the proportion of blacks was higher in non-ACSC hospitalizations. Mean expenditures were higher (US$18 070.47 vs US$14 452.28) for hospitalizations in patients with ACSC compared to those without ACSC. Patients with ACSC experienced longer hospitalizations than those without (mean LOS 4.26 vs 3.15 days). A higher proportion of patients admitted with ACSC required advanced treatment or died on admission, while a lower proportion of patients with ACSC hospitalizations required inpatient procedures on admission (29.5% vs 53.5%).

Types of ACSC in the Sample

A description of the types of ACSC reported on admission is presented in Table 2. Diabetes was the most frequent chronic condition; nearly 34% of the patients hospitalized with ACSC had this condition with its related complications. Heart failure was the second leading chronic condition reported in the ACSC group, with 14% of the patients being admitted with this condition. On the other hand, UTI (21%) and dehydration (11%) were the leading acute and preventable conditions in the ACSC group. Overall, patients presented similar proportions of chronic and acute ACSC on admission (49% vs 51%).

Levels of Expenditure in Patients With ACSC Hospitalizations

We examined the levels of expenditure in relation to ACSC hospitalization for selected patient groups. Table 3 displays patient expenditures based on race, gender, patient status, state of residence, and age at the 50th, 75th, 90th, and 95th percentiles of expenditure. Although blacks had overall higher expenditures, the levels were somewhat similar to those of whites. However, compared to whites or blacks, patients with Hispanic ethnicity exhibited lower expenditures in all percentile groups. Specifically, the expenditures for Hispanics were lower by nearly of those of whites and blacks at the median and the 75th percentile but differences decreased by about 25% in the higher percentile groups. The data showed men with ACSC hospitalizations had lower expenditures in lower percentile groups, but the levels converge to and exceed those of women in higher percentile groups.
Patients with ACSC hospitalizations who required extended treatment or died on admission had higher levels of expenditure across all percentile groups. At the 95th percentile level, this group had expenditures that were almost double of those patients who were discharged to their own homes (US$85,009 vs US$44,164). In age distribution, compared to patients in young and mid-adulthood (18 to 40 years), older adults had lower expenditure at the median level but experienced higher expenditures in higher percentile groups (US$38,111 vs US$32,876 at the 90th percentile and US$35,749 vs US$32,699 at the 95th percentile). Finally, we examined differences in ACSC and non-ACSC hospitalization expenditures. Patients in these groups had similar expenditures in the lower percentiles; however, among patients with high risk of excessive expenditure, the differences grew more pronounced with expenditures in ACSC hospitalizations being higher than those in non-ACSC hospitalizations (US$31,009 vs US$22,749 and US$44,164 vs US$34,518 in the 90th and 95th percentiles, respectively).

### Table 3. Levels of Expenditure for Patients With ACSC-Related Hospitalizations.

| Patient Characteristics | Expenditure Percentiles |
|-------------------------|-------------------------|
|                         | 50th        | 75th        | 90th        | 95th        |
| **Race**                |             |             |             |             |
| Black                   | US$11,880  | US$21,811  | US$38,132  | US$52,820  |
| White                   | US$10,051  | US$19,232  | US$34,355  | US$51,037  |
| Hispanic                | US$5,580   | US$11,193  | US$25,740  | US$40,885  |
| **Gender**              |             |             |             |             |
| Men                     | US$7,000   | US$15,544  | US$31,271  | US$61,225  |
| Women                   | US$10,602  | US$20,588  | US$35,749  | US$50,224  |
| **Patient status**      |             |             |             |             |
| Discharged              | US$9,164   | US$18,023  | US$32,699  | US$44,738  |
| Extended treatment or death | US$13,987 | US$27,579  | US$50,920  | US$85,009  |
| **Age**                 |             |             |             |             |
| 18-40 years             | US$11,185  | US$19,764  | US$32,876  | US$42,089  |
| 41-64 years             | US$8,779   | US$18,776  | US$38,111  | US$59,773  |
| **ACSC hospitalization status** |       |             |             |             |
| Non-ACSC hospitalizations | US$8,501   | US$13,372  | US$22,749  | US$34,518  |
| ACSC hospitalizations    | US$6,831   | US$16,141  | US$31,009  | US$44,164  |

Abbreviation: ACSC, ambulatory care - sensitive condition.

