Evaluating and Improving Present-On-Admission for Performance Reporting

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2. STRUCTURED ABSTRACT

Purpose. The purpose of this project was to improve the clinical relevance of hospital performance assessments through an assessment of present-on-admission reporting in administrative data.

Scope. Our goal was to evaluate the accuracy of present-on-admission coding for performance reporting in California's acute care hospitals, determine whether inaccuracies biased hospital performance assessments, and explore whether incorporating clinical data into performance assessments could improve clinical relevance.

Methods. We assessed the accuracy and reliability of present-on-admission reporting in California administrative data using data from an audit of California hospital's administrative data. We then assessed for over- and under-reporting of present-on-admission status by hospital characteristics. Next, using California administrative data, we performed a simulation analysis of patients admitted to California acute care hospitals for acute myocardial infarction in which we modified the present-on-admission reporting for subset of records with acute risk factors for acute myocardial infarction to vary rates of present-on-admission reporting accuracy to assess the impact on hospital mortality rates for acute myocardial infarction.

Results. We found that the hospitals and audit team agreed on present-on-admission coding approximately 70% of the time, and the accuracy of present-on-admission varied by hospital. For-profit hospitals were more likely to over-report acute medical conditions as present-on-admission, but teaching hospitals were likely to under-report. However, these differences in accuracy of present-on-admission reporting did not significantly affect hospital risk-adjusted acute myocardial infarction mortality rates.

Key Words administrative data, hospital quality, quality measurement

3. PURPOSE

Aim 1: Determine the accuracy of present-on-admission coding in California acute care hospitals and assess for coding biases.

Aim 2: Determine whether inaccuracies in present-on-admission coding are biased by hospital characteristics and whether inaccuracies can bias performance assessments of hospital risk-adjusted mortality.

Aim 3: Improve the accuracy of hospital assessments of complications and performance by developing a methodology using laboratory data to distinguish comorbidities present at admission from potential complications of care.

4. SCOPE

Background

The past two decades have seen an explosion of work on measuring and reporting hospital quality as a means to ensure accountability and to stimulate quality improvement.[1,2] Many of the quality metrics rely on administrative data.[3-7] Patient-level administrative data consist of standardized information that is captured for every hospitalization for billing purposes.[8] States create administrative databases that can be used to monitor quality of care by aggregating data collected by medical coders at each hospital for every hospitalization. To make clinically meaningful performance assessments, there must be adequate accounting for patient health.

Accurate outcomes reporting for performance assessment frequently requires risk adjustment, a statistical technique that accounts for differences in the health of patients. Using these risk-adjusted rates, performance reports highlight quality "outliers," hospitals whose performance is either better or worse than others. Theoretically, reports of hospital quality should only account for diseases that reflect the health status of patients when they arrive at the hospital and affect the risk of death, not for complications of care that could ensue, in part, from poor-quality care.[9]

Two states (California and New York) have used present-on-admission coding since the mid-1990s to distinguish complications of care from diagnoses that pre-existed hospitalization, when diagnoses are labeled as to whether or not they were present when the patient is admitted to the hospital,[10] as a strategy to account only for the patient's health status and not discount complications of care that may result from poor quality.

Present-on-admission coding has the potential to greatly improve hospital performance assessments and to help distinguish diagnoses that could be complications of care.[11, 12] A detailed assessment of the accuracy of present-on-admission coding and the implications for hospital assessments is critical to determine; stakeholders such as the Center for Medicare and Medicaid Services have mandated the use of present-on-admission as a strategy to distinguish eight diagnoses that complicate care and are not reimbursable since October 2008.

Setting/Context

California completed an audit of its 2005 administrative data using both registered nurses and health information technologists.[13] This provided an opportunity to assess the accuracy of present-on-admission using a gold standard.

5. METHODS

Study Design

We conducted an audit of POA reporting in the 2005 California Patient Discharge Data (PDD) by comparing its accuracy against a gold standard created from blinded re-abstraction of the corresponding medical records. We examined the accuracy of POA reporting in the California PDD compared to the gold standard overall and on three common and high-mortality principal diagnoses and one principal procedure. Two of these conditions are currently used in public reports: acute myocardial infarction (AMI) and community-acquired pneumonia (CAP). Because chronic conditions (such as hypertension and cancer) are likely to be present on admission and are unlikely to have significant variability in present-on-admission coding, the sampling strategy focused on the accuracy of acute diagnoses that are powerful predictors of mortality.

