PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	The influence of complexity: A bibliometric analysis of complexity science in healthcare
AUTHORS	Churruca, Kate; Pomare, Chiara; Ellis, Louise A.; Long, Janet; Braithwaite, Jeffrey

VERSION 1 – REVIEW

REVIEWER	Chrysanthi Papoutsi University of Oxford, UK
REVIEW RETURNED	06-Nov-2018

GENERAL COMMENTS	This is an excellent paper mapping the academic literature on complexity science in healthcare. The authors have followed robust processes to systematically search and analyse the literature, presenting their findings in a coherent and interesting way. The paper is very well written and has the potential to inform ongoing development in this area. A few suggestions in case helpful to improve the paper further: - Perhaps the authors could include a full example of their search strategy in one of the databases, rather than just their list of keywords. - It would be good to add some more detail on the process of reviewing articles based on inclusion and exclusion criteria (p.6, line 20). Did the screening process involve any consistency checks between members of the team? - I'm missing a little more detail on the content of the papers reviewed. Would there be scope to add a couple of paragraphs in the findings section describing the different approaches to complexity represented in the included papers? - The discussion places the findings in context but could be developed further to explain what this work means in relation to complexity-informed health research, how it can inform future studies and contribute to taking the field forward. A recent BMC Medicine special issue dedicated on complexity-informed thinking in health services research may provide helpful resources (I hope this does not seem as self-promotion given I am one of the co-editors but the relevance is clear). Thank you very much for this interesting contribution.

REVIEWER	Russell S Gonnering Medical College of Wisconsin, United States
REVIEW RETURNED	06-Nov-2018

GENERAL COMMENTS	I commend the authors on a very interesting, informative and topical addition to the literature. There are always limitations in any study and reviewers sometimes concentrate too much on the limitations rather than the important implications. I do not wish to do that and offer these comments only as suggestions for additional polish to an article very well done. This study has many important implications and the authors have addressed the limitations. These comments are meant to address the two "no" answers in the check sheet. They represent only areas of opportunity, not reasons for disqualification. There is more data here, I believe though, that can be converted into useful information, perhaps in further studies. The net that was cast could be broadened. For instance, an article by Katerndahl and Parchman (J Eval Clin Pract 2010;16:211-219) using a tool of complexity, orbital decomposition, was not captured because it used "nonlinear dynamics" as a keyword. There are other articles, none of which are critical, that were also not captured. It would be interesting to see the time-distribution of the keywords to see if our appreciation for what is "complex" has changed over the period in study. This would not change the overall implications of the study, but could give added information on how the "Complex Adaptive System" of those interested in complexity and health care have themselves adapted over time. Likewise, the graph in Figure 2 shows, not unexpectedly, a power law distribution of articles. The study of complexity in health care itself exhibits complex nonlinear dynamics! It would also be interesting to see the time course of both the journals in which the article appeared as well as the country of origin and even the major discipline involved. It has been my impression (which could only be answered by such an analysis) that: 1) researchers in the UK/Australia/New Zealand seem to have developed an appreciation for complexity in health care earlier than other area and 2) an understanding of complexity in nursing is further ahead than in medicine, particularly in the United States. Sometimes there is a gulf between the two. Perhaps the network analysis could be amplified to show the degree to which these two professions share information and listen to each other. There have been many seminal articles coming from this research institution addressing complexity in health care, and I look forward to many more.

VERSION 1 – AUTHOR RESPONSE

ID: bmjopen-2018-027308	
The influence of complexity: A bibliometric analysis of complexity science in healthcare	
Reviewer/editor	**Response**

Assistant Editor Emma Johnson	
Manuscript ID bmjopen-2018-027308 entitled "The influence of complexity: A bibliometric analysis of complexity science in healthcare" which you submitted to BMJ Open, has been reviewed. The comments of the reviewer(s) are included at the bottom of this letter. The Editorial Office have also checked your manuscript for any minor formatting issues and these will be listed at the end of this email. **The reviewer(s) have recommended publication, but also suggest some minor revisions to your manuscript. Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript. The reviewers' comments and the previous versions of your article will be published as supplementary information alongside the final version.**	We thank the reviewers and the editor for their feedback on our manuscript, and notice of its potential value as a contribution in BMJ Open. We have responded to all comments.
To revise your manuscript, log into https://mc.manuscriptcentral.com/bmjopen and enter your Author Center, where you will find your manuscript title listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to denote a revision.	We have done this.
You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using a word processing program and save it on your computer. Please also highlight the changes to your manuscript within the document by using the track changes mode in MS Word or by using bold or coloured text. Once the revised manuscript with track or highlighted changes is prepared, you can upload it and submit it through your Author Center under file designation "Main Document - marked copy".	We have denoted changes to the text of the manuscript by colouring them in red.
- Please include the dates of the search in both the abstract and the main methods section.	The date of the search, 19 April 2018, is now included in both the abstract and method sections.

