PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	A Systematic Review of Interventions by Healthcare Professionals to Improve Management of Non-communicable Diseases and Communicable Diseases Requiring Long-term Care in Adults who are Homeless
AUTHORS	Hanlon, Peter; Yeoman, Lynsey; Gibson, Lauren; Esiowwa, Regina; Williamson, Andrea; Mair, Frances; Lowrie, Richard

VERSION 1 – REVIEW

REVIEWER	Christine L. Savage, PhD, RN, CARN, FAAN Johns Hopkins University School of Nursing United States
REVIEW RETURNED	24-Oct-2017

GENERAL COMMENTS	This is a timely article and clearly demonstrates the need for further examination of the effectiveness of interventions aimed at improving the health of persons experiencing homelessness. The review was conducted using sound methodology and helps to underline the need for better evidence on approaches that will result in improved health for this vulnerable population. Minor Revisions: 1. In the first paragraph please define the term physical long-term conditions. This will make it clear that the studies included in the review examined effectiveness of interventions related to both non-communicable and communicable diseases. 2. Table 3: One of the inclusion criteria was that the intervention be delivered by a health care professional. It would be helpful to know which type of health care professionals delivered the intervention for each of the studies. Was it mostly nurses or did other professional also provide the interventions? Instead under “who delivers care”, for 6 out of the seven studies where this component of the intervention was included, the statement is self-management. Though an intervention may use a self-management model it would be very helpful to know which health care professionals delivered the actual intervention being examined in all of the studies. 3. What LTCs were included in the three studies that covered “various” LTCs. 4. On page 6, line 12 the term “substance misuse” is used. The non-pejorative approach is to use the term “at-risk substance use” instead.

REVIEWER	Rebecca S. Bernstein Medical College of Wisconsin

	United States
REVIEW RETURNED	24-Oct-2017

GENERAL COMMENTS	This manuscript appraises the available literature describing interventions by healthcare professionals to address long-term physical conditions in homeless adults. Chronic disease management in homeless adults is an important topic with public health, health equity, and cost implications, and this high quality review will add to the literature on the subject. My overall recommendations for improvement are to further elaborate in the introduction on 1) why "physical" chronic conditions are selected for focus given the prevalence of isolated or concomitant chronic behavioral health conditions in homeless adults, and 2) why healthcare provider delivered interventions are selected for focus since, as the authors state in the conclusion, "this review may overlook evidence for housing or social interventions that may impact on physical LTCs." Here are additional questions and comments on the manuscript: - p. 4 Strengths and Limitations: I would strengthen statement to specify that evidence is nearly limited to the United States. I think describing available studies as "high income countries" is an over-generalization, particularly given health system differences that may impact care for homeless adults. - Apologies if I missed it, but is a definition provided for physical long-term condition? I assume this is a synonym for physical "chronic disease"? I note that "chronic disease" is the MeSH term used in the search strategy, but long-term condition is used throughout the paper. I suspect this is a difference in phrase between the U.S. and U.K., but would suggest simply including a term definition to improve understanding by all readers. - p.5-6: Can you further describe your focus on physical LTC given concurrent behavior health LTC in the same population? Is this a specific gap in the literature? - p. 7: Eligibility criteria - can you define healthcare professional here? - p. 15, Table 2, 10/11 studies were rated as low risk for bias for selective outcome reporting. This was somewhat surprising, as studies frequently do not fully detail outcomes in the methods section to allow confirmation that results are fully reported for each outcome. Cochrane's risk of bias tool guides reviewers that most studies would fall under "unclear" for this criterion. - Table 2 - for Samet 2005, is the risk of bias tool applied to the fully published study or to the application for the unpublished outcome data the authors provided for the homeless subset of participants? - p. 21 - Inclusion of unpublished data is admirable, but I would add discussion under study limitations of the trade-off between comprehensiveness in this systematic review with the quality of included data specifically for unpublished data. - p. 27, line 17, should "likely" be "unlikely"? - Your discussion of the limitations of randomized/controlled research methods to homeless populations is welcome. As your review demonstrates, such studies are few and have their own limitations.

