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Major Article

Impact of hospital-acquired conditions on financial liabilities for Medicare patients

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Background: Hospital-acquired conditions (HACs) can increase the financial liabilities faced by patients when the HACs require additional treatment both in the hospital and in subsequent health care encounters. This article estimates incremental effects of 6 HACs on Medicare beneficiary financial liabilities.
Methods: Descriptive and multivariate analyses were used to examine the differences in beneficiary liability between care episodes with and without HACs. Episodes included the index hospitalization in which the HAC occurred and all inpatient, outpatient, and physician claims within 90 days of index hospital discharge. Medicare fee-for-service patients discharged from a hospital in fiscal year (FY) 2009 or FY 2010 with severe pressure ulcer, fracture, catheter-associated urinary tract infection, vascular catheter-associated infection, surgical site infection, or deep vein thrombosis or pulmonary embolism after certain orthopedic procedures were matched by diagnosis, sex, race, and age to with patients without HACs.
Results: Medicare patients were liable for an additional $20.5 million per year across the HAC episodes compared with what they would have owed without the HACs. Beneficiaries with HACs were also more likely to exhaust their Part A days in the index hospitalization.
Conclusions: HACs create significant financial burden for Medicare beneficiaries. The incremental financial liabilities are concentrated in the episode of care after the index hospitalization with the HAC. Policies and programs that reduce HAC incidence will improve Medicare beneficiaries' physical and financial health.

Hospital-acquired conditions (HACs) can significantly increase medical care costs, both in the hospital stay during which the HAC occurs (referred to as the index hospitalization) and in subsequent health care encounters that might have been triggered by the HAC or that might have been less resource-intensive in the absence of the HAC.[1-16] Although many analyses focus on the costs in the hospitalization where the HAC occurs,[1,2,4,6,9,10,13-15] subsequent or downstream services caused by the HAC can result in additional costs to both insurance payers[3,5,7,8,12] and patients. Additional financial costs to patients can come in the form of additional deductibles or higher copayments and coinsurance. The purpose of this study is to estimate incremental patient liabilities for all inpatient, outpatient, and physician services occurring over a defined episode of care that are attributable to a preventable HAC. This analysis complements other work looking at the incremental payments for HACs by insurers,[11,12,16] but focuses on incremental costs to the patients in the form of additional financial liabilities. We identify the liabilities attributable to the HAC through a retrospectively matched case-control analysis.

The methodology described in the following section of this article builds on the methodology that is found in similar studies. Whether the specific outcomes of interest are accounting costs, service use, insurer payments, or patient liabilities, the key to valid estimation of the effects attributable to a HAC is the identification of an appropriate comparison group. Statistical matching is commonly used throughout the literature, alone or in conjunction with multivariate modeling. For example, Bates et al studied cost and utilization effects in the index hospitalization, following 190 adverse drug events and using multivariate modeling in a nested case-control design.[1] Zhan and Miller used data from the 2000 National Inpatient Sample to analyze average differences in days and charges during the index hospitalization for patients identified by selected Agency for Healthcare Research and Quality patient safety indicators (PSIs).[10] The authors first used matched controls based on hospital, diagnosis-related group (DRG), age, race, and sex and then used multilevel modeling by hospital and DRG with added covariates. They also found that matched controls and multilevel modeling produced similar results, possibly because of the DRG-level analysis in the multilevel design. McGarry et al studied postoperative days and charges

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for surgical patients to identify the effects of surgical site infections (SSIs) at an academic center and its affiliated community hospital, analyzing data for 69 elderly cases and 59 controls that were chosen by surgical procedure and age group, while adding covariate control for comorbidities and other acuity measures for the final effect estimation.[5] All 3 of these studies found significantly longer hospital stays attributable to the HAC.

Throughout the literature, there is consensus that HACs increase costs and resource use. Peng et al analyzed the effect of hospital-acquired infections on index hospital days and charges using data from the Pennsylvania state data reporting system, matching on a propensity score of the probability of in-house death with additional balancing on hospital characteristics.[13] de Lissovoy et al studied the differences in days and charges attributable to postsurgical infections found in the National Inpatient Sample, with matching based on propensity scores derived from the probability of a PSI stratified by type of surgical procedure.[15] Both of these studies found increased hospital days as a result of the hospital-acquired infections.

The study that is closest to ours in research question, data, and design was conducted by Encinosa and Hellinger using information from enrollees in a large private insurance database.[12] These authors examined claims payments for the index hospitalization and a 90-day follow-up period for 4,140 patients with PSIs, assigning 1:1 propensity-matched controls.

