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BRIEF REPORT

Impact of the 2012 Medicaid Health Care–Acquired Conditions Policy on Catheter-Associated Urinary Tract Infection and Vascular Catheter–Associated Infection Billing Rates

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In July 2012, the Centers for Medicare & Medicaid Services ceased hospital Medicaid reimbursements for certain health care–acquired conditions. Using billing data from 2008–2014, we found no impact of this policy on rates of 2 targeted conditions, vascular catheter–associated infections and catheter-associated urinary tract infections, among Medicaid or non-Medicaid patients.

Keywords. catheter-associated urinary tract infection; Centers for Medicare and Medicaid Services; health care–acquired conditions; Medicaid; vascular catheter–associated infection.

In 2008, the Centers for Medicare & Medicaid Services (CMS) implemented the Hospital-Acquired Conditions (HAC) program to cease Medicare payments to hospitals for care resulting from preventable conditions acquired in the hospital, including several health care–associated infections (HAIs) [1]. In July 2012, CMS expanded this program to include health care–acquired conditions (HCACs) among Medicaid inpatients [2]. Both policies use claims codes to identify the targeted conditions, excluding those coded as present on admission (POA).

Evaluating the impact of these policies is challenging due to limitations in HAI surveillance methods. Using claims data is convenient, but improvements in billing rates of HAIs do not always correspond to changes in patient outcomes [3]. Prospective surveillance data reported to the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN) offer better clinical relevance and credibility, but major changes in HAI surveillance case definitions over the past decade limit their utility for analyzing trends over time [4, 5].

We assessed the impact of the 2012 Medicaid HCAC policy on the billing rates of 2 targeted HAIs, catheter-associated urinary tract infections (CAUTIs) and vascular catheter–associated infections (VCAIs), and a nontargeted comparison condition (surgical site infection after abdominal hysterectomy). In the absence of stable NHSN HAI definitions during the policy implementation period, we reasoned that evaluating trends in HAI billing rates may offer insight into the impact of the policy, including changes in documentation and coding practices.

METHODS

This study was approved by the Institutional Review Board of Harvard Pilgrim Health Care Institute. We included adult patients discharged between January 2009 and December 2014 from acute care hospitals in Arizona, Florida, New York, New Jersey, and Washington. Hospitals' administrative and billing data were obtained from the State Inpatient Databases (SID) of the Healthcare Cost and Utilization Project. We included acute care hospitals subject to the Inpatient Prospective Payment System (IPPS) that consistently reported POA conditions during the study period. We excluded federal, critical access, long-term care, cancer, psychiatric, children's, and rehabilitation hospitals not subject to IPPS. We used SID rather than national Medicaid data sets to allow for comparison analyses of HAI billing rates between Medicaid and Medicare or privately insured patients and because national Medicaid data did not routinely include POA fields at the time of HCAC policy implementation.

We used a quasi-experimental interrupted times series design with comparison group to assess whether the HCAC policy was associated with changes in rates of *International Classification of Diseases, Ninth Revision Clinical Modification* (ICD-9-CM) codes for 2 targeted conditions, CAUTI (996.64) and VCAI (999.31, 999.32, or 999.33) before and after July 2012 [6]. We also examined a comparison condition not targeted by the Medicaid policy, surgical site infection (SSI) following abdominal hysterectomy (567.21, 567.22, 567.29, 682.2, 998.31, 998.32, 995.51, 998.59) [7]. We calculated quarterly rates of non-POA infections. The denominator for CAUTI and VCAI was all adult hospital discharges; the denominator for the comparison SSI condition was the number of abdominal hysterectomies (identified using ICD-9 procedure codes 68.31, 68.39, 68.41, 68.49,

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68.61, 68.69, or CPT codes 58150, 58152, 58180, 58200, 58210, 58541–58544, 58548, 58570–58573, 58951, 58953, 58954, or 58956) [8]. We used logistic regression models to assess the changes in trend (slope) after July 2012 and for immediate policy effect (level change). The primary model included terms for time (calendar quarter), policy period (before vs after July 2012), and a 2-way interaction between time and policy period. Generalized estimating equations were used to estimate model parameters, and inference was based on robust sandwich variance to account for clustering at the hospital level. We assessed whether the policy effect varied across patient insurance status (Medicaid vs non-Medicaid) through formal testing of the interaction terms in the model. We also examined policy effect in hospitals caring for a high proportion of Medicaid patients (defined as those in the top quartile of percent Medicaid discharges). We further assessed whether policy impacted the proportion of CAUTIs and VCAIs that were coded as POA.

