PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Effects of e-learning in a continuing education context on nursing care: a review of systematic qualitative, quantitative and mixed studies reviews (protocol)
AUTHORS	Rouleau, Geneviève; Gagnon, Marie-Pierre; Côté, José; Payne-Gagnon, Julie; Hudson, Emilie; Bouix-Picasso, Julien; Dubois, Carl-Ardy

VERSION 1 – REVIEW

REVIEWER	Professor Karen McKenzie Northumbria University, United Kingdom
REVIEW RETURNED	10-Jul-2017

GENERAL COMMENTS	Thank you for the opportunity to review this protocol. This is an interesting protocol that would address an important topic in relation to nurse education. In order to make the protocol clearer for the reader, further information/clarification in respect of the areas below would be helpful: 1. What are the benefits/risks in conducting one overview of quantitative, qualitative and mixed reviews, given the issues that the authors highlight with finding common systems that are relevant to all three e.g. in relation to assessing methodological quality? 2. Related to the above, what are the benefits/risks in reducing all outcomes to qualitative themes? How will statistical concepts (such as effect size) be captured in these qualitative themes? 3. In terms of the search criteria what is the rationale for the following: a. choosing the cut-off date of 1st January 2006? b. only including papers published in French, English, or Spanish? c. for excluding reviews that focus only on patients' outcomes without discussing nursing resources or services? 4. How will the authors address publication bias and the issue of missing data, given the focus is on reviews, rather than primary studies? 5. Risks of bias and quality of evidence: It would be helpful to clarify- will only the quality indicator used by the authors of the original reviews included in the study be used, or will this be independently assessed by the protocol authors? 6. There were a few typos in the protocol: Line 46 page 4: and the loss of an exploratory learning environments learners can lack of guidance. Line 22, page 15: using a data-based based Line 41, page 15: according the specific dimensions of Line 51, page 15: will allow us keeping the richness of the results Line 21, page 16: overview is in continuity with In a number of places 'i.e.' is used when perhaps 'e.g.' is meant

REVIEWER	Mari Lahti
	Turku University of Applied Science, Finland
	University of Turku, Finland
REVIEW RETURNED	13-Jul-2017

GENERAL COMMENTS	Comments for: "Effects of e-learning in a continuing education context on nursing care: an overview of systematic mixed studies reviews (protocol)"
	This protocol is really interesting and seeks to answer the urgent question related to CE. This upcoming study will influence our field of science and will bring new knowledge. I hope these few comments related to your protocol are helpful. Best of luck with submission and doing the actual study.
	Introduction:
	It may also vary depending on nurses who do the CE mandatory or by their own choice. This may effect also the attitudes of taking CE and using e-learning. Have you come across with this one? Maybe referring something related to this in Introduction as well.
	There is also barriers or challenges that how the knowledge is transferred to the clinical practice. This is quite a big outcome related to CE.
	Also in introduction it should be stated more clear way, why this review is needed? As there is many reviewer existing already related to this topic. So what new this chosen methodology will bring?
	NCPF:
	Why this model have been chosen to fit in reviewing CE e-learning studies? These arguments are still unclear.
	Figure 1 and its title and text referring it in the text is not matching. Is the figure presenting the actual model used?
	I would prefer that you use only one figure to show the model and then one clear table of the dimensions and what outcomes from the model will be used. Now this phase is also unclear.
	Methods:
	Design – you should open a bit more the method used systematic mixed studies reviews (SMSRs). Refer maybe to some methodological studies of this method.
	Why you don't use The Mixed Methods Appraisal Tool (MMAT)?
	PICO – if you use the patient origin data, please state clear way how much there has to be nurse related outcomes that the study can be included?
	If you take blended, you need to state clear way how much e-learning components there has to be to be included. As this might me bias in later phase, if the results are much different with studies using e-learning fully to compared to studies using blended with minor e-learning component like watching one youtube video. This needs to be think through one more time.
	Why simulation is excluded?
	Comparisons are difficult. This needs more explanations how will analyse the comparisons.
	Outcomes are still unclear. You need to re-write this paragraph and see the comments above related to outcomes. Now following with this it would be really difficult to include or exclude the articles.
	Search methods:
	Why not consider Joanna Briggs Institute, Embase, SocIndex?
	Table of search words is unclear. Is this supposed to follow the idea of PICO?

