Author's response to reviews

Title: Development of the interRAI Pressure Ulcer Risk Scale (PURS) for use in Long-Term Care and Home Care Settings

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Author's response to reviews: see over
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The Editors
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Re: MS: 2056336432383138 Development of the interRAI Pressure Ulcer Risk Scale (PURS) for use in Long-Term Care and Home Care Settings Jeff W Poss, Katharine M Murphy, Gail Woodbury, Heather Orsted, Kimberly Stevenson, Gail Williams, Shirley MacAlpine, Nancy Curtin-Telegdi and John P Hirdes

On behalf of myself and my co-authors, I am submitting with this summary cover letter a revised manuscript.

I thank referee 1 for her review.

I thank referee 2 for a very thorough review of the manuscript. A point-by-point response follows.

(1) The Background/Introduction section is not well structured. I would suggest providing some few introductionary statements first and then leading the reader to the problem (including findings from previous research). End the Introduction part with your own research question.
   • The background/introduction has been re-structured to guide the reader to the research questions.

The lengthy descriptions of the RAI and the Braden scale should be placed somewhere in the Methods part under the heading "Instruments" or the like.
   • These 2 sections have been moved to the methods section and re-titled.

(2) Background, The Braden scale: Detailed Braden scale score properties should be explained in the Methods section (see above).
   • This section has been relocated to the methods section.

Additionally I would suggest being more precise: The Braden scale is one instrument among many others and there is no empirical evidence, that the Braden scale application improves patient care. Braden scale scores (like many others) have serious validity and reliability problems. Please provide a more balanced literature review and refer to respective papers (e.g. Pancorbo-Hidalgo et al.: Risk assessment scales for pressure ulcer prevention: a systematic review. Journal of Advanced Nursing 2006;54(1):94-110; Moore, Cowman: Risk assessment tools for the prevention of pressure ulcers. Cochrane Database of Systematic Reviews 2008;16;(3):CD006471).
   • The review of the Braden scale has been enlarged with an eye to balance, incorporating these two references.

(3) Background, Related studies & purpose: In my view you address a very important question: How to reduce paperwork and decrease pressure ulcer occurrence? Therefore I would urgently recommend to put the whole study into a broader context. Pressure ulcer risk scale scores are related to poor health and high levels of care dependency in general. Therefore it does not only make sense to look for the association between Braden scale and MDS scores. It should also be

- We struggled with adding this to the background, however have made the point in the discussion and referenced the Tannen et al. article.

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(4) Background, study aim: Please make your study aim more precise. Your methods and results do not entirely fit to your questions. I feel your main question is: Is it possible to measure pressure ulcer risk based on MDS scores? If this was true, then you could focus your whole analysis and discussion. I would NOT create a new scale. There are over 40 instruments available and we do not need the 41st. Since there are structural problems in these kinds of instruments this would not justify your effort and it would not improve practice.

- Yes, this is a main question, but we feel by itself it fails to give the context of how the Braden intervention led to the examination of the potential for the MDS as a way to get a useful clinical indication but with a lower assessment burden. Have rewritten the statement of purpose with these ideas in mind.

(5) Background, Related studies, 3rd sentence: The comparison belongs to the Methods.

- We have included more details regarding it in order for it to sit better in the background section of the paper.

(6) Methods, Setting and subjects, 3rd paragraph: What do you mean with validation data? What kind of validation for what?

- We have added language to indicate that the primary LTC homes data were for derivation and additional data was used for testing of the scale’s ability to predict pressure ulcers in other settings.

(7) Methods, Analysis: This part is hard to read and understand.

- We have added a section at the beginning of the methods to guide the reader in the phases of the work

I would suggest describing and explaining all methods in logical order step by step.

- We have tried to trod a middle path here, to reduce duplication, trying to describe general approaches in methods, and with sufficient detail in the results section to understand how that particular result was achieved

Who matched how the items

- We have identified that it was representatives of the 3 groups (wound care education, government, research)

What decision trees were used? How were they developed?

- This has been removed, on reflection it was exploratory and did not influence choices in an important way, and it overly complicates the methods

What exactly happened then?

- We have added language to clarify the steps and data used.

