Author's response to reviews

Title: Use of handheld computers in clinical practice: a systematic review

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Author's response to reviews: see over
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The Editor
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Dear Editor,

Please find attached our revised manuscript of an original systematic review titled “Use of handheld computers in clinical practice: a systematic review”. I have included all amendments in a clean copy, for ease of reading – however, I do have a copy with tracked changes if you would prefer to read that.

Thank you for two helpful reviews, which have guided us to specific useful papers to strengthen both the background and the discussion. I will summarise how we have addressed all major and minor points raised by both reviewers. I have indicated revised sections of text by the use of quotations in italics in this letter.

Reviewer 1:
Reference has been made to Alain Labrique’s paper in the final sections, Further Research; “The pace of technological change is moving faster than the time it takes to design, implement and report on rigorous research. “However, there is evidence of a rise in the number of registered clinical trials of mHealth interventions in the USA”

I have reordered the three final sections for ease of reading; Strengths and limitations, Implications for practice, and Further research.

Reference has been made to the Martinez-Perez literature and commercial review of mobile clinician decision support systems in the background, discussion and further research. In the discussion, the actual design of CDSS’s is described more clearly to confirm the included studies results; “CDSSs are designed using either rule-based systems that represent knowledge in IF...THEN rules, or machine learning models where mathematical functions estimate risks given patients’ observations [4]. Both systems were referred to in the included studies.”

The full range of evidence is referred to; “This review supports the mounting evidence from observational studies that mobile CDSSs improve adherence to guidelines and policy, facilitate patient monitoring, provide valuable predictive tools, distinguish different levels of patient impairment and model medical problems for individualised care. Further, if they are integrated with electronic medical records, then individual patient data can be automatically included”.

Reference has been made to Zurovac’s paper about text message reminders in Kenya in the discussion, by describing; “an observational study demonstrated that simpler strategies, such as text message reminders for outpatient paediatric malaria management, was associated with improved adherence to national guidelines in Kenya”

Reference has been made to Rubin’s paper about using PDAs to manage antibiotic prescribing, in the discussion by emphasising that “An observational study conducted within a rural US community randomised trial, demonstrated that a PDA-based CDSS steadily improved outpatient antibiotic prescribing rates, within usual consultations”
Thank you also for the alert to the paper quoted in the earlier JMIR article by Sintchenko titled “Handheld computer-based decision support reduced patient length of stay and antibiotic prescribing in critical care. I had a small panic that this paper should have been included in our systematic review, then realised that it was not randomised! I have included it in the discussion to support the former paper you identified; “Similarly, in a before/after prospective cohort trial in an Australian university-affiliated hospital’s intensive care unit (ICU), the use of a CDSS was associated with a reduction in antibiotic usage and a change in patterns of use, in line with clinical guidelines in critical care. This study also demonstrated a decrease in mean patient length of stay in the ICU, which can be interpreted as a surrogate for patient outcomes and overall costs.”

**Major Compulsory Revisions**

The discussion has been significantly rewritten to include suggested papers and recognise the lack of high quality RCT evidence. Alain Labrique’s paper was helpful in recognising this as an early stage in the development of relatively young research area; “This may represent the early proliferation of small feasibility projects, associated with the growth of handheld computer use in healthcare”.

The phrase “enormous potential” in the Implications for practice section has been replaced with “there is potential for improved access to information and improved clinical decision making at the point of care”.

An additional 3 systematic reviews about computerised clinical support systems have been referred to in the background and discussion to provide greater context for our reported results;


**Minor Essential Revisions**

The phrase “consider the balance the full range” in the further research paragraph has been revised to read; “and to critically evaluate implementation plans and cost-benefit comparisons”.

**Reviewer 2:**

**Major remarks**

In relation to the question of what is new, we have made more explicit the production of feasibility research and the equipoise within syntheses of the literature: “This has also sparked an increased production of feasibility research, which has yet to recommend strategies for engagement, efficacy or effectiveness of mobile health initiatives. Although early systematic reviews offer tentative conclusions, there is still equipoise in the literature.”

This has been assisted by the reference to the recent PLOS article:


We have also summarised what is known about computerised, rather than mobile CDSSs; “An early review of computerised, rather than mobile, CDSSs for prescribing, summarised their effectiveness in initiating and monitoring therapy, but provided little evidence on their impact in specific clinical settings. A later review confirmed these benefits, reporting improved processes of care in 60% of included studies and improved patient outcomes in only 20% of studies. It is not clear whether incorporating these computerised systems into mobile devices would produce similar results...”
The research focus has been clarified and actual research question has been phrased as such at the end of the background: “Most published studies to date describe the design, development and implementation of handheld computers using observational study designs. In order to determine the benefits of integrating handheld computer use in healthcare practice, it is important to summarise and quantify results from the highest quality randomised controlled trials (RCTs) of effectiveness studies. Based on the functions identified in the earlier scoping review, it is timely to better understand whether healthcare professionals’ use of handheld computers facilitates information seeking and improved clinical decision making. The purpose of this review is to answer the research question “Does healthcare professionals’ use of handheld computers improve access to information and improve clinical decision making at the point of care?”

Minor Remarks
3) the 3 distinct functions emerged from the data – this has been made explicit in the 4th paragraph in the results; “Instead, narrative summary was used to describe evidence of effectiveness of three distinct functions of handheld computers that emerged from the data: accessing information for clinical knowledge, adherence to safety and quality guidelines, and diagnostic decision making.”

4) A comment about the risk of bias was included in the results; “The highest risk of bias occurred for blinding of participants, which is not always practical when investigating the use of an obvious handheld computer. Participants could not be blinded in 5 studies where the intervention group used a PDA and the control group did not. Blinding was achieved, however, in two studies where both intervention and control groups were using a PDA.”

This was referred to again, in the first Further research paragraph; “It will be important to carefully ‘blind’ participants to particular functions or apps if all clinicians are using handheld computers within their daily work routines.”

5) Future research ideas have been expanded to include; “Robust and novel research designs are required to rapidly evaluate the effectiveness of healthcare professionals using handheld computers to improve their access to information and their clinical decision making at the point of care, while also documenting how handheld computers can be integrated into normal work practices, and to demonstrate improved clinical outcomes such as prescribing rates and lengths of stay. Areas of high impact decision making such as emergency departments and intensive care units should be targeted for early RCTs. Following on, it will be important to broaden investigations across healthcare professionals in different clinical and geographic contexts, and to critically evaluate implementation plans and cost-benefit comparisons.”

A further PLOS editorial has been used to generate the second paragraph in the Implications for practice; “Further, there is a need to understand the conditions in which handheld computers work best [25]. It may be useful to conceptualise them as complex interventions, informed by a theory of behaviour change and supporting existing practices ....”

- A Reality Checkpoint for Mobile Health: Three Challenges to Overcome. Plos Medicine 2013, 10(2).

Finally, thank you for your continued review of this manuscript. Please contact me for any further information.

With best wishes,

Dr Sharon Mickan