Reviewer’s report

Title: Ear and Forehead Temperature Has a Limited Prediction Value of Rectal Temperature in Children

Version: 0 Date: 14 Apr 2017

Reviewer: Sebastiano Lava

Reviewer’s report:

Backer Mogensen and co-authors present an interesting study comparing 2 peripheral thermometers ( tympanic and temporal) with a rectal one. The theme is of utmost relevance in everyday pediatric clinical practice. This study confirms in the age group 0-18y the results of a previous very similar study performed among infants and children 0-2 years of age consulting their primary care pediatrician (see comment below). It is surprising that, even if different thermometers were used and two different patient cohorts were studied, the 95%-CI of the Bland-Altman analyses are incredibly similar. This adds to the robustness of both studies and suggests that the intervals are really so broad (i.e., clinically meaningful). Although not really innovative, therefore, this study is interesting and, in my eyes, deserves publication.

The study is well designed and generally well written, although I feel that the paper could be shortened by about 15-20%. The analysis of data is appropriate, the literature globally quite well done (two relevant references should be added and one substituted, see below). Finally, some limitations identified by the authors are light and can be, in my eyes, softened (see specific comments below).

Following suggestions might help the authors in further improving the quality of the manuscript and should be addressed.

Page 3, lines 27-29

Significantly: please provide a p-value for the comparison, among brackets (e.g.: "The ear thermometer had a significantly greater ability to detect fever than the temporal thermometer (AUC 0.972; 95% CI: 0.963-0.981 versus AUC 0.931; 95% CI: 0.915-0.947; p-value ...?....)." or "The ear thermometer had a significantly (p-value ....?....) greater ability to detect fever than the temporal thermometer (AUC 0.972; 95% CI: 0.963-0.981 versus AUC 0.931; 95% CI: 0.915-0.947; p-value ...")."

Page 4, lines 15-23

"The quality of these devices for rapid, non-invasive temperature measurements has improved in recent years, with professional-grade infrared pre-warmed tip tympanic thermometers for ear measurements and temporal artery thermometers for forehead measurements."
"The quality of these devices for rapid, non-invasive temperature measurements has improved in recent years (as with tympanic and temporal artery thermometers)."

Page 4, lines 25-33

This is not completely true. Several studies showed the limited reliability of these methods, as underlined in a recent meta-analysis including adults and children [Niven DJ et al. Accuracy of peripheral thermometers for estimating temperature: a systematic review and meta-analysis.
Ann Intern Med. 2015;163:768-77]. Please address this point in a short sentence.

Page 4, line 57 - Page 5, line 1

1) either provide the name of the hospital (instead of "Hospital X") or simply state "to the emergency department of our pediatric hospital".

2) Only children referred to the emergency department or any child referred to your hospital? Since you state "acute", I suppose that they were all admitted through the ED… Please clarify/specify this point.

3) Why were the children referred? Fever or any condition? Please specify. Furthermore, why were they referred and not directly evaluated and treated by their pediatrician? Or were they referred by somebody else (e.g. general practitioner, nurse practitioner, …)?

Page 5, lines 4-5:

The use of the same order of measurement allows comparability of the different patients, but possibly inserts a bias: the body temperature might potentially be lower at the end (i.e. rectal measurements) than at the beginning (i.e. temporal measurements), especially if children are assessed naked. Considering your results, the difference between the measured temperatures might potentially be even bigger. Please discuss this limitation (and its possible impact on the results) in the Discussion section.

Page 5, lines 26-27

The thermometers were bought in 2010 for this study. In fact, on Page 6, I see that the study was performed 2010-2011. Why are you submitting it just during the year 2017? Which problems occurred?

Page 5, line 39: this (n=99 per arm) is including the expected drop-out rate?

Page 6, lines 46-49: if you recruited n=996 patients and 39% of them had fever, you evaluated n=388 feverish children (all the 6 age groups together). Is this correct? If yes, is the power of your study still 90%? In the evaluation of thermometers in their ability to detect fever, should the sample size not be calculated on feverish children?
In addition to the 95%-CI (which, you are right, is pivotal), could you please also provide the p-value?