	Why there is in same phrase words nurse and health care education? These are so different terms that if this is supposed to refer population as nurses it may lead to bias. I would check this search word table very closely with information specialist. What about the hand search and other additional search from reference lists etc? Will you use the TiDier method to describe the used interventions? Analysis looks promising, but this might be very challenging one in real.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name
Professor Karen McKenzie

Thank you for the opportunity to review this protocol. This is an interesting protocol that would address an important topic in relation to nurse education.
In order to make the protocol clearer for the reader, further information/clarification in respect of the areas below would be helpful:

Comment 1.
What are the benefits/risks in conducting one overview of quantitative, qualitative and mixed reviews, given the issues that the authors highlight with finding common systems that are relevant to all three e.g. in relation to assessing methodological quality?

Response 1.
Benefits: Reviews of qualitative, quantitative and mixed studies (MSRs) reviews allow us to broaden the understanding of the range of possible effects resulting from the use of e-learning in a nursing continuing education (CE) context. We believe that these three types of reviews can foster richness regarding the phenomenon of interest. We are in agreement with Caird et al. (2015) [1] who outline the usefulness/relevance of review of reviews used in an exploratory context. This review of reviews has a broad scope, focusing on multiple e-learning interventions and multiple outcomes and their effects (positive, negative, no effect) among RN working in different settings. We argue that it necessitates a variety of secondary level research designs (i.e. reviews) to grasp the overall phenomenon.
Risks: In the literature, there is little consensus on how to assess the methodological quality of qualitative primary studies (Tong et al., 2012)[2], but still less for qualitative reviews (May et al., 2016)[3]. Critical appraisal tools exist to assess the methodological quality for authors of MSRs (and then, to make a judgment on mixed method primary studies), but not for authors of review of MSRs (when the unit of analysis is « review »). In our previous work (Rouleau et al., 2017)[4], we used AMSTAR (Shea et al., 2007; 2009) [5,6] and applied it to quantitative, qualitative and MSRs. However, some criteria did not fit the specificities of qualitative and MSRs because AMSTAR has been developed to assess methodological quality of quantitative reviews using randomized controlled trials designs (RCT). Consequently, in previous work, mixed-method and qualitative reviews started with a lower score, which cannot lead to a judgment about the likely bias and methodological limitations inherent in the majority of reviews.

Excluding qualitative and MSRs from a review of reviews based on assessment of methodological quality can lead to the loss of useful reviews' information and restrict the picture of existing research (Caird et al., 2015) [1], especially considering that excluding qualitative reviews based on specific criteria might be subjective to the reviewer. In turn, this might impact external validity (Carroll & Booth, 2015)[7].

Comment 2.
Related to the above, what are the benefits/risks in reducing all outcomes to qualitative themes? How will statistical concepts (such as effect size) be captured in these qualitative themes?

Response 2:
We have suggested in the data synthesis section of the protocol a way to present quantitative results and keep the details of statistical concepts, while keeping the "logic" of classifying the findings into themes (whatever it is qualitative or quantitative, see page 17). Tabular presentation could be used to show quantitative, qualitative and mixed method data.

Comment 3.
 In terms of the search criteria what is the rationale for the following:
a. choosing the cut-off date of 1st January 2006?

Response 3.a
We based our rationale partially by reading the overview of reviews by de Caro et al. (2014) [8] on e-learning and nursing education in an academic field. 22 reviews were included in their synthesis, published between 2008 and 2013. However, search dates were from 2003-2013. We decided to put the cut-off at 2006 to foster the chance to include reviews that de Caro et al. could have omitted in their overview. Furthermore, including reviews from 2006 means that primary studies have been published a couple of years before.
b. only including papers published in French, English, or Spanish?
Response 2.b. Papers published in these languages were included because the co-authors can understand and read them.
c. for excluding reviews that focus only on patients' outcomes without discussing nursing resources or services?
Response 2.c We cannot deny that patient outcomes are important and they are of great interest for the readers. However, the purpose of this overview remains (mainly) about nursing care and nurses' professional practice. The focus of this review of reviews is the use of e-learning to support (or not) nurses practice, i.e. nursing resources, nursing services (nurses' environment, processes and professional satisfaction). If the findings of the review focus exclusively on patients' outcomes, the scope of our work will be overridden.

