Reviewer's report

Title: Measuring adherence to antiretroviral therapy in northern Tanzania: feasibility and acceptability of the Medication Event Monitoring System

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Reviewer: Staci Martin

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The rationale for this study is nicely laid out in the Background section. Clearly, to demonstrate that use of MEMS is feasible in resource-limited areas would be very important and have great potential implications for monitoring and improving adherence to antiretrovirals. Thus, this manuscript’s topic is of substantial importance. However, there are a few points that are unclear to me, and places in the paper that would benefit from added details. These and several other suggestions for strengthening the manuscript are laid out below.

Discretionary Revisions

Since the authors are making the case for the feasibility of using MEMS in resource-limited settings, it might be nice to know how they were funded (i.e., how they obtained funding to purchase the MEMS caps). I know they mention their funding source in the Acknowledgements section, but perhaps briefly mentioning how they were funded in the text would be interesting.

Page 11, the authors report that four healthcare providers participated in the interviews. Were they asked the same questions as the patients? Very few results were presented from these professionals. Is there anything of interest from these interviews? If not, why include this detail in the paper? Also, it is not clear why the data clerk was interviewed, since that person may not have known much about the topics covered in the interviews (?)

Page 14, paragraph 2: several patients reported that they did not travel with the MEMS bottle because of concerns about it being stolen. In these cases, did they put their medication into another bottle and take it with them? If so, why were they worried about the MEMS bottle being stolen but not their regular bottle of medication? Was it because of the potential expense of having to replace it? It would be nice if the authors could explain this a little more clearly.

Page 15, paragraph 3: It is too bad that the clinic sometimes mismanaged the dispensation of medication so that patients did not have enough pills to get them through until their next visit. Do the authors have any recommendations for how this could be handled better by clinic staff in the future?

Minor Essential Revisions

Watch use of commas, misspelled words, and missing words. For example, in the Background section, delete comma after “it” on line 5, paragraph 1 and after
"ART" in line 8, paragraph 1. Page 5, last paragraph, insert "in" after "ART".
Results section: enrollment should have two ls, and "widow" should be "widowed". Conclusions paragraph: insert "a" after "given in" on line 4.

Define PLWHA the first time it is used (Background section, paragraph 2).

On page 6, paragraph 1, I think “proceeding” should be replaced with “preceding” if the authors wish to convey that non-adherence comes before viral replication.

Page 7, paragraph 2: the sentence that starts “Patients were explained…” is not clear. It would be more clear to state “Patients were informed that…” or “The researcher explained that…”

Page 8: in the Interview procedures and analysis section, were they any procedures implemented to ensure that the interviewers were relatively uniform in their administration of the questions?

Page 16: sentence 5: I don’t think “fear for” should be in parentheses.

Page 17, paragraph 1: I think this paragraph could benefit from more details. When the authors note that the participants “did not mention any challenges”, could they be more specific about what they mean by “challenges”? Also, when the authors state that MEMS-data confirmed “that”, what is meant by “that”?

Table 1: Age should not be included in the table because the table column presents N values and percentiles, not means. Present mean age in the text only.

Major Compulsory Revisions

MEMS data analysis section, page 9: the authors describe examining data for “periods of one week of more during which the MEMS cap registered no medication intake events”. I am not clear on why the authors chose one week as their time frame for this purpose, and think a shorter time frame would have been better. For example, if a patient had 4 days with no MEMS events registered, couldn’t this indicate non-adherence or non-MEMS use? Please explain the rationale for this choice or shorten the time frame.

In the same paragraph: the authors say that “interviews were examined for reports of interrupted MEMS use”. In describing the interviews in the previous section, this line of questioning was not described. Were all patients asked about interruptions in MEMS use as a standard part of the interview, regardless of MEMS data results?

Page 15, paragraph 1: monthly adherence scores were computed if at least 2 weeks of data was available. This makes it sound like the researchers calculated adherence scores for patients who had two weeks of data that was unaccounted for. Reporting a monthly adherence score for someone with two weeks of data for the month seems potentially misleading. How do the researchers know what happened during the missing two weeks? If someone were 100% adherent for two weeks (on MEMS), and non-adherent for the other two weeks of the month
(with no MEMS data), you would be falsely representing that person’s adherence as 100%. I would recommend calculating adherence scores if someone had at least three weeks out of the month, or clarifying this methodology if I am not understanding it correctly.

Page 18, paragraph 1: the authors suggest that future studies should ensure that participants know their MEMS data is anonymous so that adherence does not increase as a result of being monitored. Wouldn’t that be a positive impact of MEMS caps? There is no way to prevent the effects of being monitored, even if the patients are told that their clinician will not be told of the results. Similarly, it sounds funny to say in the last sentence that MEMS instructions should be “given in a way that it does not instigate patients to improve their adherence.” Even if just for research purposes, I would wonder about the ethics of attempting to avoid having the patients’ adherence improve. Perhaps the authors could revise this paragraph with this thought in mind.

**Level of interest:** An article of importance in its field

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests.