Author’s response to reviews

Title: Implementation of grip strength measurement in medicine for older people wards as part of routine admission assessment: identifying facilitators and barriers using a theory-led intervention

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Author’s response to reviews:

Dear Editor,

We would like to thank both yourself and the reviewers for your valuable comments that will strengthen our paper. We have addressed the comments as shown in the tables below and revised the manuscript with changes highlighted. We look forward to hearing from you.

Yours sincerely

Kinda Ibrahim on behalf of the authors

Reviewer 1

1- How the hand grip was tested (sitting)? What angle were the shoulder and elbow joints? How many seconds was the subject asked to perform the grip? What was the "opening" on the Jamar device? Where the test were taken and on what time of the shift/s?
Thank you for this comment. Handgrip test was measured based on the Southampton protocol for grip strength measurement that was referenced in the paper (ref 32). Key features of this are: subject seated; Forearms resting on the arms of the chair (elbow at 90°) Wrist just over the end of the arm of the chair, in a neutral position, thumb facing upwards; Feet flat on the floor. Subjects instructed to squeeze as hard as they can for around 5 seconds until asked to stop. Jamar device read from zero on the dial. The test took place by the patient’s bedside and was carried out within 3 days of admission at any time suitable for patients and nursing staff. We did not pre-specify a particular time of day. As we demonstrated in the qualitative analysis, some staff tended to perform the test afternoon, while others chose a range of times to fit in with their work schedules. More details were added to page 7.

2- Why 'The' specific hospital was chosen for this study?

The study was conducted in our local hospital which admits a large number of older patients as unselected emergency admissions. This hospital is representative of large hospitals in the UK.

3- How many Jamar devices were used?

Each study ward received one Jamar dynamometer (5 Jamars in total). The dynamometers were calibrated at the beginning and end of the study. Additionally their measurement accuracy against known weights was checked every three months during the study period and all dynamometers remained suitable for use during the study period. This has been clarified on page 9.

4- How came demented or MCI patients included in the study?

Thank you for your comment. The main aim of the study was to train nursing staff to measure grip strength of all their patients as part of routine admission procedures. Approximately 50% of patients in the hospital acute medical wards for older people have cognitive impairment often due to delirium and/or dementia. Staff were trained to measure grip strength among these patients and to record in the grip care plan if they could not perform the test due to severe dementia or impaired cognitive function or other reasons. The Ethics Committee who reviewed the study did not require individual written consent from patients to perform the grip test.
5- The interviews with staff and patients were face-to-face as well group interview. Where these structural interview, structural questionnaires? How many subjects participated in a group?

When the interviews took place? (at the end of the hospitalization period, at the same test day, etc.).

Thank you for this point. Interviews and focus groups were semi-structured as illustrated in additional file 2.

Individual face-to-face interviews were conducted by one researcher with 8 patients by their bedside within 3 days of grip strength measurement to maximise recall as mentioned in page 11.

Staff interviews took place in a room on the wards towards the end of the implementation period to capture the actual experience of staff and any changes in practice related to grip strength implementation. We conducted 8 interviews and 3 focus groups with 7 staff (2-3 participants in each group). More detail of the qualitative data collection was added to page 11.

6- I could not understand if the testers received money (financial compensated) for their test procedures. Please clarify.

No one was offered any financial compensation. Grip strength was part of their routine assessments on admission to the wards.

Reviewer 2

1- The cohort includes 811 patients of whom 81% was able to perform the grip strength measurement. It is not mentioned in the manuscript how many patients were eligible for grip strength assessment, and what the percentage of inclusion is. It would also be informative to know how many patients were admitted to the wards during the implementation period.
Thank you for the comment. In order to capture the adoption and coverage of grip strength across the five study wards, we conducted a snapshot audit every 1-2 weeks of all patients’ records on the five wards that day to identify the percentage of patients who had the grip test done and those who had low grip strength. We were unable to review the medical records of all eligible patients who were admitted to the five MOP wards during the implementation period (9 months). From these snapshot audits, 2043 patients were eligible for grip strength measurement and 811 patients had their grip strength measured reflecting the variation in adoption between wards.

2- Patients admitted to the ward for less than 3 days were excluded from the study (which is not mentioned at "setting and participants"). The reason for exclusion is unclear (what is the number of exclusions and the median lengths of stay of this group?) Were these patients discharged home or to a different department? Grip strength is a single measurement; therefore, these patients could have been included.

Thank you for this comment. All patients were considered eligible to perform the grip strength test unless they are at end of life. This was described in setting and participants. Staff were trained to measure grip strength within three days from admission to the ward. So patients who had a length of stay less than 3 days were excluded from the audit data that evaluated staff adoption and coverage as it would be unclear whether those who had not had the assessment would go on to have it measured within the agreed time frame. This was clarified on page 10.

3- Standardization of grip strength is a challenge. How was it standardized / which protocol was used? How many patients were not able to perform the handgrip strength due to limitations in performance (broken arms, severe pain etcetera)?

Grip strength was measured based on the Southampton protocol. 156 out of 811 records reviewed (19%) were reported as the patient was unable to perform the grip strength measurement. Different reasons for inability to complete the test including: confusion 28 (18%), severe dementia 31 (20%), inability to understand English / instructions 29 (19%), patient refused 31 (20%), unwell patients who are unable to squeeze 27 (17%), aggressive patients 7 (4%), and patients with severe arthritis 3 (2%). This is now described in more details at page 15.
4- The standardized protocol for grip strength (Roberts HC et al. 2011) recommends 3 measurements of grip strength on each side. A recent study by Reijnierse et al. 2017 (Journal of Cachexia, Sarcopenia and Muscle) also reported that 3 measurements is preferable. Why did the authors choose 2 attempts per hand?

Thank you for this point. Two measurements with each hand were used because this group of older acute medical inpatients tire quickly and our recent research indicates that the third attempt is rarely the maximum value in this group of patients. We would still advocate three attempts with each hand for community based studies. This has been clarified on page 7-8.

5- In the results, it is stated that measurements were mainly performed by the "ward champions", selected by ward managers. Table 7 reveals that in 4 out of 5 wards there was low shared commitment from staff other than the ward champions. How much of the successful implementation is only attributable to the ward champions as opposed to the 155 trained nursing staff? How many of the 655 grip strength measurements were performed by these ward champions? In the qualitative analyses, it is unclear how many of the 15 included staff members were ward champions

Our aim was to evaluate the coverage and adoption of grip strength on the study wards. We aimed to identify what makes the implementation successful in practice and the variation in practice across different MOP wards. We identified two patterns of successful implementation: 1) ward 1 which had high shared commitment from staff and 2) ward 3 which had highly motivated ward champions with low shared commitment from other staff. However, we did not examine the percentage of trained staff who performed the grip strength measurement. We have added this point as a limitation to our study on page 25

In the qualitative interviews, 4 of the 15 participants were ward champions. This has been clarified on page 11.

6- The evaluation of the reported costs of the grip strength measurement during 12 months in the discussion section is limited. What is the cost-benefit of performing grip strength measurements
in clinical practice. The advantages of performing grip strength measurements should be extended. However, a major limitation is the fact that grip strength is not sensitive to change and cannot be used to assess interventions, for which we have to deviate to muscle mass measurements. This should be mentioned in the discussion section.

Thank you for this comment. As the focus of the study was to evaluate the feasibility of implementing grip strength routinely in practice, we only evaluated the costs of implementation. However, we agree that the cost-effectiveness of implementing grip strength in clinical practice should be a focus for future research. We have added this to future research on page 26. We have also added a comment on the sensitivity of grip strength to change in the discussion page 24.