### Logistic Regression for the Predictors of ACSC Hospitalizations

Results of the multivariate logistic regression for the factors associated with ACSC hospitalizations are shown in Table 4. The results are shown in percentile regressions performed at the 50th, 75th, and 90th percentiles. The data show that age of the patient and procedure on admission are consistent predictors of ACSC hospitalizations across all levels of expenditure for such hospitalizations. For example, for each additional year of life, the odds of hospitalizations for ACSC increase by 5%, 9%, and 5% for patients with expenditure levels at the 50th, 75th, and 90th percentiles, respectively. At these percentile levels, the odds of having procedures for patients with ACSC hospitalizations were lower by 75%, 77%, and 58%, respectively, compared to those with non-ACSC hospitalizations.

At the median expenditure, the odds of ACSC hospitalization were 30% higher among blacks and 25% higher among Hispanics. Moreover, patients with ACSC hospitalizations who required extended treatment or who died on admission were less likely to have expenditure at the median level compared to those who were discharged to their own homes (odds ratio [OR]: 0.733, 95% confidence interval [CI]: 0.558-0.963). These patients seemed to be more likely to have expenditures at the higher percentile groups, but the odds ratios were not statistically significant in these groups. Finally, compared to patients residing in a Midwest state, residents of a western state with ACSC hospitalizations had lower expenditures at the 75th percentile (OR: 0.406, 95% CI: 0.295-0.557), while those in a southern state had lower expenditures at both the median (OR: 0.233, 95% CI: 0.170-0.320) and the 75th percentile (OR: 0.396, 95% CI: 0.291-0.539).

### Discussion

Numerous investigations have been made on the study of ACSC and have yielded important results supporting the effort to identify and address potentially avoidable health-care costs and improving access to appropriate primary care services. We utilized expenditure differential effect in the prediction of factors associated with ACSC hospitalizations among Medicaid enrollees in comprehensive managed care plans. Our findings confirm that ACSC hospitalizations have the potential to increase the overall cost in the Medicaid program and that examination of patient differences across the distribution of expenditure could be key in determining measures for cost control. This type of analysis is important because it gives insights on the differences in expenditure when different patient groups that share the same level of risk for ACSC hospitalization expenditures are compared.

At the bivariate level, compared to patients with non-ACSC hospitalizations, patients with ACSC hospitalizations had greater expenditures at all percentile groups higher than the median level. In addition, gender, age, race, and ACSC hospitalization outcome differences in expenditure occurred only at higher percentile groups. However, at this level of analysis, expenditures of the patients who needed extended inpatient treatment or those who died on admission were significantly higher across all expenditure risk levels compared to those who were discharged to their own homes. In the adjusted logistic regression model, age and procedure on admission were found to be predictors of ACSC hospitalization across all expenditure levels. Also, race, extended treatment, and location were predictors of ACSC hospitalizations at the median or 75th percentile of the expenditure.
Table 4. Logistic Regression for the Predictors of ACSC Hospitalizations.

| Patient and Clinical Factors | Odds Ratio (95% Confidence Intervals) |
|-----------------------------|---------------------------------------|
|                             | 50th Percentile | 75th Percentile | 90th Percentile |
| Male                        | 1.169 (0.954-1.431) | 1.294 (0.969-1.729) | 0.762 (0.416-1.395) |
| Age                         | 1.053 (1.046-1.061)^a | 1.085 (1.075-1.096)^a | 1.053 (1.033-1.072)^a |
| White                       | 1.130 (0.894-1.427) | 0.877 (0.561-1.369) | 0.627 (0.263-1.497) |
| Black                       | 1.307 (1.013-1.686)^a | 1.046 (0.656-1.670) | 0.640 (0.258-1.590) |
| Hispanic                    | 1.252 (1.060-1.479)^a | 1.070 (0.816-1.403) | 0.876 (0.530-1.446) |
| Extended care or death on admission procedure on admission | 0.733 (0.558-0.963)^a | 1.096 (0.805-1.492) | 1.483 (0.887-2.481) |
| Length of stay              | 0.247 (0.204-0.299)^a | 0.278 (0.223-0.347)^a | 0.416 (0.276-0.626)^a |
| West state                  | 1.005 (0.987-1.024) | 1.003 (0.992-1.013) | 1.030 (0.999-1.062) |
| South state                 | 0.934 (0.722-1.209) | 0.406 (0.295-0.557)^b | 0.523 (0.268-1.021) |
| South state                 | 0.233 (0.170-0.320)^a | 0.396 (0.291-0.539)^a | 0.952 (0.516-1.757) |

Abbreviation: ACSC, ambulatory care sensitive condition.
^aP < .01.
^bP < .05.

