Comorbidity Index was associated with the greatest odds of readmission for acute myocardial infarction, heart failure, and pneumonia in North Carolina Medicare enrollees

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Section 3025 of the Affordable Care Act established the Hospital Readmissions Reduction Program (HRRP), which has increased attention on hospital outcomes through reductions in inpatient prospective payments to hospitals with excess readmissions for select conditions (Centers for Medicare & Medicaid Services, 2013). Readmissions have become a focus given excessive hospital readmissions are associated with poor quality (Berenson, Paulus, & Kalman, 2012) and higher costs (Friedman & Basu, 2004; Jencks, Williams, & Coleman, 2009). In addition, targeting readmissions helps to offset the unintentional incentive for hospitals to benefit from multiple admissions, as well as pressures hospitals to improve patient outcomes.

Starting in 2012 hospitals have been required to report 30-day readmission rates for three primary conditions, heart failure, myocardial infarction and pneumonia (with the list conditions and procedures to be expanded in future years). For the reporting period ending on September 30, 2013 (or the second year of the HRRP), the average penalty for North Carolina hospitals was 0.33% as compared to a mean penalty of 0.38% for all states (Rau, 2013). Of the 88 North Carolina hospitals included in the HRRP, 66% of them were required to pay penalties, which is consistent with the national average of the number of hospitals paying penalties per a state (Rau, 2013). While, North Carolina, as a state, is performing slightly better than the average state in terms of penalties, the fact that they are incurring penalties implies that 66% of NC hospitals have readmission rates for acute myocardial infarction, heart failure, and pneumonia in excess of the benchmark establish by the Centers for Medicaid and Medicare services. Given this focus on reducing hospital readmissions for acute myocardial infarction, heart failure, and pneumonia, it is important to understand the factors which lead to increased odds of readmission.

Data from the 2010 North Carolina State Inpatient Database (Agency for Healthcare Research & Quality, Healthcare Cost & Utilization Project) were obtained and analyzed for this project. The State Inpatient Database includes a 100% sample of hospital stays at participating community (non-federal) healthcare facilities. The 2010 State Inpatient Database includes a unique patient identifier that allows patients to be tracked between hospitalizations; however, subsequent data-releases (2011 and 2012) have suppressed this patient identifier. To allow for 30-day follow-up with all patients, the dataset was restricted to index (initial) hospitalizations occurring between January and November 2010. Readmissions were identified as any admission occurring within 30 days. Descriptive statistics were used to calculate the frequency, length of stay, and cost of readmissions. Logistic regression was used to calculate the odds of readmission for various factors.

Frequency and cost of readmissions varied by condition. Proportionally, heart failure patients had higher frequency of readmission than acute myocardial infarction and pneumonia patients (16.04%, 11.94%, and 11.88%, respectively). As a result, the total cost of hospital readmission was greatest in heart failure patients than in acute myocardial infarction and pneumonia patients ($128,423,156, $107,338,858, and $105,602,704, respectively); however, the mean cost of a single hospital readmission was highest for acute myocardial infarction patients ($18,967.81 (SD: $17,144.90)) than for heart failure ($8,958.71 (SD: $11,168.85)) and pneumonia ($9,097.41 (SD: $8,713.92)) patients. The average length of stay for readmissions was similar between conditions (approximately 5 days).

Readmissions led to significant health care resource utilization in 2010. These hospitalizations are expensive and, frequently, preventable. Notably, sicker patients are more likely to be readmitted. Increasing scores on the Charlson Comorbidity Index was associated with the greatest odds of readmission for all conditions. Additionally, Medicare enrollees under the age of 65 (i.e., the medically disabled) have significantly greater odds of being readmitted for all three conditions. There were no noted racial or gender disparities in readmissions. Thus, hospitals would benefit from targeting interventions (e.g., intensive follow-up with primary care physician, case management, and medical social work) at the sickest patients. In particular, the Charlson Comorbidity Index should be used as a predictive tool to identify which patients are most likely to be readmitted.

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Index hospitalization predictors of subsequent readmission for acute myocardial infarction, heart failure, and pneumonia in North Carolina Medicare enrollees

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Background

Section 3027 of the Affordable Care Act established the Hospital Readmissions Reduction Program (HRRP), which has increased attention and targeted outcomes through reductions in hospital-specific perspective payments to hospitals with increased readmissions for select conditions (Centers for Medicare & Medicaid Services, 2013). Readmissions have become a focus given excessive hospital readmissions accounted for 19% of Medicare inpatient payments in 2010 (Freidman, B., & Jencks, S. F., 2010) and higher costs (Freidman & Basu, 2004; Jencks, S. F., Williams, M. V., & Coleman, E. A., 2009). In addition, targeting readmissions likely offsets the automatic incentives for hospitals to benefit from multiple admissions, as well as promotes hospital improvement patient outcomes.

