Author's response to reviews

Title: A modest start, but a steady rise in research use. A longitudinal study of nurses during the first five years in professional life.

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Author's response to reviews: see over
A modest start, but a steady rise in research use. A longitudinal study of nurses during the first five years in professional life

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Dear Dr Aarons,

We are grateful for your and the reviewers’ comments on our paper. Below you find our reply to the comments we received. We think this revised manuscript has improved considerably and hope you will find it suitable for publication. All authors have read and accepted the revisions made. Both a ‘tracked changes’ and a ‘clean’ version are attached to this re-submission.

Best regards

Lars Wallin, RN, PhD, Assoc Prof

Comments from Dr Aaron

The missing data analyses (pages 8-9) use correlations but some of these seem to be categorical or dichotomous in which case chi-square analyses would be more appropriate. This might be mitigated if Spearman correlations are utilized for the categorical variables and Pearson Product Moment correlations for continuous variables but this is not specified in the manuscript.

In order to be able to compare the magnitude of possible selection effects we have now expressed all associations in the correlation metric. In order to account for the different data levels, we have estimated tetrachoric correlations, polychoric correlations and polyserial correlations.

The study design appears to have nurses nested in institutions. This could be educational institution (where they received their training). This would assume a possible effect of education institution on future research utilization. Alternatively - through the multiple waves of data collection nurses were nested in hospitals and hospital could also have an effect on research utilization. For example, some hospitals might have more overt emphasis on evidence-based medicine or research utilization. There is no description or rationale provided of these nesting levels. Although the manuscript states that a multilevel modeling approach was used, there was no information about the levels of nesting or how the analyses accounted for the nested data structure. It appears that analyses were all conducted at the individual nurse level. Please assess the impact of the nested data structure (e.g., information on the intraclass correlations for educational institution and/or hospital) to determine whether there are nesting effects and then apply the appropriate analytic strategy.

Good point. When data collection was initiated the eligible students were nested within 26 different educational institutions. The possible impact of educational institution on future research use was estimated using intraclass correlations. The correlations were generally low (ICC less than 0.01 in
magnitude) and the highest ICC was 0.017 (for conceptual research use one year post graduation). We have interpreted this as there are no nesting effects on future research use. We have now included this information in the method section.

Although the authors use the terminology of continuous variables - the outcome variables are categorical. It would be helpful to describe the range of number of shifts if this is known. In particular, these are potentially unequal intervals. For example, the number of shifts in the interval from ?Never? to some shifts is unknown. The interval from 50% to >50% could be a differential of 1% to perhaps 40%. Therefore there is a lack of precision in these categories that should be addressed as a limitation.

Yes, this might be a limitation. We do not have information on the actual range of number of shifts, but for a full time working nurse it would be about 19-20 shifts during a 4 weeks’ period. It would, however, also be a problem with using the actual number of shifts because there are many nurses working part-time. We have simply followed the response scale approach used by Estabrooks who developed this way of measuring research use. We have added three sentences on measurement limitations in the first paragraph in the section on methodological considerations.

As noted by one of the reviewers, the data are analyzed as linear growth curves. However, as noted by the reviewer and the authors there was some evidence of non-linear effects. No alternative strategies are discussed (e.g. piecewise functions) where the shape of the curve can be different over time. A rationale for not testing non-linear effects was not discussed.

Beside the original strategy (with test of linear effects and a search for deviations from this linear trend by use of the fully latent model/ unspecified trajectories growth model to identify possible non-linear effects), we have now, upon request, included another test for non-linear effects (i.e., the common stepwise approach adding more parameters in a stepwise fashion beginning with including the main quadratic effect, and if significant adding parameters reflecting individual differences in this non-linear effect, and so on). This added strategy is now described in the methods and the results are given in text. We have also updated figure 3 (former figure 2) to illustrate the trajectories (both the linear and the non-linear). As seen in this figure, the longitudinal data mainly reflect a linear trend, but with one important exception, data from the second year deviates from this trend. This deviation does not seem to adhere to a quadratic effect. This is probably because the other data points fit so closely to the linear trend.

The manuscript states that both standard (I assume this is ML) and robust standard error estimation procedures were utilized but only one of these was reported. Either report both or describe the similarities or differences in results with the two estimation procedures.

We have now included results from both procedures in Table 2.
Mplus has algorithms for categorical variables. More rationale must be provided for analyzing the dependent variables as continuous (e.g., is the underlying construct - number of shifts continuous?).

As stated above (and now included as a limitation), we have followed the response scale approach used by Estabrooks who developed this way of measuring research use. However, in order to test the stability of our result we have now also estimated the longitudinal models using the Mplus procedure for ordinal data. We have added information in the methods and described the results (see Stability of results in the Results section).

Comments from Dr Sales

1. Is the question posed by the authors new and well defined? The overall question of the trajectory of newly graduated baccalaureate prepared nurses’ use of research evidence in practice, measured by three categories of “research utilization” that have been used previously in the literature, is novel. It is put into an important context of changes in a complex and evolving health care system(s), although these changes are not measured along with the self-reported behavior of the new graduates. As a result, in terms of the information available in this paper, the conclusions that can be drawn are limited.

