Author's response to reviews

Title: A User Needs Assessment to Inform Health Information Exchange Design and Implementation

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Author's response to reviews: see over
Dear Prof. Duftschmid,

We would like to thank the referees for the valuable comments and suggestions that have improved the quality of our manuscript. Please, find below table containing a point-by-point response to the Referees' concerns.

We hope we have revised our manuscript to the reviewers' satisfaction.

With respect,

Diego A. Martinez
Table 1. Point-by-point response to the Referees’ concerns. Color code: red, major revisions; yellow, minor essential revisions; green, discretionary revisions.

Referee #1: Brian Dixon

<table>
<thead>
<tr>
<th>Referee’s Comment</th>
<th>Authors’ Reply</th>
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<tbody>
<tr>
<td><strong>INTRODUCTION:</strong> Overall the introduction could use both enhancement and refinement. The authors suggest that there is strong evidence supporting the use of HIE. Yet recent reviews of HIE suggest that the evidence is actually mixed. The authors need to review these articles and improve their current synthesis of the existing literature. As-is their review is outdated, especially the numbers they report with respect to adoption. Here are specific articles to review:</td>
<td>We have reviewed the suggested literature and have made improvements in our introduction.</td>
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<td><strong>INTRODUCTION:</strong> The authors stress the terms “use” and “usability” in the last paragraph on page 3 of the article. Yet they do not define what they mean by them. While related, these terms are not synonymous. Furthermore, the term “usability” has certain implications in informatics and human-computer interaction. It is unclear whether the article really has anything to do with usability, but the authors can certainly revise and make a clearer case for using this term.</td>
<td>We have clarified this point in the third paragraph of our introduction.</td>
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<tr>
<td><strong>METHODS:</strong> The article suggests that a “case study” methodology was employed. However, the article in no way represents a case study method. Therefore the authors need to clarify exactly what methodology was used to design the study.</td>
<td>After a careful review of the methods, we agree that the study design proposed in this work better fits the idea of a mixed-methods design, where the qualitative and quantitative information is analyzed together. The qualitative data was analyzed following a hermeneutical content analysis approach, while descriptive statistical values were also obtained from the quantitative data.</td>
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<td>The bulk of the methods section would imply the study was conducted using a qualitative methodology. However, as-is the article does not supply sufficient detail regarding the method. For example, on page 5 the article describes “type of information received.” What categories were derived from the system to identify type and who developed these categories?</td>
<td>The type of study is a convergent parallel mixed-methods study. Explanation provided in the Methods section of the manuscript.</td>
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<tr>
<td><strong>METHODS:</strong> Other sections of the document imply that the methods were “mixed” yet how they were mixed is not clearly articulated. The main methods seem to be qualitative with the exception of the analysis of patients for which OI was obtained. While this portion is quantitative, it is unclear how these results were “mixed” with the interview data. For information on mixed methods, refer to Zhang WQ, Creswell J. The Use of “Mixing” Procedure of Mixed Methods in Health Services Research. Medical Care. 2013;51(8):e51-e7. Quantitative data can supplement qualitative findings, although this does not itself make it “mixed methods.”</td>
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<td><strong>METHODS:</strong> The article describes 750 hours of observation performed to construct the workflow diagrams; this is the process mapping component of the methods described on page 5. How many observation periods were performed? At each observation, how many hours were observed? Were the observations performed on three members of the research team each performed 30 observation periods. During each interval, between 6-10 hours were observed. Observations were performed on every day of the week. During the observations, between 3-</td>
<td></td>
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</tbody>
</table>
**RESULTS:** There are several problems with the **RESULTS** section that need to be addressed. The overarching challenge is that for a qualitative study the results predominantly focus on providing quantitative summaries of responses from the participants. Given the small sample size, it does not make sense to report results using percentages. In a qualitative study, the results should be reported more as a synthesis of the findings rather than a quantified summary of responses from closed-ended questions. If it was desired to have physicians simply estimate % and numbers, then a better study methodology would be the survey approach described in McDonald CI, et al. Use of internet's free time by ambulatory care Electronic Medical Record systems. JAMA internal medicine. 2014;174(11):1860-3.

We used a semi-structured interview to capture both questions to gauge the physician estimates on percentages and frequencies as well as their opinions. We have updated our results section to include more quotes from interviews that give more insight into the thoughts and perceptions of the physicians.