REVIEWER	Carole Upshur University of Massachusetts Medical School USA

REVIEW RETURNED	25-Oct-2017

GENERAL COMMENTS	This overall is a well done systematic review with useful implications for health care providers attempting to manage chronic illness in the homeless population. There are only a few issues that I recommend being addressed to clarify points in the manuscript. 1) p. 5 line 40, the authors refer to 'nonmedical' personnel referring to nurses and pharmacists. Shouldn't it be 'nonphysician' personnel as I would consider nurses and pharmacists as medical personnel. 2) Table 1 -the initial NS are used to indicate missing ethnicity data-shouldn't it be N/A 3) Table 3-the entries under 'where care is delivered' are confusing and perhaps should be changed to 'components of care'? -for example transportation services and outreach services are not 'where care is delivered' 4) p. 19 the paragraph about access to primary health care results should say something about the quality of the outcome to be parallel with the text for the other outcomes. 5) p. 21 line 12, what does 'signposting" mean? 6) bottom of p. 23-24-the discussion of the results of the cost study could be clearer. what was the comparison? how did the study use the metric of QALY? 7)p. 26 line 19, should clarify that the evidence for adherence involved cash incentives-that is mentioned later in the paragraph but would be clearer here 8) p. 26 line 44 -since one of the study used peer advisors and there are other ancillary staff like case managers, care coordinators, health educators that might be used to help populations manage LTCs I think they should be mentioned here along with other types of medical care staff like nurses/pharmacists. 9) the table on p. 51 has no label. I am assuming this is more detailed information about the included studies but it should be labelled as such. Finally, the discussion, implications and conclusions sections are a bit repetitive of the s

VERSION 1 – AUTHOR RESPONSE

Dear Dr Sucksmith,

Manuscript ID bmjopen-2017-020161:
"A Systematic Review of Interventions by Healthcare Professionals to Improve Management of Physical Long-Term Conditions in Adults who are Homeless"

Thank you for the opportunity to revise the above manuscript for consideration for publication in BMJ Open. We particularly appreciate the reviewer's comments that our article is "timely", "well conducted", and has "useful implications". We have revised the manuscript in response to both the editorial and reviews' comments in the decision letter. Our responses, along with detail of any changes to the manuscript, are outlined below.

We thank you for your consideration of our manuscript and look forward to your decision in due course.

Yours sincerely

Dr Peter Hanlon and Dr Richard Lowrie, on behalf of the study authors.

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Comments from the Editorial Team:

Editor comment:
Please update your literature search, which is over 12 months old now.

Author response:
We have updated the search in each of the databases originally searched, as well as updating citation searches for each of the included studies. The PRISMA diagram and list of excluded studies have been adjusted accordingly. We did not find any additional studies meeting our inclusion criteria, as such we have not altered the text and tables of the manuscript other than to indicate that the update has been performed, in the section headed 'Literature search':

"Medline, EMBASE, Scopus, PsycINFO, CINAHL, Assia, and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from 1966 (or inception) until October 2016. The search was updated in November 2017." Page 9, line 186

Editor comment:
We agree with reviewers 1 and 2 about the term "physical long-term condition", which is unusual to see and is not a MeSH term. Please provide a definition. We also agree that you could clarify why you focused on these and left out mental health conditions.

