Author’s response to reviews

Title: Hand disinfection in a neonatal intensive care unit: Continuous electronic monitoring over a one-year period.

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Author’s response to reviews: see over
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Dear Editor,

We are grateful to have been given the opportunity to submit a second revised version of our paper “Hand disinfection in a neonatal intensive care unit: Continuous electronic monitoring over a one-year period”.

We revised the manuscript in accordance with the reviewers’ and editors’ recommendations. Below, we address the reviewers' and editors’ questions and comments.

We hope that the revised manuscript is now acceptable for publication in your Journal.

Yours faithfully,

Onno Helder, on behalf of all authors
Response to the Reviewers

Reviewer 2#: H. Sax

I have the following comments:

1. Abstract (p1, line 13): Indicate that study period for dispenser count was 1 year if word count permits (even if it is mentioned in the title).

   The additional information is added to abstract (page 1, line 9): and changed “Methods: A 12-month observational study...” into “Methods: A one-year observational study...”.

2. Page 2, line 18: objective 2 is still not clear regarding the connection between the two methods used in the study: What does “determine compliance with hand hygiene by direct observation in relation to the measurement of electronic devices” exactly mean? It appears that there is no relation between the two.

   It is indeed through that there is no direct relation between the direct observation to determine compliance and the measurement by the electronic device. We, therefore, changed objective 2 from “… to determine compliance with hand hygiene by direct observations in relation to the measurement of electronic devices...” to (page 2, line 17-18): “… (2) to determine compliance with hand hygiene by direct observations; and (3) ...”.

3. Page 4, line 4: For clarity reasons, these measures should be declared as ecological. Otherwise one could get the impression hand hygiene actions were actually attributed to individual patients/healthcare workers.

   The word “ecological” in this context seems to be some unclear to us. However, based on the second sentence we hope to interpret the crux of this comment correctly. We rewrote the sentence to clarify the message (page 4, line 7-9): “The frequency of hand disinfection events was expressed in two ways: the daily median [interquartile range (IQR)] number of hand disinfection events per bedside; and the daily median (IQR) number of hand disinfection events per healthcare worker. “

4. Page 5, line 22: This calculation needs more explanation (best in the Methods section). This calculation is of limited accurateness: see the following comment. Thus, the approximate nature should be declared.

   This calculation was already explained in the first revised Methods section. Nevertheless, this explanation was not completely clear (page 4, line 22-23). This calculation is now explained as follows: “The number of hand hygiene events for an ideal 100% compliance with hand hygiene was calculated (total sum of recorded hand disinfection events x 100/compliance).”

   The limited accurateness is mentioned in the Discussion section (page 9, line 5-6): “Therefore, the calculated number of hand disinfection events needed for an ideal 100% compliance is of limited acuteness and need to be considered with caution.”

5. Page 6, line 17: One important point is missing here: It may well be that many hand hygiene actions take place at moments that are not corresponding to any indication for hand hygiene. Thus they should not be counted.
We added this point to the Discussion section (page 9, line 2-6): “In addition, healthcare workers also might have used hand alcohol at moments that are not corresponding to any indication for hand hygiene. This possible unnoticed use could have resulted in overestimation of hand hygiene events by healthcare workers. Therefore, the calculated number of hand disinfection events needed for an ideal 100% compliance is of limited acuteness and need to be considered with caution.”

Editor's comment:


   The statement that Sterillium contain chlorhexidine is omitted (page 3, line 16-17: “One of these also has a hand alcohol dispenser (Sterillium, Bode Chemie GmbH, Hamburg, Germany),...”

2. Page 3, lines 16-18: The company’s name is "Bode Chemie GmbH" without "& co.".

   The company’s name is now correctly reported (page 3, line 17): “(Sterillium, Bode Chemie GmbH, Hamburg, Germany), ...”

3. Page 3, lines 16-18: Sterillium is approved for both hygienic and surgical hand disinfection. The wording indicates that it is only approved for surgical hand disinfection. Please check and revise.

   Sterillium is approved for hygienic and surgical hand disinfection. The sentence is revised (page 3, line 16-18): “One of these sinks also has a hand alcohol dispenser (Sterillium, Bode Chemie GmbH, Hamburg, Germany), which is exclusively used for surgical hand disinfection. However Sterillium is approved for both hygienic and surgical hand disinfection.”

4. Page 3, lines 24-26: What is the applied volume per click? I guess it is the same on all dispensers. If it is the same, can you describe how many hand disinfections were performed with 1 click (volume of xx ml), 2 clicks (volume of yy ml) or even more. That would be an interesting piece of information on volumes applied in real life and should be added.

   We added the applied volume per each complete lever-press which is the same on all dispensers (page 4, line 2): “All dispensers delivered 1.8 ml per each full lever-press.”

   The overall average lever press actuations per click was calculated which is 2.8. This information is added in the manuscript (page 6, line 10-12): “The average number of lever-presses per hand disinfection events was 2.8, which equals 5 ml hand alcohol if all lever-presses were fully completed.”

5. Page 4, line 25: Please add for IRB approval: date of approval, name and location of IRB.

   The date of approval, name and location of the IRB has been added (page 5, line 4-5): “The Institutional Review Board of the University Medical Center Rotterdam approved this study at August 23 2007.”

6. Page 5, line 10: The sum is not 44 (14 + 7; 10 + 2; 9 + 1). Please check carefully.
Page 5, lines 14-15: Description is not consistent. Use was low between 16 and 18, there was a peak between 17 and 20. This is simply not possible! Figure 1 shows a "low" until 16 and a "high" between 17-19. Please check very carefully.

Analyses of the median number of healthcare workers (nurses, physicians and nurse practitioners) were repeated with the same results. We presume that the round off of the all individual groups of healthcare workers results in this difference compared to the sum of all healthcare workers. The sum of all medians of individual groups of healthcare workers can be different from the median of all healthcare workers. We changed the text to: (page 6, line 9-10): “The distribution of both disciplines (median) during day, evening and night shifts was 14 vs. 7; 10 vs. 2; and 9 vs. 1, respectively.” So, these numbers are medians.

We have changed the legend of figure 1 according to the suggestions of the editors’ comment. The overlap of episodes of low and high numbers of hand hygiene is removed. Further, all bars are moved slightly to the left since the data in the bar at e.g. 1:00 h were collected between 0:00 h and 1:00 h.

We reworded the legend (page 2, line 4-6): “Analysis of hand disinfection events per healthcare worker by hour of the day revealed a significant increase in hand disinfection events from 8:00 h to 10:00 h, which coincides with the start of the dayshift and medical assessments. Another increase was found from 16:00 h to 19:00 h, which corresponds with elevated activities before dinnertime (p<0.001 for both). The number of hand disinfection events was relatively low from 10:00 h to 16:00 h.”