Comment 4.
How will the authors address publication bias and the issue of missing data, given the focus is on reviews, rather than primary studies?

Response 4.
Publication bias and issue of missing data are challenges that authors of review of reviews encounter. We will use ROBIS tool [9] to assess the risk of bias. We added this information on pages 15. Otherwise, it is well known that authors of review of reviews have to deal with the information reported and provided by reviews authors [1,10]. The loss of fine-grained details [10] of the population, intervention, comparisons, context of the primary studies and outcomes is one of the main issues of this type of synthesis. Consulting primary studies in order to extract the detailed information would be time-consuming as well as irrelevant because it would dismiss the anticipated efficiency gain of realizing a review of reviews [1].

Comment 5.
Risks of bias and quality of evidence: It would be helpful to clarify- will only the quality indicator used by the authors of the original reviews included in the study be used, or will this be independently assessed by the protocol authors?

Response 5.
Two authors will assess independently the risk of bias with the ROBIS tool. This information has been added on page 15. However, there is no guidance in the literature to assess quality evidence of quantitative, qualitative and MSRs. We will only use the quality of evidence indicators used by the authors of the original reviews. We added a sentence to clarify it in the paper (p 16).

Comment 6.
There were a few typos in the protocol:
Line 46 page 4: and the loss of an exploratory learning environments learners can lack of guidance.
Line 22, page 15: using a data-based based
Line 41, page 15: according the specific dimensions of
Line 51, page 15: will allow us keeping the richness of the results
Line 21, page 16: overview is in continuity with
In a number of places 'i.e.' is used when perhaps 'e.g.' is meant

Response 6.
They have been revised.

Reviewer: 2

Reviewer Name
Mari Lahti

This protocol is really interesting and seeks to answer the urgent question related to CE. This upcoming study will influence our field of science and will bring new knowledge. I hope these few comments related to your protocol are helpful. Best of luck with submission and doing the actual study.

1. Introduction:

Comment 1.a It may also vary depending on nurses who do the CE mandatory or by their own choice. This may affect also the attitudes of taking CE and using e-learning. Have you come across with this one? Maybe referring something related to this in Introduction as well.
There is also barriers or challenges that how the knowledge is transferred to the clinical practice. This is quite a big outcome related to CE.

Response 1.
a We agree that the outcomes could vary between mandatory CE and voluntary CE. We could try to separate the CE interventions by type (mandatory and voluntary), but it may prove difficult if the information is not available in the reviews. Furthermore, in our review of reviews, we are not primarily interested in the facilitators and/or barriers related to the use of e-learning interventions in a CE context, even if we know that these determinants can influence the intention and actual use of e-learning interventions. We are in agreement that the way knowledge is transferred can impact on clinical practice. We do not believe that the information included in the reviews will be sufficiently detailed to deepen our analysis in that way. However, we added complementary information on page 5 to reflect the complexity of translating knowledge into clinical practice.

1.b Also in introduction it should be stated more clear way, why this review is needed? As there is many reviewer existing already related to this topic. So what new this chosen methodology will bring? Response 1.b A section has been added (p.6) after the objective "why it is important to conduct overview". We explain that the CE context differs from the academic context and the analysis of outcomes with the NCPF could provide new and interesting data on interventions used by RN in their workplace setting.

2. NCPF:

Comment 2.a
Why this model have been chosen to fit in reviewing CE e-learning studies? These arguments are still unclear.

Response 2.a
The rationale has been added at the end of the section "Nursing Care Performance Framework". We chose this framework because it is a tool that we found useful for extraction and analysis in our previous work [4]; it offers a comprehensive perspective on nursing care and it highlights many indicators that could be relevant to this review.

Comment 2.b
Figure 1 and its title and text referring it in the text is not matching. Is the figure presenting the actual model used?

Response 2.b
Figure 1, the title and text referring have been matched.
2.c I would prefer that you use only one figure to show the model and then one clear table of the dimensions and what outcomes from the model will be used. Now this phase is also unclear.
Response 2.c Figure 1 is an adapted version of the NCPF. It represents each subsystem, dimension and indicator of the framework, which are also outcomes of interest to extract for this review. Considering this, if we keep the figure (the adapted version of the NCPF) and add a table as you suggested, the information will be repetitive since all of the dimensions from the model will be used as possible outcomes in the extraction form. When we will analyse the results, we will present the specificities of the data included under each outcome in a qualitative fashion.