Previous studies used patient clinical and demographic profiles to determine factors of ACSC hospitalizations, but, unlike the current study, did not consider patient distributions across expenditure levels for such hospitalizations. For instance, O’Neil et al.11 reported patient race to be correlated with ACSC hospitalizations in a study that found African Americans to have higher rates of hospitalizations than whites in a majority of the conditions. In a study of ACSC hospitalizations in small geographic areas located in western and northeastern states, race, age, and poverty level were found to be determinants of ACSC admissions.12 The ACSC-related hospitalizations were also characterized by excessive cost in rural hospital settings,13 race/ethnicity studies,11,14 and hospitals in nationally representative samples.15

Our findings suggest there is a proportion of potential cost savings that can be attained from resources used to care for Medicaid enrollees in comprehensive managed care models. That is, although cost savings is a major driver for establishing these models, significant savings might be achieved by reducing the volume of ACSC hospitalizations. This implies it is detrimental to assume that managed care models are performing without variations in the process of care, and, as such, strategies must further be designed to ensure primary care performs at a level that significantly reduces the costs associated with avoidable hospitalizations. Patients with ACSC hospitalizations who required extended treatment or died on admission had expenditures that were nearly twice the patients who were discharged to home. Moreover, this expenditure level was the highest among all patient groups with the risk of excessive expenditures.

Since ACSC are regarded as conditions for which hospitalizations are avoidable when effective disease management and health promotion initiatives are applied, 1 possible solution to reducing preventable inpatient resource utilization is to address the rates and relative impact of chronic ACSC. Diabetes, which is 1 of the most important ACSC,7,16,17 was found to be the most prevalent condition in the current study. Systems and providers of care should employ evidence-based organizational and financial interventions targeting improvements in the care for chronic disease. For instance, innovations in preventive health and chronic disease self-management programs should focus on how to empower the patient in the era of value-based care and take full advantage of the infusion of portable technologies in the community. This approach has the potential to generate several benefits including improvements in patient’s experience, quality metrics, and eventually reductions in preventable hospitalizations.

Further on the question of self-management, comprehensive Medicaid managed care plans should invest in enhancing services in the home setting for specific patient groups. For example, a previous investigation reported age differences in the management of chronic disease in a population-based survey whereby older individuals (aged 65 and older) in the study were determined to have poor compliance in management of several chronic conditions.18 In this study, compared to patients aged between 18 and 40, patients aged over 40 years had greater expenditures in the higher percentile groups; and, in addition, age was a consistent predictor of ACSC hospitalizations across all expenditure percentile groups. It is possible that excessive social burden among Medicaid populations such as poor living arrangement could be responsible for increased numbers of older adults with ACSC hospitalizations. In response, taking advantage of the current era of increased awareness in health promotion and preventive health strategies, managed care models have the great potential for designing age-sensitive, home-based chronic disease management programs coupled with social interventions to reduce preventable hospitalizations and corresponding costs. In the same way, culture-specific approaches could be applied to address racial differences in the expenditures.

Although our findings demonstrate occurrence of ACSC hospitalizations among Medicaid enrollees in comprehensive managed care plans, we found that at all expenditure levels, patients were less likely to undergo any procedures. This is encouraging because of the cost reduction potential of preventing inpatient procedures, and as such, providers should consider to incorporate into their current practices delivery strategies recommended in this study to ensure primary care services prevent complex ACSC admissions and reduce cost.
At the policy level, our findings reveal potential for support of redesigning further primary care services with the inclusion of important quality provisions to reduce preventable hospitalizations.

Finally, factors for regional differences are unclear, but practices associated with state-specific Medicaid provisions that influence treatment plans could be responsible. In addition, lower expenditures in ACSC hospitalizations in relatively larger western and southern states with typically excessive Medicaid spending might be attributed to the impact of more aggressive policies and strategies toward cost control.

This study has several limitations. First, as it is typical to large data sets, we did not include a large volume of patients due to failure to satisfy the inclusion criteria. Specifically for the purpose of this study, we had to include only those patients who had encounters recorded in the comprehensive managed care plans who turned out to be proportionally fewer in the data set. Second, a cross-sectional approach was adopted to study ACSC hospitalizations. This approach cannot be used to establish causality that could be important in addressing different aspects of ACSC that could be key in cost savings. Third, although ACSC hospitalizations were assessed in a single year, it is not known for how long the patients were in the managed care plans leading to the study year. Information on the length of duration could have been used to group patients in a meaningful way to assess the influence of duration of coverage on ACSC hospitalizations. Despite these limitations, the approach of using expenditure differentials to study ACSC hospitalizations uniquely enabled the analyses to show how patient groups differ in expenditures when they move across expenditure groups and, more importantly, on the higher levels of expenditure, where major concerns in cost escalation could be detected.

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