Starting in 2012 hospitals have been required to report 30-day readmission rates for three primary conditions, heart failure, myocardial infarction and pneumonia (with the addition of conditions and procedures by the expansion in future years). For the reporting period ending on September 30, 2013 as the second year of the HRRP, the average penalty for North Carolina hospitals was 0.30% as compared to a mean penalty of 0.18% for all states (Rau, 2013). 66% of NC hospitals included in the HRRP 44% of their states required some penalties, which contrast with the national average of the number of hospitals paying penalties per state a rate (Rau, 2013). While, North Carolina as a state, is performing slightly better than the average state in terms of penalties, the fact that they are occurring penalties implies that almost 44% of NC hospitals have readmission rates for acute myocardial infarction, heart failure, and pneumonia is in line with the findings which lead to increased readmission costs.

Objectives:

• To characterize the frequency and cost of readmission for acute myocardial infarction, heart failure, and pneumonia.

• To identify patient and hospitalization characteristics which are at increased odds of readmission for acute myocardial infarction, heart failure, and pneumonia.

Methods

Data sources: 2010 North Carolina State Inpatient Database (Agency for Healthcare Research & Quality, Healthcare Cost & Utilization Project) were obtained and used for this study. The North Carolina Inpatient Database includes 100% sample of hospital stays at teaching or non-teaching community (non-federal) facilities. The 2010 North Carolina database included a unique patient identifier that allows patients to be matched across admissions, but does not include data from 2004-2010 and 2012 have represented the patient identifier. To allow for 365-day follow-up with all patients, the dataset was restricted to index hospitalizations occurring between January and November 2010. Readmissions were identified only in any admission occurring within 365 days. Descriptive statistics were used to calculate the frequency, length of stay, and cost of readmissions. Logistic regression was used to calculate the odds of readmission for various factors.

Inclusion Criteria:

• North Carolina Resident

• Medicare Eligible

• Admitted between January and November 2010 for acute myocardial infarction, heart failure, or pneumonia

Exclusion Criteria:

• One-day Stay (to maintain that patient was readmitted outside of state and thus, not included in the dataset)

• Non-Medicare Eligible

• Missing Patient identifier

• Missing Diagnosis Code

• Patient Discharged to Hospitalization

• Patient Left Against Medical Advice

• Patient Transferred to Another Hospital (to avoid double counting of patients)

Results

• Total Acute Myocardial Infarction Admissions (2010): 5,608

• Readmissions within 30 Days: 3,915 (68.85%)

• Mean Time to Readmission: 14.52 Days (SD: 7.77)

• Mean Readmission Length of Stay: 4.65 Days (SD: 4.72)

• Total Cost of Readmissions: $337,883 (SD: $127,884)

• Total Heart Failure Admissions (2010): 14,337

• Readmissions within 30 Days: 11,571 (80.52%)

• Mean Time to Readmission: 14.45 Days (SD: 6.99)

• Mean Readmission Length of Stay: 4.89 Days (SD: 6.31)

• Total Cost of Readmissions: $14,088,176 (SD: $11,381,685)

• Total Pneumonia Admissions (2010): 32,399

• Readmissions within 30 Days: 24,666 (16.04%)

• Mean Time to Readmission: 18.53 Days (SD: 6.89)

• Mean Readmission Length of Stay: 3.90 Days (SD: 2.20)

• Total Cost of Readmissions: $105,602,704 (SD: $111,713,922)

Discussion

• Readmissions resulted in 8,402 additional hospital admissions for acute myocardial infarction, heart failure, and pneumonia, combined, in 2010.

• These readmissions led to 26,151 additional hospital days and cost in excess of $341 million for acute myocardial infarction, heart failure, and pneumonia, combined, in 2010.

• Younger age (<65 years) was associated with significantly greater odds of readmission for acute myocardial infarction, heart failure, and pneumonia.

• However, advanced age (>65 years) was associated with significantly lower odds of readmission for acute myocardial infarction, heart failure, and pneumonia. This may be because these patients are more likely to be discharged to a nursing home or long-term care facility where they will receive additional medical treatment and monitoring.

• For all 3 conditions, higher scores on the Charlson Comorbidity Index significantly increased the odds of having a readmission.

• Race was not a significant predictor of readmission, with the exception of Other Race for heart failure.

• Gender was not a significant associated with significantly decreased odds of readmission for acute myocardial infarction and heart failure. Gender was not a significant associated with significantly decreased odds of readmission for pneumonia.

• OR Procedures during the hospital stay declined the odds of readmission in heart failure patients.

• Patients admitted for acute myocardial infarction to the Piedmont Region of the state were more likely to be readmitted than the Coast, Geographic location (i.e., Mountains, Piedmont, and Coastal Region did not significantly change the odds of readmission for other conditions).

• There was no a significant difference in odds of readmission between Urban, New-Town, and Urban Teaching hospitals.

Conclusion

Methods

Readmissions led to significant health care resource utilization in 2010. These hospitalizations are expensive and, frequently, preventable. Notably, sicker patients are more likely to be readmitted. The Charlson Comorbidity Index was associated with the greatest odds of readmission. Additionally, Medicare enrollees under the age of 65 (i.e., the medically frail) had significantly greater odds of being readmitted for all conditions. Thus, hospitals would benefit from targeting interventions for Medicare enrollees. Factor intensives (e.g., primary care physician, case management, and medical social work) to the sicker patients. In particular, North Carolina Teaching hospitals should used as a predictor to identify which patients are more likely to be readmitted.

References


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* Statistically Significant Differences in Odds