In the primary analysis, we considered July 2012 to be an instantaneous policy inflection point. In a sensitivity analysis, we incorporated a 1-year roll-in period before policy implementation, during which time HAI rates were excluded from the analysis. This was done to account for the possibility that hospitals may have initiated a response to the policy in July 2011, the initial proposed implementation date, which was later postponed [2]. All tests were 2-sided. We considered *P* values of <.05 to be statistically significant. Analyses were performed using SAS (version 9.4; SAS Institute) or R (version 3.4.3 or higher; R Foundation for Statistical Computing).

RESULTS

Study Population

The cohort included 43.7 million adult hospitalizations, of which 6.3 million were Medicaid patients, from 546 hospitals. Most hospitals were located in metropolitan areas (88%), medium-sized with 100–399 beds (60%), nonteaching (65%), and not-for-profit (63%). The median proportion of adult Medicaid patients served by study hospitals (interquartile range) was 18.8% (13.5%–24%).

Policy Impact on CAUTI and VCAI

There were 11 200 CAUTIs (2.6 per 10 000 discharges), 30 574 VCAIs (7.0 per 10 000 discharges), and 2516 SSIs after abdominal hysterectomy (among 283 272 procedures, 0.9%) during the study period, including 1003 CAUTIs (1.6 per 10 000 discharges), 4691 VCAIs (7.4 per 10 000 discharges), and 480 SSI abdominal hysterectomies (among 43 545 procedures, 1.1%) in Medicaid patients.

Trends in CAUTI and VCAI rates are shown in Figure 1. In Medicaid patients, we observed no immediate change in quarterly CAUTI billing rates after Medicaid HCAC policy implementation (odds ratio [OR], 1.06 for quarter 3, 2012, vs quarter 2, 2012; 95% confidence interval [CI], 0.82–1.36; *P* = .66), nor

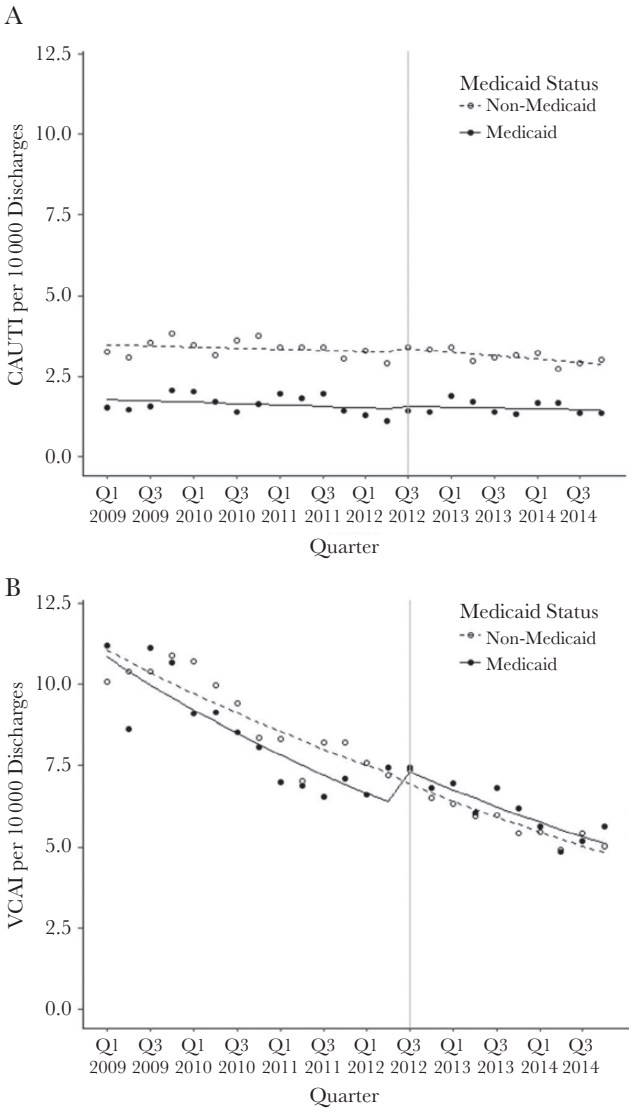

Figure 1. Trends in billing rates of (A) catheter-associated urinary tract infection (CAUTI) and (B) vascular catheter–associated infections (VCAIs) before and after implementation of the 2012 Medicaid HCAC policy. The vertical gray band in quarter 3, 2012, indicates the time the Medicaid policy was implemented. The dots represent the observed quarterly rates, and the lines connecting the dots represent the fitted model trends.