As a requirement for a case to be considered in the gold standard sample, more than one reviewer had to review the case, and the reviewers had to agree (with the PDD) on the accuracy of the sampled principal condition and secondary diagnosis. Then, for records with two or three re-abstractions, each had to agree on the POA reporting of the specified secondary diagnosis for the case to qualify as a part of the gold standard sample. For records with four re-abstractions, at least three needed to agree on the POA reporting for the case to qualify (i.e., either three of four re-abstractions agreed or four of four re-abstractions agreed on POA reporting). For the remaining records (with two or more re-abstractions) lacking consensus as defined above in the reporting of POA, physicians blindly adjudicated the POA reporting to make the final gold standard determination.

In Aim 2, we then used our re-abstraction based gold standard to identify patterns of POA under-reporting and over-reporting, including systematic tendencies by hospital characteristics. First, we linked the gold standard data to the 2005 California Financial Data and assessed whether hospitals characteristics were associated with accurate present-on-admission reporting.

Next, using the 2005 California PDD linked to the 2005 California vital statistics data and the 2005 California Annual Financial Database, we compared hospital performance rankings using an established model [14, 15] to assess hospital performance for acute myocardial infarction (AMI), with a model incorporating POA indicators of whether a secondary condition was a comorbidity or a complication of care and a simulation analysis that factored POA indicator accuracy into the hospital performance assessment. The established model adjusted for patient age, sex, race/ ethnicity, insurance status, whether the admission was an elective admission, and comorbidities.

To assess the impact of incorporating POA into the risk model, we calculated each hospital’s difference in rank (either an improvement or decline) between the established model and the model that incorporated POA indicators.

Then, we calculated the difference in rank between the model that incorporated POA and a simulation analysis. For each simulation, we changed POA indicators for six major acute risk-factors of AMI mortality: shock, pulmonary edema, septicemia, acute renal failure, congestive heart failure, and coma. The probability of POA being changed depended on patient and hospital characteristics. The simulation used the risk-adjustment model that includes the POA indicator but applied it to data with errors in POA reporting to assess the impact of POA inaccuracy on hospital-level performance as judged by risk-adjusted mortality rates.

We calculated hospital-specific risk-adjusted 30-day mortality for each of the 1000 simulated data sets and determined hospital rankings within each of these simulated data sets. We compared the difference in rank for each hospital based on the model without POA and each of the 1000 simulated rankings. This generated a distribution of differences in hospital rank across all 1000 simulations for each of the 268 hospitals. We also calculated the proportion of hospitals whose rank differed by 5% (13 positions of 268) or more, 10% (27 positions of 268) or more, and 20% (54 positions of 268) or more as a strategy to quantify meaningful differences in hospital rank by the different approaches. We examined whether there were differences in the effect on hospital rank by the type of hospital categorized by rural location, teaching status, for-profit ownership, and number of hospital beds.

We intended to explore developing a methodology to improve the use of present-on-admission reporting. Based on our findings from our simulation analyses, and the decision of the California Department of Healthcare Services not to incorporate vital statistics and laboratory data into administrative data, we decided not to proceed with Aim 3.

Data Sources/Collection

The California PDD includes patient demographics and diagnostic, procedure, and disposition codes for approximately 3.7 million hospitalizations per year from all non-federal, non-children's California acute care hospitals.[16] It captures the main reason a person is hospitalized as the principal diagnosis and the main procedure as the principal procedure; up to 25 secondary diagnoses and procedures can be reported in addition.

In Aim 1, to understand the accuracy of POA, we selected medical records randomly from the 2005 California PDD for chart review using a complex sampling strategy to maximize generalizability to all California acute care hospitals. Hospitals were randomly sampled proportionate to the number of eligible patient records from the hospital to avoid too large an influence from any one hospital. We included charts in which the condition was one of a set of ICD-9-CM codes used in the California acute myocardial infarction report for the acute myocardial infarction sample, the California community-acquired pneumonia report for the pneumonia sample, and the Agency Healthcare Research and Quality Inpatient Quality Indicators for congestive heart failure or percutaneous transluminal coronary angioplasty.[17-19] We used the ICD-9-CM codes in the mortality models to define the risk factors. To prevent any single hospital from disproportionately influencing our sample, we capped the number of records for each principal/secondary diagnosis combination.

