Reviewer's report

Title: Predicting Inpatient Hospital Prices in the United States: A Retrospective Analysis

Version: 2 Date: 25 November 2014

Reviewer: Paul Barnett

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Major revisions

1. This paper and the earlier paper refer to payments as “price.” Health care analysts usually think in terms of a payment by sponsor to the hospital, but price is an infrequently used term, perhaps because we do not want to use a term that is used for more homogenous products in more perfect markets. Using the word payment would make this payment for easy to understand. If the authors feel that price is the correct word, it would be helpful if this paper explains exactly what is meant by a price.

2. It would be helpful if the authors explained more carefully why it is important to know the ratio of payments (prices paid) to charges. It is clear that health care analysts would like to know payments but they are often disclosed. It is not clear why the payment to charge ratio is so important to know. Since charges are rather arbitrary, (high at some sites and low at others), the payment to charge ratio has little intrinsic value. This reviewer understands that charges are often available, and that payments are not. The paper determines how well the PCR can be predicted, but the important question is how well payments can be predicted.

Minor revisions

3. Page 5, line 1. Is it important to simulate PCRs? It seems that the analysts would like to know whether payments could be predicted. Given the vagaries of charge schedules, the PCR itself is not very interpretable or useful.

4. Page 5, line 17. The GLM model uses a log-link function. The previous paper indicated that there were negative values in the PCR, in cases where deductions exceed revenue. Negative numbers could play havoc with a model that is intended to evaluate observations with a lower bound of zero. Were negative observations excluded in this paper as well?

5. Page 5, line 22. “A PCR is specific to a payer within a hospital, so the unit of analysis was the hospital.” Since there are separate observations for each payer, isn’t the unit of analysis all discharges sponsored by a single payer within a hospital?

6. Page 6 line 3. Not clear why this paragraph is in the methods section. It
discusses endogeniety and earlier studies showing that public payment levels may affect payments levels of other sponsors. How is this information employed to develop the model? Does the method control for endogeneity bias? The cited studies seemed to contradict the conclusion that cost shifting occurs. Can the data be used to test if cost-shifting occurs? What parameter should be evaluated for evidence of this?

7. Page 6. Line 12. This paragraph begins with a sentence telling which method was not used. It would be better to explain the method that was used, and why. The sentence about the inapplicability of SUR has different possible interpretations and needs revision.

8. The explanation never states that there is one equation for each type of payer. Confusion also stems from having one equation at page 5, line 17, and not stating that it represents five equations.

9. It would be helpful to explain the problem that the modeling method (putting error terms in the first stage as regressors into the second stage model) is solving. Is the problem the potential correlation between PCR ratio between payers at the same facility? Does the analyst want to allow for the possibility that this correlation differs for each possible pair of payers?

10. Is the approach superior to a simpler model, e.g., a single regression, with multiple observations per hospital (one for each sponsor), with a fixed or random hospital-level effect? One disadvantage of the approach that was used was that was not possible to test if the effect of a specific hospital characteristic differed by payer (i.e., the interaction between sponsor and explanatory variable could have been tested for significance).

11. Page 7 line 8. Description of APR-DRG as measure of “loss of function” is insufficient. Isn’t the APR-DRG values of zero to four actually a measure of increasing mortality risk?

12. p. 7 line 15. Definition of rural referral centers needs revision. Don’t rural referral centers support “low-volume” rural hospitals? If there are “high volume” rural hospitals, they are exceptional and probably don’t need a referral center to handle their cases.

13. Page 9, Line 1. The source of the key variable, the payment to charge ratio, is not clearly explained. It is stated that HCUP data have payment data for 46 states. But is this the payment data that was analyzed in this study, or just irrelevant information? Is the HCUP data the source of the hospital-level averages that were used as independent variables?

14. The paper then describes source of market structure and policy data. On line 10, it is stated that 10 states provided information on charges and net revenue by payer category for every hospital. Some clear description is needed of the source of the payment to charge ratio, and how this was linked to hospital characteristics.
15. Page 11, line 18. It might be worthwhile to note the intuitive meaning of GLM log link regression parameters when Table 3 is introduced. Are parameters are relative to a value of zero for the reference group? Are they approximately equal to a percentage difference from the reference group?

16. The parameters for the effect of critical access hospital on PCR are provided, but without explanation of their intuitive meaning. Since this is a log-link function, does this mean that the critical access hospital parameter of .523 for Medicare patients represents (approximately) a 52% higher PCR than not being a critical access hospital?

17. The reader might be more interested in knowing if payments differ in hospitals that are critical access, sole provider, teaching, or rural referral. Their affect on PCR is less interesting question, because charges are so meaningless as an absolute measure. There may be good reasons to express all findings in terms of PCR, rather than payments, but this reader doesn’t understand the reasoning for this. Could charges have been an independent variable in a regression with payments as the dependent variable? We would then have much more intuitive idea of what the parameters meant.

18. What does it mean to have a “higher PCR ratio?” Does it mean, for different sponsors at the same hospital, that they sponsor with the higher ratio is providing greater payment? Can this same interpretation be made over all?

19. Is this reviewer correct in thinking case-mix was represented by “hospital-level averages” and not “hospital averages by payer”? This seems like a limitation that should be described.

20. Table 1 is in my version of the paper twice.

21. Table 2 should include information about the dependent variable, not just the independent variable. How many observations were there?

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

I am a former colleague of the first author, and I am first author on a paper on which he is co-author, now in preparation. I was previously unaware of the research that is the subject of this paper.