Author’s response to reviews

**Title:** Can the effects of the Mobilization of Vulnerable Elders in Ontario (MOVE ON) implementation be replicated in new settings: An interrupted time series design

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**Author’s response to reviews:**

RE: Can the effects of the Mobilization of Vulnerable Elders in Ontario (MOVE ON) implementation be replicated in new settings: An interrupted time series design - Ms. No. BGTC-D-18-00317

Dear Dr. Aronin and the BMC Geriatrics Editorial Team,

Thank you for consideration of our manuscript for potential publication in BMC Geriatrics. We have revised the above manuscript based on reviewers’ comments, and believe that incorporating their feedback has enhanced the quality of our paper. With our re-submission, we have included:

- Our revised manuscript (clean and tracked changes version);
- Our point-by-point responses to reviewer comments.
We have also included all other mandatory documents for re-submission.

Many thanks to the BMC Geriatrics editorial team and our peer reviewers for the valuable feedback they provided on our manuscript. We believe that our paper is aligns greatly with the objectives of Health Services Research are delighted to have the opportunity to re-submit our paper to this journal.

Sincerely,

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Response to Reviewers

1. Reviewer 1: The method in which the main outcome, mobilization of patients, was measured has significant limitations. In this study, researchers conducted visual audits on 2 days/week to assess mobilization status; if patients were out of bed (either seated, standing, or walking) during 1 of 3 audits for a given day, they were considered to be 'mobilized'. This method is limited in that it 1) does not capture the volume or intensity of mobilization; 2) does not align with what the authors describe as the goal of the intervention ["mobilization should occur at least three times per day" (line 150)]; 3) may not be a sustainable form of monitoring mobilization as a process measure in the hospital setting, which is important for implementation efforts to be successful.

Response: We agree that ideally, mobility should be assessed using automated devices or video cameras. However, these were not feasible to use given our budget constraints. Moreover, we wanted to use a pragmatic strategy that could be used after the study was completed, to facilitate sustainability. Our knowledge users identified audit as a strategy to assess mobility because many of the hospitals used a similar strategy to assess hand hygiene; as such, this was seen as a feasible strategy and could use the same individuals. We completed a test accuracy study prior to
implementation and found this to be an accurate method for assessing mobility (LR 12). We have highlighted this as a limitation in the manuscript.

- We also note that audit data included several levels of mobility (e.g., in bed, in chair, walking with assistance, walking independently). Not all patients were able to walk independently and our messages focused on tailoring the mobilisation to the individual. As an implementation strategy, we provided unit specific audit and feedback reports to illustrate type of mobilization and an average mobilization at three audit time points. Since patients are on various units (e.g., surgical, psychiatry) mobility levels are unique to each patient. Aligning with the key messages of MOVE, mobility is tailored to the patient abilities. The aim of the study is to capture patient’s mobility at a minimum level of being out of bed. Since intensity is variable and is dependent from patient to patient, the study objective was to ensure patients were out of bed. The volume of mobilization was captured in our results section and indicated in Additional file 5: Weekly visual audit results for proportion of patients out of bed for site excluded in overall ITS analysis.

- Encouraging mobilization for at least times a day was implemented as a feasible and actionable recommendation for staff to continuously keep mobilization on the radar and embedded into daily practice. Incorporating tailored mobility practices into everyday routine (AM, Lunch, and PM) can ensure that mobilization is embedded in culture and in turn improve mobilization rates.

- MOVE is a cost effective and low intensive process measure to monitoring patient mobility. Previous MOVE sites have adapted, tailored and embedded this process measure into their everyday practice by incorporating the measure into their documentation or using whiteboards for staff to use to monitor mobility. We have updated the description of the intervention in the methods to reflect this rationale. [Description of the intervention, Page 7, paragraph 1; Strength and Limitations, Page 18/19, paragraph 2]

2. Reviewer 1: Second, the results of this study should be stated more conservatively, particularly regarding the 'length of stay' outcome, but also in certain places of the 'patient mobilization' subsection. Wherever results are listed, an acknowledgement of the statistical significance (or lack thereof) should be stated.
Response: We reviewed all results in the manuscript and clarified using the term statistically significant where appropriate. [Primary outcome: Patient Mobilization Overall results Page 13, paragraph 1/2; Hospital –Specific Results Page 14, paragraph 1; Strengths and limitations Page 19, paragraph 2]

3. Reviewer 1: Third, other outcome measures, in addition to length of hospital stay and discharge destination, are noticeably absent. There is research to support (which was cited by the authors in the Introduction section) that early and more frequent mobilization may improve the incidence of hospital-acquired pneumonia and deep venous thrombosis. The authors’ work would benefit from acknowledging this as a limitation and an area of future study.