Reviewer 1: Chrysanthi Papoutsi	
This is an excellent paper mapping the academic literature on complexity science in healthcare. The authors have followed robust processes to systematically search and analyse the literature, presenting their findings in a coherent and interesting way. The paper is very well written and has the potential to inform ongoing development in this area.	Thank you for this very positive assessment of our manuscript, and the constructive feedback you have provided.
A few suggestions in case helpful to improve the paper further: **- Perhaps the authors could include a full example of their search strategy in one of the databases, rather than just their list of keywords.**	This has been provided as a supplementary (new Appendix 1) file.
- It would be good to add some more detail on the process of reviewing articles based on inclusion and exclusion criteria (p.6, line 20). Did the screening process involve any consistency checks between members of the team?	Criteria for the review was developed and discussed by the team. The first author performed the title/abstract screen, but performed a consistency check with a second author (LE). Details of this have now been added to the method, with Cohen's kappa score reported at the start of the results.
- I'm missing a little more detail on the content of the papers reviewed. Would there be scope to add a couple of paragraphs in the findings section describing the different approaches to complexity represented in the included papers?	Thank you for this suggestion. We have added greater detail on the approaches to using complexity in the included papers, with a range of specific examples. This is reported in *Stage two results: Article content*.
- The discussion places the findings in context but could be developed further to explain what this work means in relation to complexity-informed health research, how it can inform future studies and contribute to taking the field forward. A recent BMC Medicine special issue dedicated on complexity-informed thinking in health services research may provide helpful resources (I hope this does not seem as self-promotion given I am one of the co-editors but the relevance is clear).	Thank you for raising this point. We agree that the relevance is clear and have further elaborated on the issue, with reference to the special issue, in our discussion section.
Thank you very much for this interesting contribution.	Thank you.
Reviewer 2: Russell S Gonnering	

I commend the authors on a very interesting, informative and topical addition to the literature. There are always limitations in any study and reviewers sometimes concentrate too much on the limitations rather than the important implications. I do not wish to do that and offer these comments only as suggestions for additional polish to an article very well done. This study has many important implications and the authors have addressed the limitations. These comments are meant to address the two "no" answers in the check sheet. They represent only areas of opportunity, not reasons for disqualification.	Thank you for your supportive comments and positivity toward our manuscripts. We have addressed your feedback below.
There is more data here, I believe though, that can be converted into useful information, perhaps in further studies. The net that was cast could be broadened. For instance, an article by Katerndahl and Parchman (J Eval Clin Pract 2010;16:211-219) using a tool of complexity, orbital decomposition, was not captured because it used "nonlinear dynamics" as a keyword. There are other articles, none of which are critical, that were also not captured. It would be interesting to see the time-distribution of the keywords to see if our appreciation for what is "complex" has changed over the period in study. **.**	We thank the reviewer for this point. Unfortunately, we did not collect information on the keywords used in the articles. However, we did record the main term used in the title and abstract for referencing complexity, finding an initial trend toward chaos theory, which was increasingly supplanted by variations on the term complexity (e.g., complex systems, complexity science, complexity theory, complex adaptive systems), which were routinely used interchangeably. Due to space constraints (recommended 4,000 words and 5 figures and tables), we did not include the output of this analysis. However, we have now noted a further limitation of the study in terms of the terminology for complexity and cited the paper recommended by the reviewer as an example of this issue.
This would not change the overall implications of the study, but could give added information on how the "Complex Adaptive System" of those interested in complexity and health care have themselves adapted over time. Likewise, the graph in Figure 2 shows, not unexpectedly, a power law distribution of articles. The study of complexity in health care itself exhibits complex nonlinear dynamics!	We too were enthused to see a power law distribution in the papers published on complexity. Following the reviewer's encouragement, we have now noted this explicitly in the first paragraph of the discussion.
It would also be interesting to see the time course of both the journals in which the article appeared as well as the country of origin and even the major discipline involved. It has been my impression (which could only be answered by such an	These are very good suggestions, and indeed some of our analysis is indicative of the reviewer's assumption. That is, we have noted at the end of *Stage one results: Article publication data* that literature on complexity science in healthcare is becoming increasingly globalised,

analysis) that: 1) researchers in the UK/Australia/New Zealand seem to have developed an appreciation for complexity in health care earlier than other area and 2) an understanding of complexity in nursing is further ahead than in medicine, particularly in the United States. Sometimes there is a gulf between the two. Perhaps the network analysis could be amplified to show the degree to which these two professions share information and listen to each other.	with 16 countries publishing papers in 2017-2018, compared with only 4 countries prior to 2003. Due to space constraints and the general interrelatedness of many topic themes as currently coded, we do not have the capacity to further elaborate on the suggestion of amplifying our network analysis. However, we look forward to feeding the reviewer's point into our future work.
There have been many seminal articles coming from this research institution addressing complexity in health care, and I look forward to many more	We thank the reviewer for these kind words of encouragement.

VERSION 2 – REVIEW

REVIEWER	Chrysanthi Papoutsi University of Oxford, UK
REVIEW RETURNED	07-Feb-2019

GENERAL COMMENTS	No further comments - the authors have done an excellent job in addressing minor issues raised previously.

REVIEWER	Russell S Gonnering The Medical College of Wisconsin, USA
REVIEW RETURNED	23-Jan-2019

GENERAL COMMENTS	The authors have satisfactorily addressed all of my concerns. I congratulate them on a very nicely done study.