Please provide the statistics used; how they were interpreted (alpha-levels, strength of correlation …
• We believe this reads more clearly now and with more detail. 
Again, become clear of your research question and aim. In the second paragraph 
is written "… with the goal of a predictive scale that could be calculated using an 
existing MDS assessment …". Given, that this is the overall aim (see above) you 
must use appropriate methods, e.g. calculation of predictive values, ROC-curves 
to find appropriate cut scores. Please also note, it is not recommended to 
develop and validate tools using the same data set (STARD). Maybe you could randomly split 
your large sample randomly in two halves, one for development, and one for validation.
• In hindsight, yes it may have been the prudent way to go, but it was not what actually 
happened; here the CCC, HC data were used as test samples. 
Also important is the question, why do you deal with Braden scale scores in your study at all.
• We appreciate this point, but the Braden initiative was the starting point for this work; 
We are hoping that the reader will appreciate it in context 
There is no conceptual linkage between building an alternative prediction rule based on your 
MDS data set and Braden scale scores. Furthermore, you have no incidence data for the Braden 
scale sample. Therefore you can't calculate the predictive performance of the Braden 
scores in your sample.
• This is true, this work never undertook to validate the Braden Scale, only to use it as the 
starting point for a discussion between wound care experts, government, and researchers. 
(8) Results: Please clearly distinguish between results description and Interpretation 
• We believe the overall re-writing of the results and discussion makes this improved. 
(9) Results, second paragraph: As you mentioned, few MDS item scores were highly correlated 
with nearly all Braden scale items. While it makes sense to focus on pairs with highest 
correlations, it is questionable to use items that are poorly correlated. Furthermore, you can't 
operationalize Braden scale constructs like "Sensory perception" with cognitive skills or 
"Moisture" with incontinence, because they are conceptually distinct 
• This section has been rewritten, with these claims removed or downplayed. 
Again, to solve this problem I would recommend to focus on the MDS items only and to 
investigate their predictive validity only. Then you could pick the "best" items only. There is no 
rationale to build a six-item model when there are strong reasons to create a five or seven 
item model. 
• The Braden Scale remained a central design consideration, to describe it otherwise would 
not be in keeping with the spirit of the work. 
(10) Results, 3rd paragraph [I think you mean the 4th paragraph?] : I can't follow this paragraph. 
What c-statistic?
• We have added some text to guide the reader 
Where are the results of the logistic regression models?
• They are only described here as they contributed to the process, we don’t believe their 
detail would add substantively to the paper 
Why did you use multivariate models when you were interested in the independent relation of 
the item scores?
• This has been stated more clearly, the intent was to see if all contributed in a 
simultaneous model 
Why were the variables changed again?
• Assume the changing of the nutrition item is meant here? It was our process that led to it 
being changed at this point, the Braden cross-walk exercise had not picked it up, and it
was only at this point that the change in future instrumentation (the item will be absent in future versions of the MDS) was considered.

(11) Results, 4th paragraph: Here, there is a conceptual break in your analysis. Why did you considered additional items? I do agree that this makes sense, but it is completely unrelated to the Braden scale. Again, I would recommend leaving the Braden scale completely out.

- With respect, this makes it a different paper. We have added some language in the methods that there is a conceptual break, as you say, and that we kept the Braden crosswalk in mind but also looked at the large dataset for other potential predictors.

Please clearly distinguish between Methods, Results and Interpretation.

- We believe this is now improved, following several points above.

(12) Results, 4th paragraph, performance in Table 4 and Figure 1: Table and figure do not display performance. Relations between scores and incidence tell nothing about predictive performance. ROC-curves are required. Do not develop and validate a tool within the same data set.

- We have replaced ‘performance’ with ‘results’
- ROC curves for Braden cross-walk and PURS added to figures
- In hindsight, it would have been preferred to reserve a portion of the data for validation, however this was not the process that was adopted. This might have yielded different c-statistic values in the validation data, but it’s unlikely that it would have yielded a different choice for the 7 items or their weights.

(13) Results, 5th paragraph, first sentence: I feel there is something wrong with the first sentence. What exactly do you mean with modeling new pressure ulcer… Where are the results for the CCC data set?

- For brevity, we did not include a table with full treatment of CCC, HC, but we do describe distribution, the range of incidence rates at each end of the scale, and c-statistic values.

(14) Results, last paragraph: The role of this paragraph including table 5 is not entirely clear. Consider ROC-curves for different settings.

- We have added an additional sentence in the results section suggesting this is an indication of concurrent validity by using the equivalent measures in a related but distinct setting.

(15) Discussion: After the revisions have done, I think the Discussion needs some rewriting. Additionally, please discuss only things that follow from your aim, methods and results.

- We believe this now reads more tightly, but it’s not clear what things in discussion are considered superfluous

(16) Discussion: Please add limitations: use of routine data sets, secondary data analysis, measurement errors in scores and pressure ulcer diagnoses, time between risk assessment and pressure ulcer development (risks may change, ulcers may heal)

- We have added 4 sentences with additional limitations, the 3 month reporting interval, under-reporting, use of secondary data, degree that these limitation might influence the findings.

(17) Conclusions: You can't conclude that your model based on MDS data supports preventive interventions or reduces costs, because you did not investigated these issues.

- We have revised this section with different language to reflect what can be concluded.
Abstract: The description of Methods and Results is unclear and needs more precision. Please provide only Conclusions that do follow from your results.

- These sections have been revised with a mind to more precision
  - Minor Essential Revisions
  Background, first paragraph, 3rd sentence: While I agree with the list of risk factors (although there are many more) I would recommend to update the references and to provide key references (e.g. validation of subscales does not support this statement). Perhaps you could refer to up to date systematic reviews or the latest EPUAP NPUAP guideline.
    - We have added additional risk factors based on the EPUAP NPUAP guidelines and cited this reference.
  - Discretionary Revisions
  Please provide full names of all abbreviations when they first appear in the text.
    - Has been checked and corrected