Response: Thank you for your comment. We have updated the strengths and limitations section to reflect this. We agree that additional outcomes could have been included if more funds had been available to obtain these data. [Strengths and limitations Page 18, Paragraph 2]

4. Reviewer 1: Line 82, there is an extra comma after 'pneumonia'

Response: Completed [Background Page 4, Paragraph 1]

5. Reviewer 1: Line 87, please add 'the' between 'in' and 'hospital'

Response: Completed [Background Page 4, Paragraph 2]

6. Reviewer 1: Line 99, please select 'achieved' or 'done', the other should be removed

Response: Completed. Selected “achieved” [ Background Page 5, Paragraph 3]

7. Reviewer 1: Methods—Mobilization of patients was assessed by visual audit (3x/day, 2x days/week). Patients were considered 'mobilized' for a given day if they were out-of-bed (seated, standing, or walking), and then mobility status was averaged for the week from the two audited days (lines 192-195). Although the authors provide evidence to support the reliability of this measurement method, I question the validity. First, this method does not consider the amount or
intensity of mobilization that the patients received. For example, if patient A walks 100 feet in the hallway and patient B just moved from bed to chair, this is clearly different and would most likely yield different health benefits. However, under the current operational definition, they would be classified the same. Moreover, this method does not appear to match the goal of the intervention. The authors state that they believe that mobilization should occur 3x/day (line 150). The current method does not account for the frequency in which patients are mobilized, despite the fact that audits occurred 3x/day. This should be acknowledged as a limitation, and some justification should be provided.

Response: See comment response 1 and limitations clarified in the discussion on pages 18/19. The aim of this project was to implement and evaluate an evidence-based strategy targeting staff to promote early mobilization (primary outcome) in older patients admitted to hospitals. This operational definition contains key messages to outline the implementation strategy to target staff. At the unit level, the Central Implementation Team provided audit and feedback reports that reflected AM, Lunch, and PM audits over time to improve implementation efforts and mobilization rates to specifically target staff. These outcomes were reflected as an intervention activity (audit and feedback report) at the local level rather than the primary outcome which is overall patient mobilization (out of bed).

We have clarified throughout the manuscript that the intervention targeted staff. We have added more details about the intervention activities (audit and feedback report). As mentioned above, we have clarified the limitation to our methods. [Description of the intervention Page 7, paragraph 1 ; Updated Additional file 2 ; Strength and Limitations Page 18/19 , paragraph 2]

8. Reviewer 1: In addition, percent of patients mobilized is considered a process measure (i.e., a measure that is a specific step in the process that should ultimately lead to a positive outcome, such as decreased length of stay) (Lilford 2007 - Use of process measures to monitor the quality of clinical practice). For hospitals to implement, sustain, and evaluate the quality of this intervention, they should be able to easily evaluate their process measures. The visual audit method used in this study requires extensive resources, which may be burdensome to health system administration, staff, and clinicians, and thus limit the sustainability of the intervention. The authors would benefit from acknowledging this limitation, and the authors should consider future studies that incorporate mobilization reporting in patients' electronic health records to enhance the sustainability of MOVE ON.
Response: As mentioned above, use of video cameras and personal exercise monitors could be used to accurately assess mobility. However, these are expensive to implement and are not feasible in most settings, in particular, in acute care hospital units with large patient volumes. As such, the knowledge users in our study wanted to identify a strategy that could be sustained after the study, in particular, they identified use of audit, which was also being used to assess hand hygiene practices on units.

Facilitating sustainability and scalability were at the heart of the MOVE initiative. To ensure effective scalability and sustainability of the intervention, we have tailored, adapted and implemented resources for hospitals staff to monitor and assess patient mobility (e.g., embed in current quality improvement initiatives, embedded in current clinical documentation practices). These tools have been found to be feasible and sustainable tools and are included on the MOVE website (free access) www.movescanada.ca.

These are updated and reflected in the description of intervention section and the Implications for tailoring, scaling up, and spread section. [Discussion Page 16, paragraph 1; Strengths and limitations Page 18, paragraph 2; Discussion- Implications for tailoring, scaling up, and spread Page 17, Paragraph 2 ]

9. Reviewer 1: In lines 162-164, the authors discuss selecting a tool to help assess patient's mobility. It is unclear how this tool was used in the context of this study.

Response: Thank you for your comment. We agree and have removed this statement.[Methods- Description of the intervention Page 8, Paragraph 1]

10. Reviewer 1: In line 173, the authors state that palliative patients were excluded from the study. Although it is fairly obvious (more mobility may not mean lower length of stay for patients), please provide the rationale for this exclusion criterion.

Response: Palliative patients may be diagnosed life-limiting illness which in turn patients may have very limited to no mobilization. Updated to clarify this rationale. [Methods- Participants Page 8, Paragraph 1]
11. Reviewer 1: In lines 274-275, the authors state, "a significant increase in mobilization was observed during the first weight weeks…" Please provide the p-values for this statement in the text of the manuscript.