The focus of this paper is the longitudinal development of newly graduated nurses’ use of research. As Dr Sales comments this development occurred in a complex and evolving health care system. While we do not measure context and link the development of research use to contextual development, Dr Sales state that the conclusions that can be drawn are limited. We have actually measured several contextual variables but find it extremely difficult to – in the same paper and using a longitudinal approach – also address potential links to contextual factors. We have done this exercise in another paper, currently under review in Implementation Science (ms 1522 1137 7351 9615) but there focusing on relationships between extent of research use and individual and organizational factors at a specific time point (year 2). Currently we do not see how longitudinal changes of both research use and context and potential links between these two entities could be addressed (in one paper). However, as pointed out in the current manuscript, there was less variability over time in each nurse’s reported research use compared with the variability between nurses. We interpret this as if context had an impact on research use, this impact was relatively homogenous in the whole sample.

2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work? The methods are appropriate. The work could probably be replicated by referring to prior published work by these authors and the team that fielded the LANE survey initially.

3. Are the data sound and well controlled? Unfortunately, key variables related to the context faced by the graduate nurses over the period of study are not available. As a result, the conclusions that can be drawn are limited, which is appropriately reflected in the paper, but this results in a paper that is less interesting than it might otherwise be.

Please, see our comments to point 1. We agree that – if it was possible – it would be highly interesting to see how changes in context link to the development of research use. However, as no
other research group (as far as we know) has been able to present a longitudinal study on nurses’ research use, we believe this report is unique and, therefore, of substantial interest.

4. Does the manuscript adhere to the relevant standards for reporting and data deposition? No discussion of data deposition, nor of availability to other interested researchers. However, without knowing more about the rules governing data deposition and sharing in Sweden through the relevant funding agencies, I cannot comment on adherence to relevant standards. This is an area that the authors could comment on.

The data in this study is collected by the LANE research group and administered by the research group. Data are shared with other researchers in collaborative projects. This management of data is in line with overall regulations in Sweden and the principal funding organisation of the LANE study (AFA insurance). In a longer perspective, when our reporting is completed, and if resources will be available, we are open for making the database established through the LANE study available for other interested researchers.

5. Are the discussion and conclusions well balanced and adequately supported by the data? Yes. The conclusions are limited, but this is appropriate.

6. Do the title and abstract accurately convey what has been found? Yes.

7. Is the writing acceptable? Yes, this is a well-written paper.

- Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached).

None.

- Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

1. I think the limited approach to missing data and dealing with these is a bit problematic. I’m unconvinced that use of “auxiliary” variables is adequate, but I doubt that using multiple imputation, which I think would be reasonable in the situation described, would alter the findings much. I think a comment about alternative approaches that might also be reasonable would be important.

The methodological literature on handling of missing data seems to converge in the conclusion that there is no substantial difference in results when using multiple imputation compared to the use of direct estimation with auxiliary variables (see for example the excellent book by Endlers - Applied Missing Data Analysis). In addition, both methods use auxiliary variables to improve estimation. The possible advantage with direct estimation is that you do not need to use several imputed data sets with the additional problem of how to integrate results from these data sets.

2. Although I thought the discussion about the non-linearity of the trends in the three forms of research utilization was reasonable, it was also not as clear as it could be. First, the data were not actually collected in a linear approach. The categorical use of frequency by shift is actually a very
complex non-linear computation to ask respondents to undertake, and I’m not surprised that the results were not linear. However, I would also not expect the results to be linear—I would expect frequent users to be quite different in their trajectories over time than non-frequent (or essentially ‘never’) users. I think this discussion could be both simplified and clarified.

We have addressed the categorical response scale as a limitation of the measurement approach; please also see the reply to Dr Aarons. When it comes to different trajectories of research use for high and low research users Dr Sale’s assumption is quite correct. For both instrumental and conceptual (but not for persuasive) there was a correlation between initial levels and change over time, reflecting the fact that the rate of increase was smaller for those with an initially high level of research use (expressed in the second paragraphs both under instrumental and conceptual use in the Results section. This is also showed in Table 2 under Longitudinal main effects, the column Cov (I,S). There you find significant results for instrumental and conceptual use, but not for persuasive.

3. There is no discussion about issues of social desirability and the responses to the questions in the survey. It seems very likely that professional nurses would be reluctant to say that they do not use research at least some of the time, and perhaps the full range of response categories should not be used, but instead, the categories should be dichotomized to try to distinguish between socially desirable responses that indicate ‘some’ use, and nurses who indeed do use research findings with regularity.

If we had not conducted this study we would assumingly agree that registered nurses would be reluctant to say that they do not use research and that their ratings of research use would probably be affected by social desirability. However, while about 50% of the sample rated their instrumental and conceptual research use to never occur or occur only on some shifts at year 1 and 2 and the group that scored “never” ranged between 14 and 20% year 1-2 (see table 1), it is hard to be convinced that social desirability is an issue in the response pattern in this study. Thus, we do not find it adequate to do the suggested dichotomization.

- Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)

1. A comment on repurposing and data availability would be helpful, given the large sample size and utility of this data set.

Please, see our response to point 4 above.

Comments from Dr Tinkle

Major Compulsory Revisions:

1. Methods section: Further clarification of the numbers of subjects in each measurement wave is needed. The numbers in Table 1 and the Figure 1 are confusing and do not appear consistent. The
description of attrition across measurement times presented in the Methods section, paragraph #3 needs to be clarified.

We realize that clarity was compromised in our attempt to minimize the methods and sample descriptions due to space constraints. We have now added information in Figure 1 that clarifies how the sample sizes in Table 1 were derived. Specifically, in Figure 1 we have added the numbers of participants who answered the 3 different research use questions at the 5 different waves of data collection so that they also correspond to the data on total n presented in Table 1. In addition, we have revised parts of the attrition description across measurement waves presented in the Methods section.

2. The description of the instrumentation measuring research use needs strengthening (Methods section, paragraph #4). A table or figure should be used to present how each of the 3 items measuring instrumental, conceptual, and persuasive research was administered - including the definition and 3 examples of research relevant to each dimension of research utilization. Without this context, it is difficult to understand how the research use was measured.

In a new figure (Figure 2) we show how the instrumental use item was worded. The conceptual and persuasive items were structured in the same way. As these two items followed the same principles as the instrumental item we do not think it is necessary to also present the exact wordings of them.

3. The description of the psychometric properties of the items used in the study, including validity and reliability, needs more detail in the Methods section, paragraph #5 and other relevant places in the manuscript. (General Comment: Frequency of use of each type may not be the only important outcome. It seems probable that persuasive research use might be utilized less frequently than the other kinds, but when used appropriately to help change care or policy at a group or unit level, this is highly significant.)

We have added more details regarding psychometric properties of the items (Estabrooks’ kinds of research use) in paragraph 6 in the methods section. We have also extended the discussion on the measurement approach under Methodological considerations. We agree fully that persuasive research use can be assumed to occur less frequently than the other kinds, but still being of significant importance. However, due to space limitations we have not been able to go deeper into that issue.

4. The writing style in the manuscript is generally fairly easy to understand. But there are some occasional awkward phrases or wording that could be reworked/edited (such as “exercises” in Methods section, paragraph 34).

We have changed the word ‘exercises’ to ‘operations’. What the other awkward phrases or wordings are is difficult for us to know. Before submitting the manuscript we had it reviewed by a professional language reviewer.
Minor Essential Revisions:

1. Background section, 1st paragraph: The authors argue that evidenced-based practice is especially critical for delivery of quality care when resources are limited. Perhaps even in higher resource contexts, evidenced-based practice is the optimal goal.

   This comment is of course correct. We have changed this sentence to have a wider applicability.

2. Background section, 1st paragraph: The authors refer to other studies that suggest that nurses’ use of research in clinical practice is “defective”. The outcome here needs to be described more fully without this kind of negative label.

   Yes, this statement was perhaps somewhat misleading and too ‘final’. We have changed this sentence to instead highlighting the variability shown in studies examining nurses’ use of research. We also refer to a recent systematic review on extent of nurses’ use of research. We do not believe it is necessary to further extend the manuscript on this point as our focus is newly graduated nurses (and there are not many studies on this group’s use of research).

3. Background section, 2nd paragraph: The authors refer to a national audit of higher education. The relationship of the findings from this audit to research utilization needs to be clarified.

   We have added a concluding sentence to this paragraph to clarify the assumed impact of the identified flaws in higher education on research use.

4. Background section 4th paragraph: The review of the literature in this paragraph is very truncated and more details about the studies, such as sample, methods and findings need to be included as they relate to the study being reported.

   We have added two sentences in this paragraph presenting the main findings of a systematic review on the extent of nurses’ use of research, focusing on the results regarding studies using the same measure (Estabrooks’ kinds of research use) as we do. All these studies used a survey approach which now is stated. Overall sample description is provided (however not sample sizes which would be too detailed) and we have added the country origin of these studies. It should also be noted that previous results concerning ‘kinds of research use’ are discussed in the first paragraph of the discussion section where we also refer to the findings of the systematic review mentioned above.

5. Background section 4th paragraph: The last sentence of this paragraph needs to be clarified.
The point with this sentence was to describe if there were other studies on research use, not using ‘kinds of research use’ as measurement tool, but having a longitudinal design. The sentence has been revised expressing this more clearly.

6. Background section 5th paragraph: There are some generalizations in this paragraph related to the contexts in hospitals that seem fairly sweeping and without citation.

In this paragraph we are referring to seven studies to support the statements. We have made slight revisions of the text to link it closer to citations. The data in this paragraph, supported by references, underpin the conclusion we make about the busy working environment for nurses. We believe this is true for hospital care in most high-income countries, not least Sweden.

7. The logic of the narrative in the Discussion section, paragraphs #3-4 is difficult to follow.

We have edited the text slightly and hope it now has a better and more logical flow.