Author's response to reviews

Title: Improved hospital-level risk adjustment for surveillance of healthcare-associated bloodstream infections: a retrospective cohort study

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Author's response to reviews:

Dear Dr Alam,

Thank you for forwarding the comments on the revised version of our manuscript and we are delighted that the reviewers are happy with the major amendments to the article. Regarding the comments by the Associate Editor, we have thoroughly re-read the article and can only find limited examples of technical terminology that are not followed by a simple, lay description of the meaning. We have made some changes to the abstract (removing the terms “dependence and overdispersion”) and have made other additions as explained below.

Burns and trauma units do exist in Queensland and they were considered as candidate risk-adjustment variables, but they were removed for the reasons explained in detail in the methods (too few hospitals providing these services, collinearity with other services). Some high risk services tend to occur in the same hospitals and their effects are, therefore, collinear. To include two high-risk, collinear services (e.g. ICU and infectious diseases) would not be desirable because this would create unstable model estimates and would, in effect, be modeling the same process twice (i.e. it would result in model over-fitting). Inclusion of infectious diseases captures the impact both of having infectious diseases units and collinear services.

It is possible that variation in surveillance quality could contribute to observed variation in BSI rates between hospitals. We cannot capture this in our models but if a hospital signals (i.e. has a higher than expected rate), an investigation should be conducted and this will determine if the signal is a reporting artifact or a result of an infection control break down. We have acknowledged this in the discussion.

We have validated our models (using c-indices, AUC, etc.) on a validation subset that was separate to the training subset – this is explained in detail in the methods and means that, while the validation was conducted on data from the same hospitals, it was done using data collected over a different time period.
This gives greater confidence in the validity of the models than if we had simply done the validation on the dataset used to generate the models. It also means that the models are robust over time. We do not have data available from another state for external validation purposes but that is something we could investigate in the future. We have acknowledged this in the discussion.

Thank you for reconsidering our manuscript for publication in BMC Infectious Diseases,

Yours faithfully

Archie Clements