3. Methods:
Comment 3.a
Design – you should open a bit more the method used systematic mixed studies reviews (SMSRs). Refer maybe to some methodological studies of this method.

Response 3.a
At the time of the protocol submission, we used the term "overview of SMSRs". But we realized that this terminology didn't include "qualitative reviews" as well as "quantitative reviews". We have changed the terminology throughout the paper to refer to our review of systematic qualitative, quantitative and mixed studies reviews in the Design section of the protocol (p.9).
As underlined by Lunny et al. [11], methods to conduct, interpret and report overviews are in their infancy. Often, overviews include quantitative reviews with randomized studies and nonrandomized studies. In addition, what can make the report and the assessment of quality of overviews more complex is the array of underlying types of SRs combining qualitative and quantitative evidence, which can be named "systematic mixed studies reviews (SMSRs) [12].

Comment 3.b
\Why you don't use The Mixed Methods Appraisal Tool (MMAT)?

Response 3.b
The MMAT assesses five main type of studies: (1) qualitative studies; (2) randomized controlled trial; (3) non-randomized quantitative studies; (4) quantitative descriptive studies; and (5) mixed methods research [13]. It is used for authors of systematic reviews when the critical appraisal is done for primary studies. Since the MMAT is used to assess mainly primary studies, it is not suitable for the assessment of qualitative, quantitative and MSRs.

Comment 3.c
PICO – if you use the patient origin data, please state clear way how much there has to be nurse related outcomes that the study can be included?

Response 3.
c Only one nurse-related outcome is needed to be included in the review. We added this detail in the Methods section.

Comment 3.d
If you take blended, you need to state clear way how much e-learning components there has to be to be included. As this might me bias in later phase, if the results are much different with studies using e-learning fully to compared to studies using blended with minor e-learning component like watching one youtube video. This needs to be think through one more time.

Response 3.d
We understand that including blended interventions could bring bias to the results. On the other hand, we do not want to exclude any e-learning interventions if possible. We decided to compile them and we will compare the blended interventions to the other type of interventions. If the results are different, we will separate them from the "non-blended" interventions and highlight their differences.

Comment 3.e Why simulation is excluded?

Response:
Simulation with physical mannequin is excluded because we target "electronic" components. Some reviews do not specify which kind of simulation was used in the interventions presented. We prefer to exclude them all instead of having to search every primary study, which would defeat the purpose of conducting a review of reviews. However, we could include simulations if the format is specified and if it includes an "electronic" component (e.g. virtual reality). See page 11.

Comment 3.f
Comparisons are difficult. This needs more explanations how will analyse the comparisons.

Response 3.f
We will list all the comparisons in the characteristics of reviews. We will also compare the comparisons and the outcomes in order to know if there are any differences in the outcomes when they are compared to different type of interventions. You can refer to response 3.d.

Comment 3.g
Outcomes are still unclear. You need to re-write this paragraph and see the comments above related to outcomes. Now following with this it would be really difficult to include or exclude the articles.

Response 3.g
The NCPF is not used in our review to include or exclude articles. The inclusion and exclusion criteria are presented on pages 10-12. Otherwise, we agree that outcomes are very broad, but this is one the reason that we chose the NCPF. We do not want to limit the outcomes in order to ensure a whole picture of the effect of e-learning on nursing care.

4. Search methods:
Comment 4.a
Why not consider Joanna Briggs Institute, Embase, SocIndex?

Response 4.a
We agree that the Joanna Briggs Institute is relevant and will therefore hand search this database: thank you for your recommendation.
SocIndex could be interesting to search, however we are unsure if it is as relevant to the work we are conducting. We are convinced that the actual databases we will be sufficient for a thorough search of the literature on the subject. We decided to target these three databases (PubMed, Embase, CINAHL) since they cover a large proportion of the literature on the subject and are often used in systematic reviews.

Comment 4.b
Table of search words is unclear. Is this supposed to follow the idea of PICO?
Why there is in same phrase words nurse and health care education? These are so different terms that if this is supposed to refer population as nurses it may lead to bias. I would check this search word table very closely with information specialist.

