Reviewer’s report

Title: The association between each central line insertion bundle and central line-associated bloodstream infection

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Reviewer: Koen Blot

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The study by Lin et al. implemented compliance surveillance, a labour-intensive task. Their central line-associated bloodstream infection rate appears to decrease through implementation of quality improvement interventions (education, insertion bundle, and process surveillance through use of a checklist). Compliance with the care bundle items (hand hygiene, chlorhexidine skin disinfection, maximal sterile barrier precautions, and optimal catheter site selection) was measured only in the post-intervention period. Compliance adherence between patients with central lines that did and did not develop CLABSI was performed. Maximal sterile barrier (MSB) precautions and catheter insertion by intensivists were identified as protective factors for CLABSI prevention.

Major compulsory revisions

Unfortunately, the inappropriate English made it difficult to read and should be revised. As an example, the title should read “The association between each central line insertion bundle item and central line-associated bloodstream infection”.

The primary objective was to identify protective care items. The authors conclude that their results suggest that MSB may be the most effective preventive strategy among the four central line insertion bundles. There are limitations that need to be discussed before making this statement.

1. Lack of the fifth Institute for Healthcare Improvement (IHI) care item (daily review of line necessity) as part of the bundle impedes this reasoning.

2. The CDC guidelines identify all five items to be crucial for infection prevention. A lack of MSB compliance will (as with other care items) lead to an increased CLABSI risk. A lower adherence to chlorhexidine skin disinfection will likely increase CLABSI risk, however since the compliance was near 100% in this study, the association was not found. Therefore it’s inappropriate to conclude that MSB is the most effective preventive strategy.

As mentioned in the discussion section, this kind of analysis is conducive to local ICU CLABSI prevention. With this knowledge the ICU can improve awareness for MSB use and subsequently prevent infections. This difference between external and internal validity should be nuanced.

The secondary objective was to identify CLABSI rate changes due to the quality
improvement interventions. Assessing the impact requires improved intervention
descriptions, adjusting for confounding factors (length of catheterisation), and
preferably interrupted time series analysis. Unfortunately the lack of
pre-intervention compliance data prevents any definite conclusions concerning
the impact of the quality improvement interventions on the CLABSI rate.

1. The initiatives should be described by intervention length, scope and
frequency. What was the content of the education intervention? What are the
care items of the maintenance bundle?

2. Pre- and post-intervention CLABSI data (CLABSI, patient days, catheter days)
and mean length of catheterisation is missing.

3. An interrupted time series regression analysis is preferred.

4. The total number of CLABSI, catheter days and patient days per quarter (or
month) is missing.

5. To assess the impact of the quality improvement intervention, an adjustment
could be made based on device-utilisation rates and duration of catheterisation.

6. The use of retrospective data is not mentioned in the discussion section.

7. Which quality improvement interventions were applied in the pre-intervention
period?
These factors are important to take into account before stating that an
intervention was successful. The authors should reflect this in their conclusion
and abstract: it is premature to state that the intervention effectively reduced the
rate of CLABSI.

Other comments concern general aspects of the manuscript:

1. The applied CLABSI terminology/definitions should be mentioned (CDC
NHSN?)

2. Can the data showing differences in compliance between intensivists and
non-intensivists be reported in this manuscript?

Finally, considering the multiple aspects that come into play during quality
improvement implementation, I would be interested in reading what (if any) of the
barriers to bundle and checklist introduction and process measurement were.
Was there a reason MSB precautions were less likely to be implemented? It
would be interesting to see the effect of a follow-up intervention to improve
awareness on the CLABSI rate.

Minor essential revisions
CLASI is written instead of CLABSI. Sentence structure, grammar and syntax
should be reread and edited.

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

**Quality of written English:** Not suitable for publication unless extensively edited
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.