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Can We Make Performance Measures More Resilient to the Effects of Coding?

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Starting in 2012, the Centers for Medicare and Medicaid services (CMS) instituted a value-based purchasing (VBP) program for most US hospitals. Under this program, participating hospitals have their base operating Diagnosis-Related Group (DRG) payments reduced by a small percentage each year (1.5% for fiscal year 2015). The amount that is withheld is then given back, in the form of incentives, to hospitals that exceed the 50th percentile of all hospitals' performance for selected metrics, including risk-adjusted mortality.^{1, 2} CMS has instituted a differently structured but similarly themed initiative under the Hospital Readmissions Reduction Program.³ Fear of financial penalties along with concern about the effect of public reporting on hospital reputation have resulted in hospitals putting great effort into improving performance on these metrics.⁴ Pneumonia was a clear choice for inclusion in the VBP and HRRP programs because it is the most common infectious diagnosis in US hospitals, with aggregate costs of US hospitalizations exceeding \$10 billion in 2011.^{5, 6}

In the years since the introduction of quality metrics for pneumonia, however, new evidence has indicated that the choice of codes used to define pneumonia has important implications for monitoring trends in outcomes over time and in evaluating and comparing hospital performance. This is especially relevant for calculating pneumonia mortality and readmission rates. For example, large declines observed in case fatality for patients hospitalized with pneumonia between 2003 and 2009 suggested better outcomes for patients with this condition,⁷ but further research revealed that mortality changed very little when patients with a secondary diagnosis of pneumonia and principal diagnosis of sepsis or respiratory failure were included in the cohort.⁸ These findings suggested that although improvements in care might have occurred, another explanation for the declining mortality rate among the cohort with a principal diagnosis of pneumonia was that the sickest pneumonia patients had, over time, become more likely to receive a principal diagnosis of sepsis or respiratory failure. In a follow-up study, the same group of investigators found that

assignment of a principal diagnosis of sepsis or respiratory failure varied across hospitals, with some hospitals never using these codes in the principal position and others coding up to 75% of pneumonia patients with these principal diagnoses [Intraquartile range 18–34%].⁹ The authors observed that changing pneumonia cohort inclusion criteria to include principal diagnosis sepsis or respiratory failure led to reclassification of “outlier” status for one-third of hospitals.⁹

There are a number of possible explanations for the variation in use of codes across hospitals. First, it is almost certain that there are true differences in case mix across hospitals. Some hospitals simply have more cases of respiratory failure and sepsis in pneumonia than others. Nevertheless, the extreme variation observed in the use of these codes is difficult to justify on clinical grounds alone. Second, recent initiatives, including the Surviving Sepsis Campaign,¹⁰ have improved recognition of sepsis by clinicians, although the penetrance of this knowledge is likely to vary across hospitals. Third, there are differences in documentation and coding unrelated to gaming. Hospitals, in recent years, have made attempts to improve coding for sepsis and respiratory failure because patients that meet criteria for one of these principal diagnoses are far sicker and more expensive than traditional pneumonia patients. Through better documentation and coding, hospitals can recoup these costs because sepsis and respiratory failure fall into a higher-paying DRG. A final explanation for this variation, which is the focus of a paper by Sjoding and colleagues in this issue of CCM, is gaming by hospitals to influence performance on hospital quality measures. By gaming, the authors mean that hospitals purposefully code a higher percentage of marginal pneumonia patients with principal diagnoses of sepsis and respiratory failure in order to change their performance ranking for VBP or HRRP purposes.

Sjoding et. al used simulation methods to examine the impact of changes in coding on hospital rankings for pneumonia mortality and readmission.¹¹ The authors were specifically interested in how gaming might change a hospital’s performance ranking. They also used simulation techniques to explore whether increasing prevalence of coding sepsis and respiratory failure might make it more difficult to be a high performer without engaging in the practice. The authors identified Medicare patients with principal diagnosis pneumonia (because CMS uses this definition for calculating risk-adjusted mortality and readmission rates) and then, using simulation, excluded a percentage of patients who met diagnostic criteria for sepsis or respiratory failure. They varied both the percentage of admissions that were recoded and the number of hospitals that engaged in the recoding because as more hospitals engaged in the practice, the mean mortality rate changed.

When 100 hospitals with mortality rates above the 50th percentile recoded all eligible patients as principal diagnosis sepsis or respiratory failure, 41 hospitals dropped below the 50th percentile, greatly reducing the likelihood that they would face financial penalties under VBP. Findings were similar but less pronounced for risk-standardized readmission rates. As more hospitals engaged in recoding, overall mortality and readmission rate declined, making the effect of recoding more pronounced. When 50% of hospitals engaged in recoding, hospitals that engaged in the practice improved their ranking by 242 places, on average, and hospitals that did not worsened their rankings by 241 places. The authors concluded that, given variation in coding across hospitals and the increasing need to recode as more

hospitals engage in the practice, CMS should consider including principal diagnosis sepsis and respiratory failure (with secondary diagnosis pneumonia) in their pneumonia definition.

This suggested change, although sensible, raises additional questions. One obvious concern is that patients with a principal diagnosis of sepsis and a secondary diagnosis of pneumonia might have been admitted with a non-pulmonary infectious diagnosis and developed pneumonia as a complication. To address this, it has been suggested that only patients with pneumonia marked “present on admission” (POA) should be included in the metric.^{8, 9} POA was introduced in 2008, and its use by hospitals has increased rapidly since its introduction.¹² However, use of POA codes still varies across hospitals,¹³ which could pose challenges in identifying patients with POA pneumonia. Use of the POA code to define pneumonia is likely to improve over time. Still, in the case of the pneumonia mortality and readmission metrics, there might also be some incentive for continuing to use POA codes intermittently. This is because hospitals could remove the sickest patients with pneumonia from both the numerator and denominator by leaving off the pneumonia POA indicator in patients with sepsis and respiratory failure.

Risk adjustment presents an additional dilemma. One interesting finding of the current study is that the impact of recoding was greater for mortality compared to readmission. This is a function of the larger differential in the mortality rates of patients with principal diagnosis sepsis or respiratory failure compared to patients with pneumonia.⁹ If sepsis and respiratory failure patients were to be included in the metric, hospitals with more of these cases might, justifiably, express concern that the patient’s severity of illness at the time of admission is not fully accounted for in CMS’s mortality and readmission models (which include demographics and comorbidities). One possible solution to the problem of risk-adjustment would be to include sepsis or respiratory failure as covariates in the CMS outcome models. Yet this adjustment could perpetuate the same problems that changing the cohort definition is intended to solve – as it would “reward” hospitals that had a lower threshold for using the codes.⁹ Ideally, future measures would incorporate clinical information from the electronic medical record, such as vital signs and admission laboratory data, to better assess severity on presentation.

Regardless of CMS’s final decision on this issue, Sjoding et al have confirmed prior work that suggested that recoding affects hospital risk adjusted mortality rates and thus performance status. They are the first to suggest that readmission is affected in a similar but attenuated way, and are also the first to describe that the coding behavior of other hospitals can be an important modifier in this equation. This work raises important questions about how to best measure hospital performance for pneumonia mortality and readmission. It appears that, under the current definition, variation in use of diagnostic codes across hospitals has the potential to greatly impact hospital performance. The approach to measure development and revision must therefore be thoughtful, with efforts directed at constructing measures that are resilient and minimize the impact of attempted gaming.

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