Reviewer’s report

Title: Operationalizing a model to quantify implementation of a multi-component intervention in a stepped wedge trial

Version: 0 Date: 06 Jul 2017

Reviewer: Sarah Krein

Reviewer’s report:

Strengths

This manuscript describes a useful framework and provides a well-defined step by step illustration of developing quantitative measures for evaluating implementation of a complex multi-component intervention. Discussion of the conceptual basis along with a detailed practical example is much appreciated and quite useful for anyone conducting implementation research. The importance and potential utility of using quantitative measures as part of implementation evaluation is also nicely demonstrated and the work in general contributes to the field of implementation science.

Primary Weaknesses

Major weaknesses of this manuscript are in the presentation and some disappointment in that the example seems incomplete.

Many of the presentation issues are likely due to translation issues (e.g., use of the term efficient components rather than effective components) and can be readily addressed with some additional editing.

The fact that there is no analysis involving the effectiveness outcome(s) is a bit more problematic. Granted, this may be the topic of a subsequent paper but without showing a link (or attempting to show a link) between the measures and the desired outcome, the full utility of the measures is not clear. This is especially true given that it is difficult to assess the importance of the identified differences, which even if statistically significant may not be truly meaningful. Moreover, the steps in developing quantifiable implementation measures as described in the methods section include determining "optimal delivery" of the intervention and "optimal receipt". Yet, how optimal is defined or determined is not clearly specified although presumably could be empirically derived. As such, while this work clearly demonstrates a strategy for defining and constructing measures of key implementation constructs it just seems incomplete.

Other issues

1) Background: in the first sentence, I believe you mean heterogenous not heterogenic
2) Background: in paragraph 3, sentences 4 and 5 are confusing, as I'm not clear as to what frameworks or characteristics are being discussed, and could likely just be eliminated.

3) Methods: under development of program logic and intervention protocol, I don't understand the question "How important is fidelity to adaptation?" or more specifically how the issue of adaptation is considered as part of this work.

4) Methods: in defining the fidelity measures the phrase "a percentage of the intention" is used a couple of times and what this means is not entirely clear, perhaps the percentage delivered as expected or delivered as specified in the protocol?

5) Results and Table 2: the differentiation or relevance of intended sessions vs. sessions held is not clear and how one obtains measures of content and quality for intended sessions that were not held needs to be discussed.

6) Results: the discussion of Table 4 suggests a lot of pairwise comparisons were conducted but whether many of these differences are meaningful even though some may be statistically significant is questionable. Thus, simply showing p-values for all of these comparisons doesn't seem overly useful and a few examples may be a better strategy for highlighting the key points.

7) Discussion: in the discussion of differences in implementation of the three components, it is not clear what is meant by the phrase: "...thus required comprehensive organization of working hours to conceive."

8) Discussion: although the issue of potential bias (i.e., overestimation) of the self-report data used for some of the measures of intervention delivery is acknowledged as a limitation, a more thorough discussion of certain measurement principles and potential challenges with measure specification is warranted. This includes issues with having to make certain assumptions, data sources that may not be ideal (resulting in potential bias as acknowledged or even misclassification errors) and issues of reliability and validity. These are issues that most anyone who tries to develop quantitative measures will likely have to face and could have a significant impact when assessing the association between the measures and any outcomes.

9) Table 4: please verify the SD for delivery timing, step 1 participation rate, which is listed as 1.

Level of interest
Please indicate how interesting you found the manuscript:

An article of importance in its field

Quality of written English
Please indicate the quality of language in the manuscript:

Needs some language corrections before being published

Declaration of competing interests
Please complete a declaration of competing interests, considering the following questions:

1. Have you in the past five years received reimbursements, fees, funding, or salary from an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

2. Do you hold any stocks or shares in an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

3. Do you hold or are you currently applying for any patents relating to the content of the manuscript?

4. Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript?

5. Do you have any other financial competing interests?

6. Do you have any non-financial competing interests in relation to this paper?

If you can answer no to all of the above, write 'I declare that I have no competing interests' below. If your reply is yes to any, please give details below.

I declare that I have no competing interests

I agree to the open peer review policy of the journal. I understand that my name will be included on my report to the authors and, if the manuscript is accepted for publication, my named report including any attachments I upload will be posted on the website along with the authors' responses. I agree for my report to be made available under an Open Access Creative Commons CC-BY license (http://creativecommons.org/licenses/by/4.0/). I understand that any comments which I do not wish to be included in my named report can be included as confidential comments to the editors, which will not be published.

I agree to the open peer review policy of the journal