Reviewer’s report

Title: Improved visualization of peripherally inserted central catheters on chest radiographs of neonates using fractional multiscale image processing

Version: 0 Date: 25 Oct 2018

Reviewer: Michael Chuang

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The authors compared standard (STD) with specially processed (FMP) chest radiographs for PICC placement in neonates and used 5-point Likert scales to rate images for PICC-tip visualization and diagnostic confidence. PICC-tip visualization was superior with FMP, but STD images were preferred for diagnostic confidence.

Major Issues

1. The MUSICA-based FMP system generates paired STD and FMP images. Were these viewed pairwise (at the same time) by readers, or were images anonymized and randomized? If the former, then comment on this in Discussion, i.e. could this paired-reading study design force the reader to "select a favorite" between STD and FMP for each pair? Would it even be possible to blind the reader to whether an image was STD or FMP? Discuss.

2. What is the reproducibility of reader scoring?

3. Is quality of PICC-tip visualization by STD correlated with that of FMP? In other words, is it a matter of "good is good, no matter what". Or are there instances where a poor image is "rescued" by FMP? Were there cases where PICC tip was not well seen or not seen at all on STD, but confidently identified with FMP? Was FMP ALWAYS superior to STD for PICC-tip visualization (Figure 1 implies this)? If so, say that explicitly.

4. What does "diagnostic confidence" refer to. Is this confidence in the location of the PICC tip (unlikely) or the perceived usefulness of the FMP image for visualizing and identifying OTHER pathology? If so, then the underlying question is whether FMP is good for everything, or in other words, can STD be discarded. It would improve clarity as to purpose of the study if you just say this explicitly.

5. Repeated reference is made (e.g. in first paragraph of Discussion) to "fast detection". How was "fast" determined? There is nothing in Methods to describe any sort of speed metric. Was fast subjective? If so, then you should not say that FMP is faster without qualification. At best you could say that readers felt that FMP allowed them to more quickly identify "important accompanying pathologies". Of course, if you HAVE quantitative measurements of reading speed, then please present them. Also, discuss why
FMP might allow faster identification of pathology. Does FMP essentially serve as a bandpass spatial filter? Or what other reason.

Other Issues

1. What are study limitations? These should be mentioned in the Discussion.

2. The description of the FMP in Methods (page 8) is not very informative about what is really going on. Frankly it looks as if parts are taken from advertising copy. The phrases "… images are displayed simultaneously and exquisitely…" and "…based on patented, next generation of multiscale image processing called FMP…" are particularly egregious. I would suggest you either give a nontechnical summary, and provide reference to a technical publication, or substantially rewrite this section to provide actual details instead of the current rather "sales pitch" description.

3. Does FMP have any impact on processing time? Presumably FMP and STD images can both be viewed at bedside on the DX-D 100 system. If not, tell us so.

4. Persuant to #3 above, were the reads (especially by the nonradiologists) viewed under optimal (dark room, typical Radiology "cave") conditions, or under bright lights as might be found at bedside when placing a PICC? If there was difference in viewing conditions, discuss how this may have affected scoring. And more importantly, which is the more realistic and clinically relevant condition if the PICC radiographs are likely to be evaluated at bedside.

5. In the figures, I recommend using colors/shades that will look different even when printed out on (grayscale) laser printer. Some people still read printed-out PDFs rather than on screen.

6. Ensure reference format is correct for BMC Medical Imaging (e.g. period at end of each reference is missing), also, ensure that correct abbreviations for journal names are used.

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

No

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.
No

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If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

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