Author's response to reviews

Title: Application of biomedical informatics to chronic pediatric diseases: A systematic review

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Author's response to reviews: see over
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Editor
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Dear Sir/Madam:

Thank you very much for the referee reports of our manuscript entitled “Application of biomedical informatics to chronic pediatric diseases: A systematic review”. The comments were very helpful.

Please find enclosed an itemized list of responses along with the revised manuscript.

In our response to the reviewers, we used regular font for the comments/questions by the referees and *italics* for our responses, which are shown immediately following the questions/comments.

Thank you once again for the opportunity to submit this manuscript to BMC Medical Informatics and Decision Making.

Sincerely,

Joseph Beyene, PhD
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Referee #1:

Overall, this is a well-written paper describing a systematic review of informatics applications to support pediatric chronic disease management. The review covers twenty-seven studies published between 1985-2008. In this respect the authors have done well to undertake a systematic review of informatics applications specifically to manage chronic disease in children as there are no previous systematic reviews on this subject.

We thank the reviewer for the comments.

Comments to strengthen this paper are as follows:

Major Compulsory Revisions

1. Can the authors provide a rationale for a systematic review of a broad range of biomedical informatics applications for physical as well as mental conditions? How valuable is such a review given the heterogeneity of chronic disease and the diversity in models of care that can be supported by biomedical informatics applications.

We fully agree with the reviewer regarding the inherent heterogeneity in the various chronic conditions and models of care. To our knowledge, there is no systematic review providing a comprehensive review of a broad range of biomedical informatics applications for both physical and mental chronic illnesses in pediatric settings that could give some insight for a wide range of consumers and care providers in a qualitatively comparative way. We undertook this project with the aim of characterizing biomedical informatics application in a broader sense to help us narrow down specific areas in the pediatric setting that may warrant further detailed systematic reviews of their own. This rationale is stated in the last paragraph if the “Introduction” section in the manuscript.

2. In the background, please show how this paper builds upon the 2007 JAMIA reviews of informatics systems for chronic disease and home telemonitoring which have both been acknowledged. In particular the following statement on pg. 4 needs to be clarified: “previous systematic reviews of adult chronic disease have examined the effect of medical informatics applications such as home tele-monitoring (8), and information systems (2)” . Indeed, 86% of the studies reviewed in this paper were undertaken in an out-patient setting. Also, what is the difference between “web or computer-based information and communication technology” reviewed here and the informatics systems reviewed by Dorr et. al. (2007)?

We have now added in the background how our review builds upon their reviews. We concentrate specifically on the computer-based information and communication technology which has significant overlaps with informatics systems considered by Dorr et al. (2007. However, there are interventions considered by them, such as disease registry,
public health reporting, audit/feedback, administrative process, population reports, public health reporting that may affect adults with chronic conditions but not necessarily children. Our focus was on interventions that use computer software and communication tool like internet to specifically designed to affect children with chronic conditions.

3. In Table 1, suggest including the primary users, study duration, primary outcome variable and results for each of the studies reviewed. This will make it easier for readers to understand the findings presented in the results section.

In Table 1 of the modified manuscript, we have modified the headings’ Selected outcome’ to’ primary outcome’, ‘System users’ to’ primary users’, and study results are summarized in Table 1 as ‘Study effect’ being either positive or negative. With respect to the study duration, some papers reported study duration and follow-up and some others reported intervention duration; therefore, we decided not to include the study duration in the table due to the large number of columns. Instead, we reported the summary duration and study intervention in the result section of our article.

4. In the results section, can the authors include results of the analyses used to examine methodological adequacy described in the methods section on pg. 5?

We have added the summaries of the scores for methodological adequacy in the result section.

5. Please provide overall descriptive statistics of the characteristics of the studies reviewed i.e. primary users, study duration etc.

Overall descriptive statistics are added in results section of our modified manuscript.

6. In the discussion, please make comparisons with existing literature where relevant. For example, compare results the asthma related studies with previous reviews of asthma interventions.

We included in the discussion section comparisons with existing relevant systematic reviews.

Minor Essential Revisions

6. In the abstract, please include main quantitative results of the review.

We included the main quantitative results of our systematic reviews in the abstract.