Response 4.b
An information specialist has already validated the terms used in the search. However, we are aware of the limits of our search strategies and we will take the necessary precautions in order to limit bias.

Comment 4.c
What about the hand search and other additional search from reference lists etc?

Response 4.c
As explained in the article "we will contact authors to find other relevant works in this domain and will consult reference lists of included reviews" to obtain additional articles. Additionally, we added the "hand search" in the search strategy section in order to better highlight that we will search articles beyond the databases.

Comment 5.
Will you use the TiDier method to describe the used interventions?

Response 5.
We do not plan to use TiDier to describe the interventions presented. We will not conduct an assessment of primary studies, so some parts of the TiDier method may not be useable or available for our review. However, we plan to document elements that are similar to those contained in TiDier, such as: type of e-learning, intervention setting, theory used in the intervention and mode of delivery.

Comment 6
Analysis looks promising, but this might be very challenging one in real.

Response 6.
We agree that our analysis is challenging. On the other side, we have the chance to work with a team that has methodological expertise in that domain. We will try to develop or adapt data synthesis method for integrating quantitative, qualitative and MSRs because no guidance is presently available. With this review, we hope to contribute to advance the state of knowledge in that field.

References

1 Caird J, Sutcliffe K, Kwan I, et al. Mediating policy-relevant evidence at speed: are systematic reviews of systematic reviews a useful approach? Evid Policy J Res Debate Pract 2015;11:81–97. doi:10.1332/174426514X13988609036850
2 Tong A, Flemming K, McInnes E, et al. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. BMC Med Res Methodol 2012;12:181. doi:10.1186/1471-2288-12-181
3 May CR, Cummings A, Myall M, et al. Experiences of long-term life-limiting conditions among patients and carers: what can we learn from a meta-review of systematic reviews of qualitative studies of chronic heart failure, chronic obstructive pulmonary disease and chronic kidney disease? BMJ Open 2016;6:e011694. doi:10.1136/bmjopen-2016-011694
4 Rouleau G, Gagnon M-P, Côté J, et al. Impact of Information and Communication Technologies on Nursing Care: Results of an Overview of Systematic Reviews. J Med Internet Res 2017;19:e122. doi:10.2196/jmir.6686
5 Shea B, Grimshaw J, Wells G, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol 2007;7:10. doi:10.1186/1471-2288-7-10
6 Shea BJ, Hamel C, Wells GA, et al. AMSTAR is a reliable and valid measurement tool to assess the methodological quality of systematic reviews. J Clin Epidemiol 2009;62:1013–20. doi:10.1016/j.jclinepi.2008.10.009
7 Carroll C, Booth A. Quality assessment of qualitative evidence for systematic review and synthesis: Is it meaningful, and if so, how should it be performed? Res Synth Methods 2015;6:149–54. doi:10.1002/jrsm.1128
8 De Caro W, Marucci AR, Giordani M, et al. [E-learning and university nursing education: an overview of reviews]. Prof Inferm 2014;67:107. doi:10.7429/pi.2013.672107
9 Whiting P, Savović J, Higgins JPT, et al. ROBIS: A new tool to assess risk of bias in systematic reviews was developed. J Clin Epidemiol 2016;69:225–34. doi:10.1016/j.jclinepi.2015.06.005
10 Hartling L, Vandermeer B, Fernandes RM. Systematic reviews, overviews of reviews and comparative effectiveness reviews: a discussion of approaches to knowledge synthesis. Evid-Based Child Health Cochrane Rev J 2014;9:486–94. doi:10.1002/ebch.1968
11 Lunny C, Brennan SE, McDonald S, et al. Evidence map of studies evaluating methods for conducting, interpreting and reporting overviews of systematic reviews of interventions: rationale and design. Syst Rev 2016;5. doi:10.1186/s13643-015-0178-0
12 Hong QN, Pluye P, Bujold M, et al. Convergent and sequential synthesis designs: implications for conducting and reporting systematic reviews of qualitative and quantitative evidence. Syst Rev 2017;6:61. doi:10.1186/s13643-017-0454-2
13 Pluye P, Gagnon M-P, Griffiths F, et al. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. Int J Nurs Stud 2009;46:529–46. doi:10.1016/j.ijnurstu.2009.01.009