PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (http://bmjopen.bmj.com/site/about/resources/checklist.pdf) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	The Development and Validation of the Fracture Risk Scale (FRS) that Predicts Fracture Over a 1 Year Time Period in Institutionalized Frail Older People living in Canada: An Electronic Record-Linked
AUTHORS	Ioannidis, George; Jantzi, Micaela; Bucek, Jenn; Adachi, Jonathan; Giangregorio, Lora; Hirdes, John; Pickard, Laura; Papaioannou, Alexandra

VERSION 1 - REVIEW

REVIEWER	Angela Juby University of Alberta
	Canada
REVIEW RETURNED	12-Apr-2017

GENERAL COMMENTS	This is an interesting study, and has clinical validity given that is uses data that is already being routinely captured in many LTC facilities
	Table 1, line 35-37 is confusing as to which groups are being evaluated.
	It would be interesting to the readers to compare this tool to the QFracture tool that also includes LTC, and also provides fracture risk lovels for 1 year. Comments on how this tool differe from
	QFracture would be useful, as well as what this tool adds to the field. If this work is planned for the future, then a comment in this regard
	should be made.

REVIEWER	Johanna de Almeida Mello LUCAS KULeuven, Belgium
REVIEW RETURNED	15-May-2017

GENERAL COMMENTS	This is an interesting and well-written manuscript which addresses the very important topic of hip fractures. The scale you are developing and validating will be a great asset to the outcomes of the interRAI instruments. The CAP which can be developed from this scale will be very helpful as a tool for careplanning as well as very relevant to improve quality of life of older people as well as avoid visits to the emergency department and hospitalizations. I have only a few remarks since I found the statistical analysis very sound and the text of the manuscript is clear throughout. Thank you!

The words 'of' and 'the' are not separated in this sentence: "However bone density is challenging to obtain in LTC, and previous work has identified that the use of the FRAX model without bone mineral density identified 98% of residents as candidates for treatment 14."
The same problem: the words 'systematically' and 'interpret' are not separated in this sentence: Our intention is to further develop the FRS into a CAP algorithm, to assist LTC health professionals to systematically interpret fracture risk levels that are generated by the instrument and to inform clinical decision making as part of the care planning process."
As you are not using a follow-up assessment from the MDS, why did you discard people without reassessments during the 1 year follow up? Is it because they might have left the nursing home?
It would be helpful to include some examples in the sentence below. It is too vague as it is now. This information could be relevant for the manuscript, so please add some examples of these different risk factors of LTC and community: "Finally, the instruments do not include LTC specific risk factors for hip fracture which are different than in the community specific risk factors."
I have a question about your methods on how the derivation and the validation samples were divided. How was this done? It is not explained clearly in the paper and as it is now the reader would not be able to replicate it. Was this division random or did you make the division of the samples by choosing a validation population similar to the derivation population, in order to have almost the same proportions for each of the characteristics displayed in table 1? How was this performed?
Please add the percentage to this number in the results section as well as in the abstract: A total of 1553 (%) new fractures
In table 1, what do you mean by "very severe"? Fractures? Or health status? Please specify.
In the decision tree, please specify "previous falls in the last 180 days" and "previous fractures (hip or other fractures)". This is essential information in the tree and can only be found in the Appendix. It is better to indicate it in the items of the tree or in a footnote.

VERSION 1 – AUTHOR RESPONSE

Reviewer 1

We would like to thank the reviewer for taking the time to review our manuscript and for her thoughtful comments.

1. Table 1, line 35-37 is confusing as to which groups are being evaluated.

We have changed the table and include headings for the 2nd page. We believe that this has improved

the readability of the table.

2. It would be interesting to the readers to compare this tool to the QFracture tool that also includes LTC, and also provides fracture risk levels for 1 year. Comments on how this tool differs from QFracture would be useful, as well as what this tool adds to the field. If this work is planned for the future, then a comment in this regard should be made.

We agree that it would be useful to compare our FRS to other instruments including the QFracture. We know include the following in the discussion section (page 12 and 14) "The use of our scale will minimize the duplication of work that is often required to support non-integrated tools, such as FRAX, CAROC or QFracture 9-12 40" and... "Future research should focus on comparing the FRS to other fracture prediction instruments, developing a CAP for the scale, and evaluating the performance of the FRS in home care."

Reviewer 2

We would like to thank the reviewer for taking the time to review our manuscript and for her thoughtful comments.

1. The words 'of' and 'the' are not separated in this sentence: "However bone density is challenging to obtain in LTC, and previous work has identified that the use of the FRAX model without bone mineral density identified 98% of residents as candidates for treatment 14."

Thank you. We now separated the words "of" and "the".

2. The same problem: the words 'systematically' and 'interpret' are not separated in this sentence: Our intention is to further develop the FRS into a CAP algorithm, to assist LTC health professionals to systematically interpret fracture risk levels that are generated by the instrument and to inform clinical decision making as part of the care planning process."

Thank you. We now separated the words "systematically" and "interpret".

3. As you are not using a follow-up assessment from the MDS, why did you discard people without reassessments during the 1 year follow up? Is it because they might have left the nursing home?

Yes, you are correct that the resident may have left the nursing home. As a result, these individuals may have developed a fracture outside the LTC setting.

4. It would be helpful to include some examples in the sentence below. It is too vague as it is now. This information could be relevant for the manuscript, so please add some examples of these different risk factors of LTC and community: "Finally, the instruments do not include LTC specific risk factors for hip fracture which are different than in the community specific risk factors."

We agree, the sentence has been modified as follows: "Finally, the instruments do not include potential LTC specific risk factors (i.e. wandering, cognitive impairment and transfer status) for hip fracture which are different than in the community specific risk factors (i.e. age, sex, and prior fracture status) 15."

5. I have a question about your methods on how the derivation and the validation samples were divided. How was this done? It is not explained clearly in the paper and as it is now the reader would not be able to replicate it. Was this division random or did you make the division of the samples by choosing a validation population similar to the derivation population, in order to have almost the same

proportions for each of the characteristics displayed in table 1? How was this performed?

We now include the following: These residents were randomly divided between a derivation (n=22,386) and validation sample (n=7,462) for the development and testing of our scale (Figure 1).

6. Please add the percentage to this number in the results section as well as in the abstract: A total of 1553 (...%) new fractures...

We now include the following in the abstract: "A total of 1553 (5.2%) fractures were reported over the one year time period." We now include the following in the results: A total of 1553 (5.2%) new fractures (including hip, spine humerus, forearm, and pelvis) were reported over the one year time period.

7. In table 1, what do you mean by "very severe"? Fractures? Or health status? Please specify.

Thank you. Yes, very severe indicate cognitive performance. We have deleted this row and the data are now included in the cognitive performance scale section of the table.

8. In the decision tree, please specify "previous falls in the last 180 days" and "previous fractures (hip or other fractures)". This is essential information in the tree and can only be found in the Appendix. It is better to indicate it in the items of the tree or in a footnote.

As suggested, we now include these variables in a footnote.

VERSION 2 – REVIEW

REVIEWER	Johanna de Almeida Mello LUCAS, KULeuven
REVIEW RETURNED	23-Jun-2017

GENERAL COMMENTS	Thank you for the revisions you have made to the manuscript. In my opinion, the manuscript does not need any further reviewing. It is a very interesting paper and very relevant to the field of geriatrics. This will be an added-value to the outcome measures from the interRAI instruments.
	Thank you for your effort!