



A RISK-ADJUSTED, ALL-PAYER, 30-DAY READMISSION METHODOLOGY

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BACKGROUND

- Hospital readmission rates reflect quality and efficiency of care.
- CMS publishes hospital-specific, risk-standardized 30-day readmission rates for Medicare fee-for-service (FFS) inpatients on its Hospital Compare website.

OBJECTIVES

- To design an all-payer methodology comparable to the Medicare heart failure (HF) 30-day readmission methodology
- To compare the all-payer and Medicare methodologies by analyzing consistency of hospital-level, risk-adjusted 30-day readmission rates

DATA

- The Thomson Reuters Disch_08 database was used. This database contains more than 15.7 million discharges from 2,270 hospitals in the United States for federal fiscal year 2008.
- The model used administrative claims (UB) data from each index HF hospitalization to assess eligibility and to obtain risk-adjustment information.
- Split-sample validation techniques were used to measure the predictive accuracy of the model. The training and validation datasets were created using random assignment.

METHODS

- The methodology used by CMS for its 30-day readmission rates was used to the extent possible.
- Valid index cases were adult admissions (age greater than 17) that had a principal diagnosis consistent with HF, were not discharged to another acute care facility, and did not expire during the hospitalization.
- Once a valid index hospitalization occurred, a patient would then be eligible for a subsequent index hospitalization as long as the admission date was at least 30 days after the discharge date of the previous index admission.
- A readmission would be a hospitalization for any cause to the same hospital as the index stay within the 30 days following a valid index hospitalization.
- A standard logistic regression model for risk-adjustment was specified using the same terms as the hierarchical logistic regression model described by Krumholz et al.¹

METHODS

- Two random samples were created from the available data, identical models were fitted to each random sample, and the resulting model coefficients were used to predict readmission in the random sample that was not used to fit that specific model.
- If the c-statistic and the correlation between observed and expected readmission rates remain similar, it would be considered evidence that the model is robust (not over-fitted) and could be used to produce accurate predictions in data that were not used to calibrate the model.

RESULTS

- There were 241 acute-care, unit-numbering hospitals identified in the disch_08 database. These hospitals had 74,175 total adult HF discharges that were candidate index cases. The following discharge exclusions were applied:
 - Discharged to another acute-care facility (n = 2,589)
 - Died during hospitalization (n = 2,536)
 - Admissions within 30 days of the previous index case (n = 14,477)
- After the exclusions were applied, there were 54,573 valid index HF hospitalizations, among which 11,588 readmissions were identified, resulting in a crude readmission rate to the same hospital as the index admission of 21.2 percent.
- Figure 1 shows split sample validation results, Pearson correlation = .95, p<.0001.
- The c-statistic for the overall model was 0.59, which was similar to the value of 0.60 reported by Krumholz et al. for their model. The Pearson correlations between the coefficients produced by our model and those produced using the Krumholz model were 0.33 without the intercept term and 0.96 with the intercept term.
- We were able to match 206 of the 241 hospitals in our all-payer data with hospitals from the CMS Hospital Compare database. Figure 2 shows the level of agreement in the hospital-specific, risk-adjusted 30-day readmission rates between the Thomson Reuters and CMS data and methods. The Pearson correlation for this comparison was 0.49 (p<0.0001), indicating that approximately 25 percent of the variability in the hospital-specific readmission rates produced by one methodology could be “explained” by the other methodology.

RESULTS

- Figure 3 shows the level of agreement in the hospital-specific, risk-adjusted 30-day readmission rates between the Thomson Reuters and CMS data and methods for hospitals that had statistically better or worse performance than expected in both models. The Pearson correlation for this comparison was 0.89 (p<0.0001), which was substantially higher than the correlation for all hospitals.
- The crude 30-day readmission rate reported for the CMS methodology was 23.7 percent. The comparable readmission rate using the all-payer methodology was 21.2 percent. The higher CMS rate is likely due to their ability to detect more cases of readmission because they can observe readmissions to any hospital, whereas our methodology was restricted to identifying readmissions to the same hospital as the index case. This restriction is due to a general limitation in UB data that prevents the tracking of individuals across different hospitals.
- When we exclude all patients under 65 years of age, our readmission rate increases to 22.3 percent but remains lower than the CMS rate, providing further evidence that the difference in readmission rates is likely to be primarily due to the ability to track readmissions to hospitals other than the one where the index admission occurred.