Page 7, lines 34-37: same comment.

Page 8, lines 9-12

This is not (more) true. Reviews are now available, please check the most recent literature (e.g.: Niven DJ et al. Accuracy of peripheral thermometers for estimating temperature: a systematic review and meta-analysis. Ann Intern Med. 2015;163:768-77).

Page 8, lines 24-25

Studies finding a good performance are not official recommendations. Thus, please change your formulation (for example: "The temporal device […] was found to be reliable…”).

Page 8, lines 34-37 ("In Belgium, 294 children had […] a sensitivity of 41% to detect fever"): children cannot have a sensitivity of 41%, instead, thermometers have one. Please reformulate.

Page 9, lines 22-25 ("(6 months to 5 years), which is also the age group most reluctant to accept rectal measurements"): It is be quite surprising that a 10 year-old girl is less reluctant to accept rectal measurement than a 8 month-old infant. My everyday clinical practice as a pediatrician suggests the opposite. In fact, a survey among Swiss pediatricians supports my clinical impression [Br J Clin Pharmacol. 2013;75:236-243]. I suggest to eliminate this sentence (", which is also the age group most reluctant to accept rectal measurements").

Page 9, lines 36-37: "The strength of our study is that…” --> "The strength of the current study is that…”

Page 9, lines 36-49

Since your study finally included only about 388 children with fever, it is not "the most comprehensive": studies like your reference 14 [Holzhauer JK. Evaluation of temporal artery thermometry in children 3-36 months old. J Spec Pediatr Nurs. 2009;14:239-44], performed among 474 children, are not really smaller. Thus, please reformulate this paragraph in a more prudent way.

Page 9, lines 54-61

Since the temperature readings are "hard facts" and I do not think that the nurses changed the readings before registering them in the CRFs, I think that the failure to blind the nurses does not represent a real limitation. Hard outcomes (such as alive/dead, but also such as a temperature
This objection is adequate. However, you might add a sentence with a (further) defence of this potential limitation (in addition to the fact that the rectal temperature was used as a reference in most studies performed to date): our clinical guidelines and everyday clinical practice base on a temperature defined basing on rectal measurements. It means that the threshold of 38.0°C you assumed (>37.9° means >= 38.0°C) is chosen based on clinical experiences collected with rectal measurements.

Discussion, general comment

Discuss the very similar study of Teller J et al [Teller J et al. Accuracy of tympanic and forehead thermometers in private paediatric practice. Acta Paediatr. 2014;103:e80-3], which found surprisingly similar results in 0-2 year old children consulting their community pediatrician for fever (see also global comment above).

Why do you write >= 38.0°C in the figures legends and >37.9°C in the body of the manuscript (Page 3, line 22; Page 5, line 51; Table 1, legend: Page 15, line 7/8). I suggest to always write ">=38.0°C".

Please be consistent: either always first "peripheral" (i.e. temporal or tympanic) and then rectal, or always first rectal and then "peripheral". For example, change line 8 into: "Fig. 4: Bland-Altman plot for tympanic and rectal temperatures". If you change so, please also change in the figures (Ox axis): instead of "Mean rectal/ temporal temperature" into "Mean temporal/ rectal temperature", and the same for the tympanic temperature.

"Reciever-operatur curve" --> "receiver operator curve" (or, ideally, with the official terminology: "receiver operating characteristics curve")

1) I am afraid that Reference n. 10 is not in English. Can you speak Korean? If yes, congratulations! However, since most of the readers of BMC Pediatrics cannot understand Korean and further meta-analyses are available in more accessible languages, please substitute
this reference with another one, preferably in English (for example the already cited work of Niven et al, 2015).

2) Cite the seminal work of Niven et al, 2015 (see comments above).

3) Discuss the very similar study of Teller J et al (see comment above).

4) After this changes, limit the total number of references to n=20 (i.e.: eliminate one of your current references).

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

Yes

Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

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Please indicate the quality of language in the manuscript:

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