Response: We updated the statement to reflect the trend rather than stating that it is significant. Site specific results are reported in additional file 4. [Please see additional file 4 for each site; Results- Hospital-specific results Page 14, Paragraph 1]

12. Reviewer 1: In 'Secondary outcome: Length of Stay' subsection (lines 284-285), please preface that all changes here were not statistically significant in nature. Then, I think it is OK to go on to point at the 'trends' seen in the analyses.

Response: We have changed the results to clarify when results were statistically significant. [Secondary outcome: Length of Stay Overall results Page 14/15, paragraph 1]

13. Reviewer 1: In lines 295-297, the authors state that the decreasing trend post-intervention [for length of stay] correlates with patient mobilization. To my knowledge, however, the authors did not employ a form statistical test to assess the correlation between the two. Unless a formal statistical assessment can be performed, please revise this statement to say 'upon visual inspection of the data, it appears that a decreasing trend in LOS corresponded with an increasing trend in mobilization'.

Response: Thank you for your comment. The statement has been updated. [Results- Secondary outcome: Length of Stay Overall results Page 15, Paragraph 1]

14. Reviewer 1: In line 312-313, the authors state that there 'was a significant decrease in length of stay during the intervention'. The word 'significant' lends the reader to believe that the decrease was statistically significant. Please revise this sentence.

Response: Thank you for your comment. The statement has been updated. [Discussion Page 17, Paragraph 1]
15. Reviewer 1: For lines 309-325, please truncate this section to only include interpretation, rather than re-stating your findings. For example, statements such as, "some sites were able to maintain intervention effects into the sustainability phase, while others experienced declines in mobilization eight weeks post-intervention," is repetitive with the information given in the results/figures.

Response: The discussion was shortened to focus on interpretation. [Discussion Page 16]

16. Reviewer 1: For line 332, the authors reference their previous study's findings. A p-value is provided for mobilization rates, but the p-value for decreased LOS if left out. As previously mentioned in the comments on the Results section, please provide p-values for LOS analyses, as it can be misleading to the reader.

Response: Similar to this study, the previous study findings indicate a p-value describing the difference between two phases (intervention phase vs. pre-intervention). We have clarified this in the manuscript. [Discussion Page 16, Paragraph 2]

17. Reviewer 1: For lines 345-347, the authors mention a systematic review that only found 14 studies to meet the inclusion criteria specified. Please provide how many studies were evaluated (e.g., "14 of ____ studies..."), so the reader does not have to search for the reference.

Response: Completed. 14 of the 272 studies met inclusion criteria. Updated manuscript to reflect this [Discussion- Implications for tailoring, scaling up, and spread Page 17, Paragraph 2]

18. Reviewer 1: In the Strengths and Limitations section, please include the limitations concerning the method of mobilization assessment, as discussed in the General Comments and Specific Comments for the Methods section. In addition, it is worth noting that this intervention did not cause a statistically significant decrease in length of stay. Is it possible that: 1) the sample size was still too small to detect an effect; 2) the intervention dose needs to be increased to affect length of stay; or 3) other outcomes may be more susceptible to enhanced mobilization, such as the rate of deep venous thrombosis or hospital-acquired pneumonia?
Response: The limitation section was clarified to mention the limitations to the measurement used and to enhance the interpretation around the length of stay results. [Strengths and limitations Page 19, paragraph 2]

19. Reviewer 1: In the 'Declarations' section, the authors state that, "all data generated or analyzed during this study are included in this public article." To me, this statement implies that the raw dataset is available for analysis, but it doesn't seem that the dataset is contained within the supplemental material. I would encourage the authors to amend this statement to reflect this point.

Response: Thank you for your comment. This has been amended. The data are available from the authors on request. [Declarations Page 20]

20. Reviewer 2: This is an interesting study in implementation and adds to the science on replication. However, many details are missing - due to previous publications (e.g., methods) which should, in part, be included here. There is also too much in the table and not enough synopsis/detail in the paper. While methods are published elsewhere there should be enough in this MS to understand what was done. Additional description of each of the units needed in methods. Lines 182-185 are unclear.

Response: Included additional information to the methods. All replicated methods were described in the paper. Moved unit description from the results section to the methods. [Methods Page 5, Paragraph 1]

21. Reviewer 2: In table 1, what does "other" include?

Response: Other means unspecified discharge destination data. This change has been updated in the manuscript. [Table 1: Patient characteristics for the 5 sites included in the ITS analysis Page 12]
22. Reviewer 2: Implemented interventions should be discussed in text, not just table.

Response: We have updated the manuscript to include the primary implementation activities used. [Methods- Description of the intervention Page 8, Paragraph 1]

23. Reviewer 2: Take limitations out of abstract conclusion. MS needs editing/careful read through.

Response: Removed and reviewed. [Abstract Page 3]