Reviewer's report

Title: Frail-VIG index: a concise frailty evaluation tool for rapid geriatric assessment. Results of a 24-months prospective follow-up

Version: 1 Date: 30 Oct 2017

Reviewer: Elsa Dent

Reviewer's report:

This paper proposes a new Frailty Measurement Tool derived from electronic medical records then assesses its discriminative ability to predict mortality in older adults.

Here are a few comments to improve the quality of your paper:

MAJOR COMMENTS

1. Clegg et al. 2013 (your reference #3) state that a frailty measurement tool should be able to identify frailty. How do we know that your Frail-VIG Index actually identifies frailty? You have validated your Frail-VIG Index against mortality to show that it is an accurate predictor of mortality. However, that makes your index a good mortality index, not a frailty evaluation tool. You need to validate your Frail-VIG Index against reference standards for frailty (eg a full Frailty Index, Fried's criteria, or a geriatrician assessment of frailty) to show that you are actually measuring frailty with your measurement tool.

2. Please read the author guidelines with how to present tables and figures for BMC Geriatrics. Specifically, colour shading should not be used in Tables, and Figures should be designed so that all information including text is legible.

   Note that your figures are blurry, and you cannot read the text in Figure 1. Where is the legend in Figure 1? Why is colour used in Figure 2?

3. What are the implications of your study? Why do we need another frailty measurement tool, especially one that is so similar to Rockwood's FI-CGA and Pilotto's MPI? Your study does use electronic medical records from CGAs to compute frailty. How will this information be useful? Note that a geriatrician will need to complete the full CGA before frailty can be identified with your index, so it will not be a fast process (which is a limitation that you need to note in your study).
How do your results compare to those of other frailty indices derived from electronic medical records (EMRs). Eg see Clegg et al. 2016:  
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4846793/ 

This information needs to be discussed in your Discussion section.

2. You have used a cut-off point of greater than or equal to 0.20 to define frailty in your Frail-VIG Index. However, you have cited a study from 2007 [reference 21 in your paper] which: (i) uses 32 variables as opposed to your 22 variables; and (ii) does not actually state anything about using a cut-off point of 0.2.

This brings the question: why have you used a cut-off point of 0.2 to define frailty? You have stated that your index is a "new concise evaluation tool for rapid geriatric assessment". If you have a new tool, you will need to establish your own cut-off point specific for this tool.

To work out an optimal cut-off point for your frailty tool, you will need to work out the sensitivity and specificity for each 0.05 point in the frailty index (focus on between 0.1 and 0.4 so you need to do fewer analyses). Then compute Youden Index (J):

\[ J = \text{sensitivity} + \text{specificity} - 1 \]

The score that receives the maximal Youden Index is the optimal cut-off point for your Frail-VIG.

Note that whilst it may be easier to simply use a cut-off point of 0.2 that papers applying Rockwood's Frailty Index are using, you are not using a Frailty Index. Both the original and follow-up papers on the frailty index emphasize that a minimum of 30 variables are used. When you have 30 variables, it does not specifically matter which variables you use as long as follow the procedures outlined by Searle et al. (as you have stated in your paper). However, when you use less than 22 variables, it does matter which variables you use. Thus, you will need to develop your own cut-off points for your frailty tool.

Also of note: many papers applying the Frailty Index use a cut-off point of 0.25 to define frailty (and not 0.20):  
Eg http://www.europeangeriatricmedicine.com/article/S1878-7649(13)00110-1/abstract  
^^ the latter of these is for a link from a book by Rockwood himself stating that if a cut-off point be used, 0.25 should be it.

Also importantly: you have cited the incorrect Rockwood 2007 article for your reference 21.

3. On page 5, you state that you have followed the STROBE guidelines during your paper. However, this is not a true statement:

   - We do not know the demographic, clinical or social characteristics of your population. Where is your Table showing the baseline characteristics of the participants in your study?

   - You have not reported the number of individuals in each stage of your study. Eg You state that there was no exclusion criteria in your study. However, how many patients did you need to approach before you recruited 590 patients into your study? Were their patients who said no to participation in your study?

   - Did you control for confounding variables in your study (eg in your ROC curves)?

   - How did your select your sample size?

4. Why was your auROC value so high compared with the literature? Most studies have values between 0.6 to 0.7 for frailty indices against mortality as an outcome, and thus your findings are inconsistent with the literature. It is therefore suggested that you compare your frailty measurement tool against another well validated tool so we can see if it is indeed a good predictor of adverse outcomes, otherwise it is unknown if there is something in your study inflating the auROC.

6. You state that you had no missing values observed for any of the study variables. This is pretty amazing, and is the only study I have ever heard of in geriatric medicine that has been able to do this. Are you able to add this observation to the "strengths" section in the Discussion section of your manuscript and describe how your data collection was able to have no missing values. This information will be of value to readers of your paper.
MINOR COMMENTS

1. Are you able to shorten your title? It is not very concise. 15 words maximum is suggested.

2. Your paper states that your "Frail-VIG index" is new. However, this comment is an overstatement. Your Frail-VIG is essentially a shortened version of the FI-CGA as defined by Rockwood and colleagues, and is the same conceptually as the Italian Multidimensional Prognostic Index (MPI). Please therefore refrain from using the word "new" when describing your frailty measurement, particularly in your title.

3. A major limitation of your study is that you do not use the national death registry to follow-up mortality data. Please state this in your limitations sections. Using EMRs to locate information on mortality is prone to errors, and has been found to miss around 30% of mortality in previous studies.

4. In your abstract, define what Frail-VIG stands for (eg state what you have in your introduction, or state what VIG stands for in Spanish).

5. State your mean and SD values as: "mean (SD) patient age was 86.4 (5.6) years....." as per statistical standard. eg refer to a modern statistical textbook on how to do this: eg "How to report statistics in medicine" by Thomas Lang and Michelle Secic.

6. Please use formal language throughout your paper: that is avoiding shorthand abbreviations such as "i.e." (page 8, etc).

7. Page 2, P<0.001 (line 66). Note that you have one too many decimal points here.

8. Page 2, line 55: please report your auROC values to two decimal points (eg 0.90).
9. Define NECPAL (page 6)

10. Where is "Vic" (page 6 of your paper), for readers not familiar with your research location (eg which country).

11. Terms such as "social frailty" are introduced in your Discussion section, but need to be defined earlier in your paper.

12. Additional file 2: if you are going to include this information on the different frailty measurements, then you will need to describe these in your methods section, as well as describe the underpinnings of this table (eg what was the purpose of this table).

13. Can you add in more detail about how your data on mortality was collected? Was it one researcher who went through patient charts at the follow-up time-points, or did they contact patients directly, and if so/when?

14. 5. Methods section: there is missing information here. How long were patients in hospital on average before a CGA was performed? How long was it between the time the relevant CGA data was collected and you applied your index to the dataset?

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

No
Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

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