**DISCUSSION/CONCLUSION:** The results from this study must be carefully interpreted. In several places they are exaggerated a bit. Given the relatively small convenience sample of internal med physicians at one institution, results are limited to identifying only some of the motivations for HIE and only some of the circumstances in which HIE may be useful. The abstract, discussion and conclusions must be careful not to over generalize.

The manuscript was carefully reviewed and given more acknowledgements that the findings are limited given the small sample size. This was addressed specifically in the limitations section of our discussion.

**RESULTS:** It is confusing to go back and forth between quantitative and qualitative results. Where quantitative results exist, summarize them first. Then present the results of the qualitative methods.

This was addressed in the Results section of the manuscript to be clearer.

**RESULTS:** On lines 161-162, ",...which is much lower than that reported in other studies,..." is not appropriate for the results section. This kind of comparison to existing literature needs to be moved to the DISCUSSION section.

We have edited this in the results section.
### RESULTS:

On line 156 the article asserts that 2091 of 30461 (6.86%) admissions generated a request for OI. Yet in the same paragraph on line 160 the article asserts that 13.7% of admissions generated a request for OI. Which % is correct? 

This was corrected in the “Respondents and EMR Data” area in the Results section.

We have clarified this in the Discussion section of the paper. During our study we found it was operator dependent if they would give the outside facility the correct fax number to send the clinical information back to. Therefore, it was a problem identified by our study that improvements need to be made in the standard operating procedures and staff training.

### Table 2

Table 2 is unhelpful to the reader. Percentages when N < 100 are useless. These results need to be synthesized because they resulted from interviews.

We have described the information of the tables in paragraph form and in a more appropriate Table 2.

### Table 3, Figure 3 and Figure 4

These are all unhelpful for the same reasons. 

Table 3 has been eliminated and the information was transferred to the new Table 2. Figure 4 was maintained as more of a visual for the reader to easily see comparisons of the frequencies that topics were mentioned by physicians.

### Table 5

This was also maintained as a visual to show frequencies and easily see what was mentioned and comparisons among topics. We acknowledge that this was a small sample size and have addressed the generalizability of our study in the limitations section.

### DISCUSSION:

The first sentence of the discussion section provides a reference to just one study. Therefore this sentence needs to be rephrased, at a minimum, to more clearly state that these suggestions have been identified previously in a single study instead of suggesting they are consensus-based or come from a much larger review article.

This has been addressed in the manuscript in the Discussion section.

A brief discussion about Table 4 was added to Discussion.

Adjustments to the manuscript discussion section were made.

As stated in our introduction, this study was performed at a hospital prior to HIE implementation. Therefore, all OI takes time (1-3 days) to receive by fax and thus cannot be viewed before the clinician sees the patient.

We have addressed this in the manuscript.

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Referee #2: Robert S Rudin

The authors do not say so, but this research is essentially a “user needs assessment.” The authors have correctly identified an important gap in the literature—most HIEs are built and implemented without first doing a user needs assessment. The authors should use that term “user needs assessment.”

We have updated the title and abstract to reflect this.

### INTRODUCTION:

The introduction, the authors point out the limitations of prior studies in that talking with providers who have already implemented HIE have “developed biases.” In the field of Human-Computer Interaction, it is generally considered better (although more expensive) to talk with users who have actually used the product because one’s imagination of a technology and what the product actually does are different things. I think there are tradeoffs to both approaches. It is too simplistic and unclear to dismiss user testing as “biased” in favor if user needs assessments. We need both and they are complementary. The introduction should be more comprehensive.

These are excellent points. We have addressed this in the introduction section of the paper.
**DISCUSSION:** The major strength of this research is that it can inform the design of HIEs. You should make explicit design recommendations in the discussion, perhaps as a table or figure (some of the other tables or figures can probably be moved to an appendix). For example, allow keyword search functionality, provide the phone number of the information source for follow up questions, and format documents for specific clinical situations.

We have added the suggested table to our manuscript based off information from the interviews.

**RESULTS/DISCUSSION:** Much of the information in the discussion should be in the results. There are a lot of findings brought up for the first time only in the discussion - this should not happen. Discussion should not bring up new results; it only discuss implications of what is in the results section. You may have to make the results section more concise.