In Aim 2, we linked the 2005 California Annual Financial Database to each sampled case in the California PDD[20-23] to identify hospital characteristics including teaching status, ownership, percent profit margin, the number of staffed beds, and percent of discharges reimbursed by Medicaid. The Office of Statewide Health Planning and Development performs a linkage of its PDD to California vital statistics data based on patient's social security number.

Interventions

None

Measures

<u>POA accuracy</u>

We evaluated POA accuracy using several different metrics. In Aim 1, we defined accuracy using percent agreement between the gold standard and the California PDD. For Aim 2, we considered POA misreporting in two ways. Over-reported secondary diagnoses are those in which the PDD recorded the POA reporting as present on admission but the gold standard assessment was not present on admission. Under-reported secondary diagnoses were documented in the PDD as not present on admission, but the gold standard assessment was present on admission.

Limitations

Our study had several limitations. First, we were using POA reporting from 2005 in a single state. We chose California for this project because data was available on the accuracy of POA reporting, and there was a long-standing history for reporting POA in patient discharge data. We suspect that the accuracy of POA reporting might have improved since 2005, but this along with the generalizability of our findings to other states' patient discharge data should be evaluated, particularly now that all hospitals are reporting POA to Medicare and attention to POA reporting has increased. Second, our performance assessment was based on AMI risk-adjusted mortality. We only tested the impact of inaccuracies in POA reporting for the clinical outcome of mortality associated with AMI. Therefore, we cannot say with certainty what the size of the impact of inaccuracy in POA reporting would be on other clinical conditions or outcomes. Third, our study simulated the impact of the accuracy of only six risk factors for AMI mortality. Though these risk factors are highly predictive of mortality, it is possible that results that simulating the impact of the inaccuracy of all risk factors for AMI mortality would have led us to a different conclusion.

Our findings reflect POA reporting in California prior to the 2008 CMS mandate that hospitals report POA in their administrative claims. Since 2008, CMS's reporting process has attempted to clarify further the POA reporting. Hospitals now can report that a condition was present on admission, that a condition was not present on admission, or that there was inadequate data available to determine. Any improvements in the accuracy of POA would decrease the degree to which inaccuracy would be the cause of difference between models with and without POA.

6. RESULTS

Principal Findings

In the audit of the California PDD, the initial sample consisted of 1694 records across 48 hospitals; the Health Information Technicians abstracted 1557 of these records, and the RNs abstracted 1688. Of the abstracted records, we excluded 525 records in which the Health Information Technician did not code and 162 in which the RN did not confirm either the sampled primary diagnosis or procedure or the acute secondary diagnosis. A total of 1059 records met our gold standard criteria, of which 304 (28.7%) required physician adjudication.

The patient sample tended to be sick with an in-hospital mortality of 26.0%. Eighty-one percent of the patients were older than 60 and had multiple medical diagnoses (85% $\geq$ 2 comorbidities).[8]

For the primary diagnosis or procedure, 298 patients had an acute myocardial infarction, 205 had community-acquired pneumonia, 288 had congestive heart failure, and 268 had percutaneous transluminal coronary angioplasty. Overall, we found 74.3% agreement in POA reporting of secondary diagnoses between the gold standard and the PDD without any tendency to over- or under-report POA (McNemar's, p-value = 0.25). Reporting accuracy ranged from only 60.2% for septicemia in the setting of community-acquired pneumonia to 81.6% for pulmonary edema in the setting of acute myocardial infarction. There were no substantial differences in over- or under-reporting of POA for secondary diagnoses for which umbrella conditions were publicly reported in risk-adjusted mortality reports (78.9% agreement for patients with acute myocardial infarction and 70.7% in community-acquired pneumonia) compared to those umbrella conditions without public reports (76.4% in congestive heart failure and 69.8% in percutaneous transluminal coronary angioplasty) (p = 0.42).

The 48 sampled hospitals included nine (18.8%) for-profit and 39 (81.3%) not-for-profit institutions. Eight of the hospitals (16.7%) were teaching facilities, and 40 were not (83.3%). The average number of staffed beds was 284, ranging from 24 to 855. On average, 19% of hospital admissions were reimbursed by Medicaid (range 0.5% to 63%), and the average profit margin was 2% (range -22% to 18%).

