Reviewer's report

Title: Hospital-level associations with 30-day patient mortality after cardiac surgery: a comparison of the application and interpretation of conventional, marginal and multilevel logistic regression

Version: 1 Date: 30 August 2011

Reviewer: Zhenqiu Lin

Reviewer's report:

Major compulsory revisions:
1. I find it unnecessary to include conventional logistic regression in the article. Given the nature of the data and the goal of assessing the effects of hospital characteristics, there is no need to report what would be found if an inappropriate method was used. I would recommend keeping information on conventional logistic regression to minimum.

2. Two hospital characteristics were assessed using different modeling approaches. However, more information on these two characteristics is desired. For example, are all 18 hospitals teaching hospitals throughout the study period? Did all these hospitals perform cardiac surgeries during each of the nine years? Does the annual surgery volume refer to cardiac surgery only?

3. In addition, the section of Statistical techniques should be made more concise.

Minor essential revisions:

Abstract:
a). Background: At the end of this paragraph, “Methods” does not belong there.
b). Results: Why use # per 1,000 patients instead of simple percentage?

Full text:
c). Background: Page 5, References should be provided when MOR and IOR-80% are first mentioned.
d). Methods: Page 6, “median across 2001-2009 of the annual number of surgeries,” annual volume of cardiac surgeries or annual volume of all surgeries?
e). Page 10, references are needed for “it has been shown that the odds ratio for a risk factor from …”.

Results:
f). Page 14, line 13, “between 4 and 176”, reporting min and max mortality rates would be more informative.
g). Page 14, line 14, “Figure 1 shows … not excessive with all rates in the range 1.0 to 4.1%.” This statement is questionable. The highest mortality rate is 4 times higher than that of the lowest, certainly an eye opening difference. Even among hospitals with substantial volumes, the differences appear to be quite large.
h). It will be important to report the median of annual volumes for each hospital. In addition, did all hospitals perform cardiac surgeries during each of the nine years?

i). Page 15, line 11, “increased by 20% compared to that of patients in teaching hospitals.” This seems to be in contradiction with the results in Table 3 where OR associated with Teaching is positive.

j). Page 15, line 15, same issue.

k). Page 15, while reporting OR for teaching status, the authors seem to focus too much point estimate, while ignoring the CI.

l). Table 3, it is important to include random effects from the multilevel model in the table.

Discussion:
m). The first sentence seems to be incomplete.

**Level of interest:** An article of limited interest

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests.