

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	What's on your keyboard? A systematic review of the contamination of peripheral computer devices in healthcare settings
AUTHORS	Ide, Nicole; Frogner, Bianca; LeRouge, Cynthia; Vigil, Patrick; Thompson, Matthew

VERSION 1 – REVIEW

REVIEWER	Andrea Cortegiani University of Palermo, Italy
REVIEW RETURNED	08-Oct-2018

GENERAL COMMENTS	<p>Thank you for considering me for this revision. The authors presented a well-performed report of a systematic review of the literature to determine the extent and type of microbial contamination of computer peripheral device used in healthcare. They also evaluate the interventions used for terminal cleaning.</p> <p>The systematic review is well-performed in all aspects. They followed PRISMA guidelines to perform and report their analyses. They also reported in details their findings.</p> <p>I have some comments about the manuscript per se:</p> <ol style="list-style-type: none"> 1) The title. In my opinion, the authors should modify the title (although nice) because keyboards are not the only device they searched for. A more formal title would add value to this study. 2) Abstract Line 3-5 pag 3. The authors stated that "computer peripheral devices are frequently contaminated and have the potential to contribute to the transmission of pathogens to patients and staff". However, this statement is not consistent with their findings. Although this MAY be true, this is not a conclusion of their review. They should modify the sentence underlining that there is insufficient evidence to determine the real impact of computer contamination on pathogens transmission. They could report their sentence 36-40 pag. 18 (that is consistent with their findings). 3) I suggest the authors to add some updated reference about the contamination of inanimate surfaces in ICU? I may suggest: Russotto et al. Bacterial contamination of inanimate surfaces and equipment in the intensive care unit. J Intensive Care. 2015 Dec 10;3:54. doi: 10.1186/s40560-015-0120-5; Russotto et al. What Healthcare Workers Should Know about Environmental Bacterial Contamination in the Intensive Care Unit. Biomed Res Int. 2017;2017:6905450. doi: 10.1155/2017/6905450) 4) Did the authors consider to perform a sensitivity analysis for studies in ICU, OR or ED? These departments have more or less the same terminal cleaning procedures. The authors stated that "the vast majority of studies of studies were conducted only in
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	hospitals, including intensive care unit (ICU)" Line 40-44 Pag. 8. So, I believe that it may be possible. 5) Why don't add a conclusion paragraph with (very) strict summary of the findings?
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REVIEWER	Olivia Smibert Massachusetts General Hospital, USA
REVIEW RETURNED	13-Nov-2018

GENERAL COMMENTS	<p>This is an interesting review of the existing literature and complies with the PRISMA 2009 guidelines.</p> <p>The methodology and results are appropriate and I have no suggestions to make</p> <p>My only suggestions pertain to the conclusions or assessments made in the discussion</p> <ul style="list-style-type: none"> - I think it is important to be clear that this review is an assessment of contamination of devices and interventions to reduce contamination not a systematic review of evidence to establish a transmission risk from devices to patients. - It is also important that the authors have acknowledged that there are no conclusions to be drawn about the impact of these potential for reservoirs as a source of transmission in the hospital setting. - The final conclusion should be that no further research should be done on establishing point prevalence of contamination of such devices with any organisms. Only clinically relevant (ie MDRO) organisms should be investigated and the work moving forward should focus on transmission dynamics of these organisms on clinical device, the surrounding environment and the patient. Furthermore, these studies should use WGS to be clear whether the same organisms exist on devices and in patients. Its not enough to simply determine to species level with culture methods any more.
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

The authors presented a well-performed report of a systematic review of the literature to determine the extent and type of microbial contamination of computer peripheral device used in healthcare. They also evaluate the interventions used for terminal cleaning.

The systematic review is well-performed in all aspects. They followed PRISMA guidelines to perform and report their analyses. They also reported in details their findings.

Authors: Thank you for these comments

I have some comments about the manuscript per se:

1) The title. In my opinion, the authors should modify the title (although nice) because keyboards are not the only device they searched for. A more formal title would add value to this study.

Authors: We appreciate this opinion, which we took into consideration. There are many perspectives on the best ways to title a paper. Overall, our goal is to provide a reflective and engaging title. After considering many factors and positions on the title, we would like to keep the title as stated. The title does make it clear that we are looking at keyboards as well as peripheral computer devices. By including the word keyboard, we feel this will make the paper more easily identified by readers. It is our hope that the value of the paper is manifested in the content. Of course, if there is strong indication that our title is misleading, we are open to revision and welcome alternative options.

2) Abstract Line 3-5 pag 3. The authors stated that "computer peripheral devices are frequently contaminated and have the potential to contribute to the transmission of pathogens to patients and staff". However, this statement is not consistent with their findings. Although this MAY be true, this is not a conclusion of their review. They should modify the sentence underlining that there is insufficient evidence to determine the real impact of computer contamination on pathogens transmission. They could report their sentence 36-40 pag. 18 (that is consistent with their findings).

Authors: we agree with the reviewer's comment and have taken the suggestion to update the abstract with language taken from pg. 18.

3) I suggest the authors to add some updated reference about the contamination of inanimate surfaces in ICU? I may suggest: Russotto et al. Bacterial contamination of inanimate surfaces and equipment in the intensive care unit. *J Intensive Care*. 2015 Dec 10;3:54. doi: 10.1186/s40560-015-0120-5; Russotto et al. What Healthcare Workers Should Know about Environmental Bacterial Contamination in the Intensive Care Unit. *Biomed Res Int*. 2017;2017:6905450. doi: 10.1155/2017/6905450)

Authors: we have added the suggested Russotto et al 2015 article to the discussion section (reference 91).

4) Did the authors consider to perform a sensitivity analysis for studies in ICU, OR or ED? These departments have more or less the same terminal cleaning procedures. The authors stated that "the vast majority of studies of studies were conducted only in hospitals, including intensive care unit (ICU)" Line 40-44 Pag. 8. So, I believe that it may be possible.

Authors: We considered sensitivity analyses, but as outlined in the "Summary measures" paragraph of the methods, the data was simply too heterogenous in terms of outcomes and data available to allow this. We could only provide a narrative analysis of possible differences or contrasts between different health care settings.

5) Why don't add a conclusion paragraph with (very) strict summary of the findings?

Authors: We intended the first paragraph of the discussion to be a summary of the findings. We have edited this paragraph to include all major highlights from the findings.

Reviewer: 2

This is an interesting review of the existing literature and complies with the PRISMA 2009 guidelines.

Authors: thank you for this comment

The methodology and results are appropriate and I have no suggestions to make

Authors: thank you for this comment

My only suggestions pertain to the conclusions or assessments made in the discussion

- I think it is important to be clear that this review is an assessment of contamination of devices and interventions to reduce contamination not a systematic review of evidence to establish a transmission risk from devices to patients.

Authors: Thank you for this point. We have revised the Discussion to make it clear that while we did include in the inclusion criteria studies that "reported any association between contamination of

computer-related equipment and infection or colonization of patients/healthcare workers”, our findings were very minimal in this area, thus no conclusions are able to be drawn regarding transmission risk.

- It is also important that the authors have acknowledged that there are no conclusions to be drawn about the impact of these potential for reservoirs as a source of transmission in the hospital setting.

Authors: Thank you for this point, which we agree with. We have edited the “Implications for researchers, clinicians and policy makers” section of the discussion as well as the abstract to emphasize this point.

- The final conclusion should be that no further research should be done on establishing point prevalence of contamination of such devices with any organisms. Only clinically relevant (ie MDRO) organisms should be investigated and the work moving forward should focus on transmission dynamics of these organisms on clinical device, the surrounding environment and the patient. Furthermore, these studies should use WGS to be clear whether the same organisms exist on devices and in patients. Its not enough to simply determine to species level with culture methods any more.

Authors: we agree, this is a good point, we have changed the discussion to emphasize this point (middle paragraph of pg. 19).

VERSION 2 – REVIEW

REVIEWER	Andrea Cortegiani University of Palermo, Italy
REVIEW RETURNED	15-Jan-2019
GENERAL COMMENTS	Thank you for submitting your revised manuscript. I have no further query.