Figure 2: Risk-Adjusted 30-Day Readmission Rates (%) for All Hospitals (n = 206)

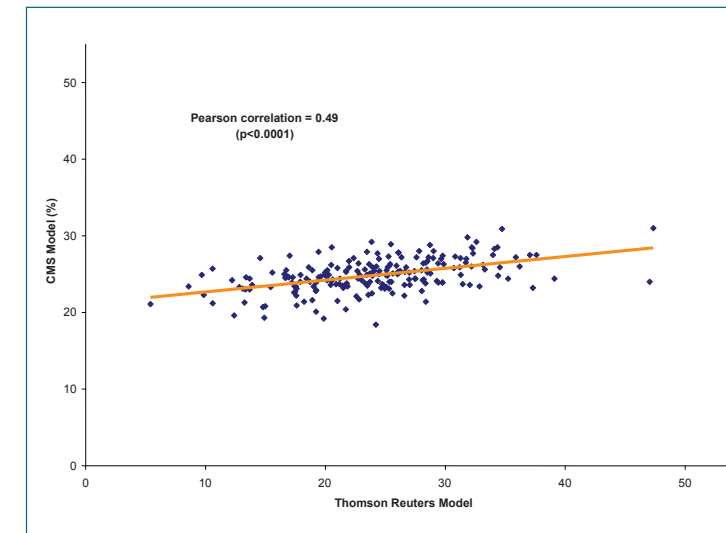


Figure 1: Split-Sample Validation Results

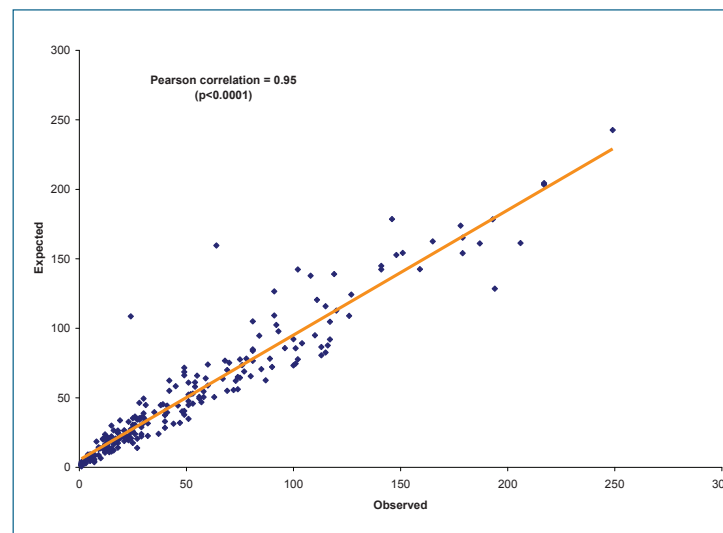
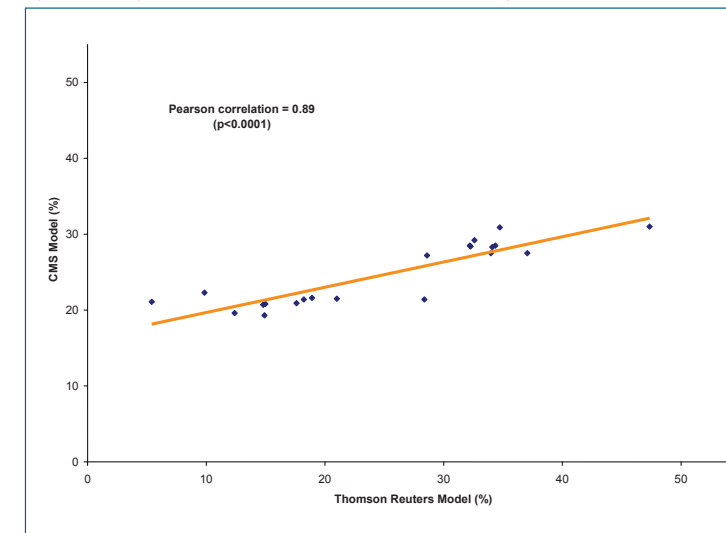


Figure 3: Risk-Adjusted 30-Day Readmission Rates (%) for Statistically Significant Hospitals (n = 21)



LIMITATIONS

- The CMS methodology is able to “look back” over the prior year at all care encounters for any given individual relative to that individual's index hospitalization in order to evaluate comorbid conditions for risk-adjustment. We have relied on the ICD-9-CM codes from just the index hospitalization for this information.
- The current CMS Hospital Compare website lists HF readmission rates for 4,221 hospitals; presumably a similar number of hospitals were used to calibrate the CMS methodology. We had only 241 hospitals available for deriving our model coefficients.

CONCLUSIONS

- The results of this investigation suggest that it is possible to design an all-payer, risk-adjusted 30-day readmission methodology comparable to the corresponding CMS methodology. However, the ability to include more unit-numbering hospitals that contribute all-payer data would be very helpful.
- The CMS data from the Hospital Compare website contained heart failure readmission rates for 4,221 hospitals. The use of hierarchical logistic regression models helped to reduce the spread in the CMS data. It is clear from the results reported here that the all-payer model, an ordinary logistic regression model, was producing a much wider range of readmission rates.

REFERENCES

¹ Krumholz H, Normand SL, Keenan P, et al. *Hospital 30-Day Heart Failure Readmission Measure Methodology*. New Haven, CT: Yale University/Yale-New Haven Hospital Center for Outcomes Research & Evaluation, 2008.

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