We have moved material from the discussion into the results.

**DISCUSSION:** Please make some comments in the discussion about the value of doing a user needs assessment before implementing an HIE, and if it is important in designing effective HIE. Don’t be shy about severely criticizing existing methods described in the literature in which HIE is implemented without doing any needs assessment (the lack of user involvement may explain in part the low usage of most HIEs today). You should make a very strong case for the need for more upfront work in understanding the user, and designing a product for them. This methodological argument (i.e. demonstrating the value in an in-depth users needs assessment) is the most important result of your work.

Thank you for this feedback. We have addressed this in an above reviewer comment and made updates in the introduction and discussion of the paper.

**The methods should discuss the coding process. How many coders where there? How were disagreement resolved?**

This comment was addressed in the previous reviewer’s comments.

**Line 160: 13.7% is not “around one fifth”. I think stick with the number and don’t try to round.**

This has been corrected in the Results section.

**The flow chart is interesting and shows the complexity of the current process. There are cases where there is a pause to wait for some information – it would be better to more clearly label those cases.**

We have updated the flow chart to reflect this.

**Line 287: What exactly is this advanced functionality?**

Advanced functionality in that paper referenced was meant to mean specific examples of sharing information. Meaning not generally an HIE but that they created a system to share specifically the cardiac catheterization procedures easily with other hospitals involved.

**Line 316: Does 50% refer to the portion of physicians or portion of visits in which a transfer was involved?**

It refers to the portion of physicians. This has been clarified in the Discussion.

**Referee #3: J. Mac McCullough**

Please provide additional information regarding the qualitative data analysis. How was coding performed (i.e., was it open ended or pre-codified)? Were multiple researchers involved in coding and if so how were discrepancies resolved?

This has been addressed in an above reviewer comment.

The authors provide a wealth of findings spanning physicians’ use—and non-use—of OI in a non-HIE setting. The paper could benefit from additional consideration of which of the factors shown in tables 2 and 3 are amenable to HIE and which are likely.
to remain problematic. Findings could be contrasted with other existing studies of 
physician usage of HIE.

Even the modest size of this non-probabilistic sample, the authors should be careful 
to avoid overstating the ability to make reliable comparisons between the self- 
reported usage of OI and the quantitative clinical data. Moreover, the statistics 
reported actually appear to be more accurate than the authors are giving credit for. 
For instance, 80% of physicians estimated they ordered OI for < 15% of patients 
when the actual figure was 13.7%. Also, 75% of physicians estimated that the 
information wasn't received or wasn't correct more than 33% of the time when 
according to the results, 38.9% of OI requests were not fulfilled. These alternative 
interpretations paint a different picture than those contained in the discussion.

Authors state that a non-probabilistic sampling approach was used. What 
characteristic(s) were used to select participants for inclusion, and why?

In the limitations the authors note that findings may not be generalizable. Please 
provide additional contextual information so that readers might understand how 
their settings compare to the one studied (e.g., EPIC is used in at least two places to 
imply that the EMR system in use is EPIC. But it is not entirely clear whether this is 
the case.)

The empirically-validated value of HIE is perhaps overstated in the introduction. HIE 
is certainly known to have major benefits, but systematic reviews [including Rudin et 
Al. (#6)] also clearly state known shortcomings and other areas where HIE is 
currently failing to live up to its anticipated promise.

A few minor grammatical issues (e.g., Abstract - Background “...yet utilization 
among US hospitals IS low?”)

This has been addressed in the paper. Per our results, 80% of 
physicians under and over estimated the % of patients 
that they request outside records for. In regards to the 
estimation of correct OI, we have corrected the typo in the 
discussions section to reflect the numbers in the results 
section.

We have indicated in our limitations section that this study 
may not be generalizable and have provided specific 
information about our setting that will help others, such as 
the use of EPIC.

Our study focuses on clinicians’ perspectives of utilization 
of outside records and how better access to information 
would help them provide better care. We also wanted to 
capture what information was needed in different 
situations. Our paper is not a study on the pros and cons of 
HIEs. The goal is to better inform those that are designing 
HIEs to help them incorporate clinician friendly interfaces 
and functions as well as inform administrators as to 
advantages of finding properly designed HIEs.

The Abstract-Background section was changed in a 
previous reviewers comment.