was there any change in secular trends after policy implementation (prepolicy OR per quarter, 0.99; 95% CI, 0.97–1.01; postpolicy OR per quarter, 1.00; 95% CI, 0.97–1.04; *P* = .41 for difference in slope). For VCAIs, we observed an increase in billing rates at the time of policy implementation (OR, 1.20 for quarter 3, 2012, vs quarter 2, 2012; 95% CI, 1.06–1.35; *P* < .01) but no change in secular trends (prepolicy OR per quarter, 0.96; 95% CI, 0.95–0.97; postpolicy OR per quarter, 0.97; 95% CI, 0.95–0.99; *P* = .48 for difference in slope). Among non-Medicaid (Medicare, privately insured, or noninsured) patients, we observed no immediate impact of the Medicaid policy in CAUTIs or VCAIs and no change in secular trends. We also

observed no change in billing rates for SSIs after abdominal hysterectomy among Medicaid or non-Medicaid patients.

There was also no immediate impact or change in secular trends for CAUTIs and VCAIs regardless of whether hospitals cared for a high proportion of Medicaid patients (interaction $P = .90$ for level change and $P = .59$ for difference in slope for CAUTI; interaction $P = .77$ for level change and $P = .44$ for difference in slope for VCAI). We also found no policy impact on the proportion of CAUTIs and VCAIs that were coded as POA (interaction $P = .30$ for level change and $P = .16$ for difference in slope for CAUTI; interaction $P = .94$ for level change and $P = .15$ for difference in slope for VCAI).

Incorporation of a 1-year roll-in period before Medicaid HCAC policy implementation yielded similar results to the primary analysis (data not shown).

DISCUSSION

We found that the 2012 Medicaid HCAC policy had no appreciable impact on secular trends of billing rates of CAUTIs and VCAIs. This was true in both Medicaid and non-Medicaid patients, and in hospitals caring for high or low proportions of Medicaid patients. The findings were consistent when conducting sensitivity analyses considering a wider 1-year roll-in period for policy implementation. We also observed no change in billing rates of SSIs following abdominal hysterectomy, a comparison condition not targeted by the policy.

Our findings contrast with prior analyses demonstrating a sudden decline in Medicare billing rates for targeted HAIs after the 2008 Medicare HAC policy [9, 10]. One possibility is that many hospitals had already initiated prevention programs or modified their billing practices for these conditions as a result of the 2008 Medicare program, which increased awareness of HAIs among hospital leadership and targeted the same conditions. In addition, response to policy may not be uniform across the country, as declines in Medicare HAI billing rates after 2008 were not observed in every state [11].

Although prior work has suggested inappropriately high rates of POA coding for CAUTIs and VCAIs [12], we found no evidence that hospitals changed coding practices in response to the Medicaid policy. Surprisingly, we observed a slight increase in billing rates of non-POA VCAIs in Medicaid patients at the time of policy implementation, but this appeared to be mild and transient, with no change in the overall decreasing secular trend. Two of the ICD-9-CM codes indicative of VCAI (999.32 and 999.33) were introduced in October 2011, and so they could have contributed to the mild unexpected increase, although we would not expect this to differentially affect Medicaid vs non-Medicaid patients.

The primary limitation of this study is our reliance on billing data, which may provide limited information about the impact of the policy on quality of care and overall HAI burden. Prior work has suggested that billing data, including the determination of POA status, have limited accuracy for HAIs [12–14]. Undercoding for CAUTIs, including preferential use of other UTI codes, and inappropriate designation of POA status may explain why CAUTI rates in our cohort were lower than those for VCAI, contrary to what is observed with other epidemiologic data [11]. Examining standardized, prospectively collected surveillance data submitted to the NHSN might offer more clinically relevant insight into the impact of the Medicaid HCAC policy. We do note that the decreasing VCAI and stable CAUTI trends we observed mirror national trends observed using NHSN data during a similar time period [15]; however, the multiple surveillance case definition changes in NHSN for central line–associated bloodstream infections and CAUTIs that occurred during the study period limit the interpretation of these data [4, 5]. We also only examined the 18 months after policy implementation and cannot exclude a delayed effect occurring after this point.

In conclusion, the 2012 Medicaid HCAC policy had no appreciable impact on trends in VCAI and CAUTI rates as determined by billing data, suggesting that expansion of existing penalties to target additional patient populations does not yield any further impact. As CMS continues to expand implementation of these payment policies to broader populations and with larger penalties, continued evaluation is needed to understand their successive impact on health outcomes, as well as possible unintended consequences.

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