Similar to the Encinosa and Hellinger study, our study uses claims data to analyze the effects of selected HACs on beneficiary liabilities for all medical services delivered from the index hospitalization through a follow-up period of 90 days.[12] Unlike the Encinosa and Hellinger study, but similar to the methods used in Zhan and Miller, we identify the comparison group using multivariable matching on age, sex, race, and Medicare Severity–Diagnosis-Related Group (MS-DRG) and then add HAC risk factors as regression covariates.[10] We present unadjusted data comparing beneficiary liabilities for HAC versus comparison cases. We then use clinical risk factors and index hospital fixed effects as covariates in linear regressions of total episode liabilities on the HAC indicators.

Although the articles reviewed have examined increased hospital days and increased insurance payments,[1-16] our article fills a gap in the current literature by specifically examining the liabilities faced by Medicare fee-for-service (FFS) beneficiaries who experience a HAC. Although insurers face most incremental costs triggered by HACs, the costs to patients could also be substantial. Also, to ensure that we include any downstream effects of the HAC, we consider the beneficiary liabilities attributable to a HAC across a 90-day episode of care. We report results for overall episode liabilities and for 8 subcategories of liabilities. We examine the effect of the HAC on the likelihood of hospital readmission and postacute care, and finally, we report on the relationship between a HAC on the likelihood of having noncovered hospital days in the index hospital stay.

MATERIALS AND METHODS

Data

The primary data source for this study is the Medicare claims files, fiscal years 2009 and 2010. Inpatient claims, including claims from acute care hospitals, critical access hospitals, long-term care hospitals (LTCHs), skilled nursing facilities (SNFs), inpatient rehabilitation facilities, inpatient psychiatric facilities, and any other inpatient settings covered by Medicare Part A, come from the Medicare Provider Analysis and Review (MedPAR) file. Claims for physician, outpatient, and other services covered by Medicare Part B come from the Medicare Standard Analytical Files. The episodes of care used in this analysis include live hospital discharges during the 21-month period between October 1, 2008 and June 30, 2010. The Enrollment Database was used to limit the sample to beneficiaries who were enrolled in both Medicare Part A and Part B and who lived in the United States in the 90 days after the hospital discharge and to exclude cases where Medicare was the secondary payer, or where beneficiaries were enrolled in Medicare managed care.

The accurate identification of HACs from Medicare claims has only been possible since the implementation of the Hospital-Acquired-Condition-Present-on-Admission (HAC-POA) Indicator program by the Centers for Medicare and Medicaid Services (CMS), starting in fiscal year 2009. The HAC-POA program required all hospitals paid under Medicare's inpatient prospective payment system to add a present-on-admission (POA) indicator to each of the ICD-9 diagnosis codes appearing on the hospital claim. This POA indicator allows us to identify which conditions were truly hospital acquired, as opposed to those acquired in a previous health care encounter or in the community.

Using the criteria for HACs specified in the Federal Register (74 FR 43754), we identified all hospital claims that contained 1 of the 10 CMS-selected HACs. Two of the HACs—air embolism and blood incompatibility—had extremely low (<50) case volumes during our sample period, and 2 other HACs—foreign object retained after surgery and manifestations of poor glycemic control—had <500 cases and were dispersed across a wide range of MS-DRGs. These low case volumes and MS-DRG dispersion greatly reduced the likelihood of finding statistical significance and specificity in the results; therefore, these 4 HACs were removed from the analysis. The remaining 6 HACs were as follows: (1) stage III and IV pressure ulcers (pressure ulcers; n = 2,201); (2) falls and trauma: fractures (fractures; n = 7,595), (3) catheter-associated urinary tract infection (CAUTI; n = 5,310); (4) vascular catheter-associated infection (VCAI; n = 5,927); (5) SSI after spinal fusion or refusion, arthrodesis of shoulder or elbow, or other repair of shoulder or elbow (SSI/ortho; n = 317); and (6) deep vein thrombosis and pulmonary embolism after total or partial hip replacement or resurfacing or total knee replacement (DVT/PE; n = 4,364). Hospital claims in which the HAC occurred are referred to as index hospital claims, and episodes of care are constructed that begin with these index hospital claims.

The main outcome of interest, episode-level patient liabilities, was calculated from deductible, copayment, and coinsurance fields on the claims. The episode liability measure sums the liabilities owed by Medicare FFS beneficiaries, including those for hospital, skilled nursing, physician, and outpatient claims. Liabilities for durable medical equipment and prescription drugs are not included in this analysis. An additional outcome of interest we evaluate is whether or not the patient exhausted their Medicare Part A days in the index hospitalization.

Episode construction

Care episodes used in this analysis were constructed for 6 HACs using the beneficiary identifiers and the admission and discharge dates on the index hospitalization claims to link to any physician claims that occurred during the index hospitalization and all other claims with a service or admission date within 90 days of the index discharge date.[5,12,16]

Matching

For each set of HAC episodes, we created a comparison group using hospital claims that did not include the HAC diagnosis codes. To avoid inadvertently including a HAC readmission as a possible comparison claim, we excluded from the comparison groups any