POA accuracy was highly variable across hospitals. The percent agreement for the eight secondary conditions ranged from 1 to 100, in part due to small number of cases at some hospitals. Certain hospital characteristics predicted POA reporting accuracy. Adjusted for patient-level characteristics, for-profit hospitals were more likely to over-report secondary diagnoses as being present on admission (OR 1.96, 95% CI 1.11, 3.44) .In contrast, POA was more likely to be under-reported at teaching hospitals (OR 2.61, 95% CI 1.36, 5.03). Neither percent profit margin, number of staffed beds, nor percent of discharges reimbursed by Medicaid were independently associated with POA reporting accuracy (p > 0.05).

In our simulation analysis, we included all adult patients with an acute myocardial infarction, and our sample consisted of the 40,087 hospitalizations for their index AMI at the 268 hospitals The average 30-day AMI hospital-specific mortality rate was 11.8% (95% CI 11.5-12.1).

When we compared each hospital's 30-day mortality ranking using without POA to each hospital's 30-day mortality ranking with POA, we found that 25% (n=67) experienced at least a 10% difference in 30-day mortality hospital ranking; 13.4% had an increase in rank of at least 10% and 11.6% had a decrease in rank of at least 10%.

When we compared the hospital’s rank with POA to the rank based on simulated data representing over-reporting of POA, we found that only 4% of hospitals experienced a difference in ranking of at least 10%, suggesting that inaccuracy due to over-reporting of POA was playing a minor role in the differences observed between the model without and with POA. The effect of under-reporting of POA on difference in hospital rank was even smaller. We found that only 0.6% of hospitals experienced a difference in 30-day hospital mortality ranking of at least 10% in the simulations of underreporting POA compared to the model with POA, again suggesting that observed differences between the model without POA and with POA were not due to the inaccuracy of POA under-reporting.

As another indication of the relatively minor role that POA inaccuracy has on hospital rankings based on 30-day risk-adjusted mortality, we found that the percentage of hospitals whose rank differed (either increased or decreased) was similar between the model without POA and the simulation of over-reporting POA, as it was between the model without and with POA. We found that 25% of hospitals experienced a difference in ranking of at least 10%; 12.5% increased rank by greater than 10%, and 12.4% decreased rank by >10%. Similarly, in comparing the model without POA to the model simulating under-reporting of POA, 20.8% of the hospitals’ rank differed; 10.8% increased in rank >10%, and 10.0% decreased rank >10%.

Stratification by hospital characteristics revealed that the addition of POA to the model impacted the ranking of hospitals with certain characteristics more than others. Rural hospitals’ ranks increased by greater than 10% more frequently than urban hospitals' did when POA was added to the model (rural 23.8% vs. urban 12.6%). In contrast, teaching hospitals rank was more likely to decline more than 10% compared with non-teaching hospitals (teaching 20.8% vs. non-teaching 10.7%). When comparing the model with POA to models that simulated over-reporting, there was little difference in how frequently hospitals rank differenced based on the type of hospital, with the exception of profit vs. non-profit hospitals. For-profit hospitals were more likely to decrease their rank by greater than 10% (8.7% vs. 1.1%) versus non-profit (0.6% vs. 0.7%). Comparing the model with POA to models that simulated under-reporting, we found even fewer differences by hospital characteristics. Our findings for differences in ranking of >5% and >20% showed similar patterns as >10%.

We found in comparing the model without POA to the model with POA, that 247 (92%) of the hospitals remained in the same category; no hospitals were identified as top performers in one model and bottom performer in the other (or the reverse). Comparing the model with POA to the simulation of over-reporting POA, in 262,771 (97.8%) of the 268,000 simulations hospitals performance remained in the same category; in none of the simulations did a hospital’s category shifted from a top to a bottom or a bottom to a top performer. The comparison between the model with POA and the simulation of underreporting POA was similar; 262,055 (98.6%) of hospitals performance was categorized the same; and in none of the simulations did a hospital’s category shifted from a top to a bottom or a bottom to a top performer.

Discussion

Our study is the largest to date to evaluate the accuracy of POA reporting for acute medical conditions that could be either comorbidities or complications.[24] Consistent with a smaller study of POA reporting in California among cases of community-acquired pneumonia[18] and a three-hospital study in Canada,[25] we found variability in the accuracy of reporting POA across secondary diagnoses. In general, we did not find a tendency toward under- or over-reporting of POA. We found that for-profit hospitals tended to over-report POA and teaching hospitals tended to under-report. However, we did not find that inaccuracy of POA greatly impact hospital risk-adjusted AMI mortality assessments.

