PEER REVIEW HISTORY

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ARTICLE DETAILS

| TITLE (PROVISIONAL) | Variation in Charges for Ten Common Blood Tests in California Hospitals: A Cross-Sectional Analysis |
|---------------------|-------------------------------------------------------------------------------------------------|
| AUTHORS            | Hsia, Renee; Akosa Antwi, Yaa; Brownell, Julia                                                |

VERSION 1 - REVIEW

| REVIEWER          | Leah Honigman  |
|-------------------|----------------|
|                   | Assistant Professor |
|                   | George Washington School of Medicine and Health Sciences |
|                   | Washington, DC   |
|                   | United States    |
| REVIEW RETURNED   | 26-May-2014      |

GENERAL COMMENTS

Regarding the methods, please include a description of how the Herfindahl-Hirschman Index values were transformed into the three categories (pg 7).

Overall this is a well-done study of a timely and important topic in health economics that highlights the seemingly subjective nature of pricing in healthcare. While there are some limitations in using charge data since it is often inflated above the cost of the service, the authors adequately justified the use of charges for this analysis. As the authors discussed, there was a wide variation in the average charge of each of the blood tests analyzed. However I am concerned that the distribution of charges are quite skewed, especially towards the extremely high charge outliers. There appears to be a large difference between the 95th percentile and the maximum values for all the tests. Therefore, it is more appropriate to report the median as opposed to average charge (pg 8, line 20). While the authors did offer some description of the variation in charges by excluding the extreme cases, the coefficient of variation and the linear regression model both include these extremes. The authors state that there is not likely to be error in the average charge reporting. I am concerned about the presence of these outliers and wonder if it might be worthwhile to examine those cases specifically if it is appropriate to include them in the analysis.

Finally, one of the major findings is how little variation in charges is explained by the model. However there was limited discussion regarding the potential other factors that might not have been assessed in this model that could affect the variation. I would like to see further postulation by the authors as to these potential variables.

REVIEWER

Jennifer L Wiler
VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name Leah Honigman
Institution and Country Assistant Professor
George Washington School of Medicine and Health Sciences
Washington, DC
United States
Please state any competing interests or state 'None declared': None declared

Regarding the methods, please include a description of how the Herfindahl-Hirschman Index values were transformed into the three categories (pg 7).

The HHI categories were developed by dividing the distribution of HHI values into terciles. We have added the following text to our methods to clarify this point:

“To parameterize HHI in our regression, we divided it into terciles.”

Overall this is a well-done study of a timely and important topic in health economics that highlights the seemingly subjective nature of pricing in healthcare. While there are some limitations in using charge data since it is often inflated above the cost of the service, the authors adequately justified the use of charges for this analysis. As the authors discussed, there was a wide variation in the average charge of each of the blood tests analyzed. However I am concerned that the distribution of charges are quite skewed, especially towards the extremely high charge outliers. There appears to be a large difference between the 95th percentile and the maximum values for all the tests. Therefore, it is more appropriate to report the median as opposed to average charge (pg 8, line 20).

Done.

While the authors did offer some description of the variation in charges by excluding the extreme cases, the coefficient of variation and the linear regression model both include these extremes. The authors state that there is not likely to be error in the average charge reporting. I am concerned about the presence of these outliers and wonder if it might be worthwhile to examine those cases specifically if it is appropriate to include them in the analysis.

Thank you for this comment, which we will respond to in full below.

First, as the reviewer pointed out, we believe the values are likely accurate as we explain in the paper, and thus feel that excluding values may be excluding the real experience of patients at the outlier hospitals. Simply because the values are extreme does not necessarily mean they are invalid. Second, we believe the outliers are less of an influence on the regression, because we used the log of charges as the dependent variable to account for some of the skew we observed in the distribution of charges.

However, we felt it was important to investigate the influence these charges have on the variation we
document and our regression results directly, so we re-ran each of the analyses including only the 5th to 95th percent of charges in an effort to exclude outliers. The descriptive statistics for each blood test without outliers follow (please see PDF version of response to reviewers [a supplementary file] for the table, as it is not able to be pasted as plain text).

As you can see, the coefficients of variation are far more conservative when excluding the outlier hospitals. We also re-ran the regressions using this more limited sample and present the results in the table below (see PDF version of response to reviewers [a supplementary file] for the table, as it is not able to be pasted as plain text).

Though the coefficients change for most regressions, the factors significantly associated with charges and overall percent of the variation explained remain largely unchanged by removing values outside the 5th – 95th percentile range. Given the similarities in takeaway messages and our belief in the validity of the data we have obtained, we have opted to keep our analysis as currently presented in the paper. If the editor and reviewer feel strongly that the more limited sample is preferable, we would potentially be amenable to switching.

Another option, which we would be happy to pursue if given a few more weeks’ time for the revision, is to individually investigate all of the highest charges for each of the blood tests by contacting the hospital and/or comparing it with more current chargemasters to ensure that these were not data recording errors. If the editors and reviewer would like us to pursue this, we would be more than happy to do so and would likely be able to accomplish this within 3-4 weeks (to account for hospital administrators’ responses).

Finally, one of the major findings is how little variation in charges is explained by the model. However there was limited discussion regarding the potential other factors that might not have been assessed in this model that could affect the variation. I would like to see further postulation by the authors as to these potential variables.

We have added the following text to our discussion:

“Though we attempted to investigate a range of hospital and market characteristics from pervious literature on charge variation in aggregate inpatient indices and surgical procedures,4 7 11 14 there are numerous factors that could explain hospital variation in charges for blood tests that we were unable to include in our regression. For example, many hospitals may choose to invest in higher-quality facilities, supplementary services, and social services than others. The costs of these differences, while of value to patients, are not easy to measure and may not be captured by variables in our regression like wage index. However, they likely do trickle down into charges for all basic services, including blood tests. Additional neighborhood factors in the hospital’s catchment area such as education, home prices, age distribution, and race/ethnicity breakdown may influence charges, but were not included in our regression due to absence from previous literature on potential explanatory factors in charge setting,4 7 11 14 on which we based our decisions of which variables to include. Thus, it is possible that some portion of the variation left unexplained by our model could be explained by additional characteristics of the hospital or market not included in our regression.

However, given past literature suggesting that system-wide factors incentivize nearly random charge setting, we believe that the majority of the variation in blood test charges between hospitals that remains unexplained by our model is not based on cost or observable market characteristics....”

Reviewer: 2
Reviewer Name Jennifer L Wiler
Institution and Country University of Colorado School of Medicine, USA
Please state any competing interests or state 'None declared': none declared
This is a well written paper which describes the lack of association between common hospital characteristics and lab charges.

VERSION 2 – REVIEW

| REVIEWER | Leah Honigman  
| Assistant Professor  
| George Washington School of Medicine and Health Sciences  
| Washington, DC  
| United States |

| REVIEW RETURNED | 02-Jul-2014 |

| GENERAL COMMENTS | Thank you to the authors for the thoughtful response and revisions. I appreciate the analysis without the outliers and agree it is reasonable to leave the analysis as is with all hospitals included since there is reason to believe the validity of the data and there is no significant difference in the overall conclusions. While it would be interesting to further evaluate those hospitals with the highest charges, I do not believe it is necessary for this paper but might be interesting for future studies. |