7. In Figure 1, include exclusion criteria to show readers how studies were selected.

Figure 1 is modified.
Referee #2:

Major Compulsory Revisions

1. Reviewing the application of biomedical informatics to chronic pediatric diseases is timely, if as the authors indicate, there are no other recent comprehensive reviews. The article abstraction methods the authors used appear appropriate. The authors found a very heterogeneous collection of studies meeting their criteria, differing particularly in chronic condition, intervention domain and intervention method. Since the body of studies is not coherent enough yet to be amenable to standard meta-analytic methods, the authors’ primary challenge is to organize their review so that it is more than a narrative. This task would be assisted by a more critical approach, beginning with an explicit theoretical perspective. There have been various attempts to classify biomedical informatics interventions and the authors should more explicitly comment on how these are or are not relevant to the body of literature that they are reviewing. This would help define the question that the review proposes to answer.

   In this systematic review, we have used several categories which we think are critical in assessing the effectiveness of any biomedical informatics applications including setting, domain, intervention and primary users (Table 1). Our review aims to answer a broad question regarding application of informatics tools in a range of chronic conditions in a pediatric setting. It is our hope that the results from this broader assessment can be used to embark on a more focused review, perhaps targeting only one or two related chronic conditions, specific settings or interventions.

2. The authors indicate that most of the reviewed studies report positive outcomes. Since chronic conditions are difficult to treat and this is a relatively new literature area in which success presumably comes in fits and starts, to what extent does the preponderance of positive outcomes reflect reality, author emphasis or positive result publication bias? Are the methods of the reviewed studies all of sufficient quality to support an overall conclusion of positive outcome? The authors report they evaluated methodological adequacy of the studies but do not report their results. A more critical methodological perspective would be helpful here. This should be reflected in the limitations section.

   We fully agree with the issues raised by the reviewer. For example, publication bias is a real possibility in the kind of studies we included in our systematic reviews. If we had numerical data amenable to meta-analysis, we would have tried to investigate potential publication bias using standard methods (e.g., using asymmetry in funnel plot, which is a visual approach that is often used to assess for publication bias or using regression-based methods that are readily available in the literature). Regarding methodological adequacy of the studies, we now report summary statistics of evaluated methodological adequacy in the results section of our modified manuscript.

3. The authors organize their presentation with regard to chronic illness condition, so that within each illness reviewed studies’ intervention targets and
methods vary. This approach should be justified as superior to an organization by intervention targets or intervention method. Which approach provides the most useful framework to learn from what has been done so far?

We are not sure if there is what would be considered a “superior” approach in this context. We believe that this depends on what aspects of the findings are being highlighted. For example, we chose to organize the material by condition simply to emphasize chronic conditions where there have been more studies done in the past showing biomedical informatics applications and within each condition to articulate methods and intervention targets. This approach could potentially be a preferred approach for readers primarily interested in specific chronic diseases. Having said this, we concur with the reviewer that one could also organize the material by intervention methods used or intervention targets, thus giving slightly different focus to the findings.

4. The ability to generalize from the authors’ review depends on classification of subject samples, intervention types and targets. The review’s illness categories are asthma, cognitive impairment, autism, oncology, diabetes, other and the Discussion adds an obesity study. The cognitive impairment and autism categories overlap in that, for example, both include children with ADHD. Given the small number of studies involved and the overlap, what is the expository benefit of having more than three chronic condition categories; asthma, cognitive impairment, and other? The domain classification does not always make it clear whether the intervention targets were the patients, caregivers, medical providers, or treatment system. Little detail is given about the informatics interventions themselves. Are all unique? Have some had more development than others? How do they relate to informatics interventions in the adult literature?

We did not combine conditions with fewer publications because we thought having more than three chronic condition categories will help researchers to follow up on a particular disease in which they are interested. For our review, the focus was on presenting an overall assessment of the impact of different types of informatics interventions on a spectrum of pediatrics chronic conditions. We plan to pursue another project on which we can expand the scope and perform a detailed comparative analysis of informatics interventions in children and their relations to informatics intervention in adult population.

5. Finally, reviews of medical informatics literature pertaining to treatment of adults with chronic conditions suggest that at least as important as the informatics intervention itself are the human factors that are involved. How is the intervention introduced? How are involved individuals trained in its use? How does it relate to other treatment factors? It would be interesting to know whether the authors’ review revealed the importance of similar contextual factors in this as yet nascent pediatric informatics literature.

We thank the reviewer for pointing this out. This is a very interesting issue that is often given little or no attention in the whole evidence-based medicine paradigm. Majority of
users of health informatics interventions were school age children who either directly used computer or internet or were directly exposed to intervention in several short sessions in school. The human factors were not discussed in details in the papers we reviewed therefore we were not able to comment on the human factors although we agree with the reviewer that human factors involved in the study may be as important as the informatics interventions.