Our findings are consistent with previous studies that have found a greater number of billed diagnoses in for-profit hospitals. [26] This may suggest a general tendency of hospital medical record coders at these institutions to code medical records more aggressively to the point that they are over-reported. However, in the case of POA reporting, it is less clear than in the case of billing codes to understand why for-profit hospitals would have a motivation to over-report. In 2005, the year of our sampled data, hospitals were not subject to any direct financial penalties related to POA reporting. At this time, there was public reporting by the state of the risk-adjusted outcomes of acute myocardial infarction and community-acquired pneumonia, but POA reporting was only part of California's risk adjustment model for community-acquired pneumonia. [18] This suggests that over-reporting may reflect a general approach to coding by these hospitals that is not always tied to financial gain. Our finding that teaching hospitals under-report POA is more likely related to differences in physician documentation rather than differences in health information technician reporting. At teaching hospitals, physician trainees are responsible for the majority of documentation. In the past, they received relatively little training in billing and had minimal personal incentives to document optimally from a billing perspective.[27, 28]

Hospital-specific mortality rates have been used for over 20 years as metrics to evaluate hospital quality.[14] CMS currently includes this measure as a part of its assessment of hospitals for the purpose of determining financial rewards and penalties.[29] Some have questioned the use of hospital-specific mortality as a quality indicator, citing the extent of random variation in hospital-specific mortality as being too problematic for it to be an effective quality improvement strategy.[30] POA indicators were developed for the purpose of eliminating some of this error. Our study cannot answer the question of whether the addition of POA to risk-adjustment models results in a more valid assessment of hospital performance. However, we have shown that differences in the ratings of hospital performance based on risk-adjustment models with and without POA indicators are not heavily influenced by any inaccuracy in how POA is recorded by hospitals.

Conclusions

POA reporting of secondary diagnoses is moderately accurate and varies by hospital. Incorporating POA indicators into risk-adjusted models of AMI care has a substantial impact on hospital rankings of performance that is not primarily attributable to inaccuracy in POA hospital reporting.

Significance

Though it was not the case during the time period of our study, POA reporting in administrative data is now being applied in hospital payment decisions. In 2008, the CMS implemented a Medicare policy to not reimburse hospitals for certain hospital-acquired conditions that are identified in part using POA reporting. Several private insurers adopted the same policy, [31 32] and, as a part of the Patient Protection and Affordable Care Act, CMS applied the policy to Medicaid hospitalizations.[33] Though the fiscal impact of CMS's policy on Medicare reimbursement is not as dramatic as had been anticipated,[34] the potential for fiscal consequences associated with POA reporting accuracy substantially increases as more payers participate and use performance-based reimbursement. The ability to improve hospital quality and accountability in the era of healthcare reform hinges on having accurate hospital assessments. Our study suggests that accuracy of POA reporting varies by hospital characteristics, and, in the setting of increasing care accountability, teaching hospitals could mistakenly be assessed as having worse performance than they actually have and perhaps suffer negative financial consequences as a result. Similarly, for-profit hospitals would present themselves as having better performance than they actually delivered. The linking of Medicare's payment policy to POA reporting may influence the accuracy of this variable over time.

Our finding that POA reporting is moderately accurate suggests that it could be improved to become more useful as a tool to discriminate between comorbidities and complications.

Since our study was completed, subsequent efforts to address POA reporting errors have been introduced and could change POA reporting accuracy and therefore the utility of this data element. The National Center for Health Statistics has published official guidelines for coders on how to report POA status, which were not available in 2005. In addition, the response categories for this variable have been changed to give coders more latitude to report POA status. Finally, a variety of edits have been developed to flag suspicious present-on-admission data,[24 35] which may substantially improve the accuracy of POA data that are actually used for risk adjustment.

Implications

The stakes for identifying clinically relevant risk-adjustment strategies rise as financial penalties are increasingly tied to hospital performance reports. Our study confirms that the use of POA indicators in administrative data significantly alters risk-adjusted hospital assessments that do not incorporate a method for distinguishing between comorbidities and complications. Furthermore, our study provides reassurance that the adoption of POA indicators in a risk-adjustment model for AMI care is not substantially confounding results due to the inaccuracy in how POA is reported by hospitals. Future studies should attempt to confirm whether our findings apply to other important hospital outcomes and conditions.

LIST OF PUBLICATIONS and PRODUCTS

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