Author response:
Thank you for your comment. We have re-written our introduction to include a definition of Long Term Conditions and Physical Long Term conditions:

"This includes physical long-term conditions (LTCs). LTCs are conditions that require care and management over a prolonged priod of time.[9, 10] We use the term physical LTCs to draw a distinction between conditions considered in this review and mental health conditions or addictions. Physical LTCs include non-communicable diseases[11] as well as specific communicable diseases (such as human immunodeficiency virus (HIV), tuberculosis (TB) and hepatitis C) which require long-term management and access to care. This review focusses on physical LTCs because, compared to interventions for mental health problems or addiction, the management of physical LTCs in the context of homelessness has not been synthesised in the systematic review literature.[12] Physical LTCs disproportionateley affect people who are homeless. They may also be amenable to effective prevention or treatment. Innovative models of care and expanded roles of healthcare professionals offer potential strategies to target physical LTCs. However, no previous systematic reviews have specifically focussed on the potential impact of healthcare professional or other intervention on physical LTCs for adults experiencing homelessness. This is despite calls for more evdence for interventions for health problems that can be improved by equitable access to prevention and early intervention.[12]" Page 5, Lines 96 to 114

Editor comment:
The inclusion criteria are not very clear in the methods section, but they are well described in a table on page 36, so please direct readers there. That table does mention the prespecified primary outcomes for this review – unscheduled use of health services, but you do not mention any outcomes

in the introduction or the abstract (the introduction says “What outcome measures have been used in trials of interventions aimed at optimising physical LTC management and what effects, if any, have been reported?”). In the conclusion you mention “Trials of interventions delivered by healthcare professionals for the management of physical LTCs in people who are homeless do not show convincing evidence of the primary outcome measure for this review – an impact on unscheduled healthcare utilisation”. So when reading the abstract or the introduction, readers might be led to think the review is more unfocused than it is. You should mention the prespecified outcomes in the methods section.

Author response:
Thank you for these comments. As the editor’s comments highlight we set out primary and secondary outcomes a priori, and have made the following adjustments to the manuscript to make this clearer:

- in the introduction we have altered the wording of aim two Introduction (Aim 2):
"What impact has been demonstrated of trials of interventions aimed at optimising physical LTC management?" Page 7 line 53

- as the comments highlight, our pre-specified outcomes are detailed in additional file 1, and we have added a line to the methods section to direct readers accordingly:
"Eligibility criteria and search process are described in detail in our published protocol paper,[24] and are outlined briefly below. Full details are given in Additional File 1…" Page 8 line 166

- we have also added to the methods section a specific summary of our pre-specified outcomes:
"We considered a range of pre-specified outcomes. Studies including any of our primary or secondary outcomes were eligible for inclusion. Unscheduled healthcare utilization was our primary outcome. Secondary outcomes included physical measures of disease control, quality of life, behavioural outcomes, emotional wellbeing, satisfaction with care and cost effectiveness. These are fully detailed in Additional File 1" Page 8, lines 175 to 180

- to the abstract we have indicated which outcomes were primary and which were secondary:
"Outcomes: Primary outcome: unscheduled healthcare utilization. Secondary outcomes: mortality, biological markers of disease control, adherence to treatment and engagement in care, patient satisfaction, knowledge, self-efficacy, quality of life and cost-effectiveness." Page 2, lines 49 to 50

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Reviewer: 1

We thank the reviewer for their comments that our article is "timely" and "conducted using sound methodology". We also thank the reviewer for their constructive comments to improve the article, and outline are responses to these below.

Reviewers' Comments to Author:

Reviewer's comment:

1. In the first paragraph please define the term physical long-term conditions. This will make it clear that the studies included in the review examined effectiveness of interventions related to both non-communicable and communicable diseases:

Authors' response
Thank you. We have changed the introduction as described above in response to the Editor's comments. We have included in this a specific explanation of the inclusion of both non-communicable and selected communicable diseases. The revised section is quoted below:

"This includes physical long-term conditions (LTCs). LTCs are conditions that require care and management over a prolonged priod of time.[9, 10] We use the term physical LTCs to draw a distinction between conditions considered in this review and mental health conditions or addictions. Physical LTCs include non-communicable diseases[11] as well as specific communicable diseases (such as human immunodeficiency virus (HIV), tuberculosis (TB) and hepatitis C) which require long-term management and access to care. This review focusses on physical LTCs because, compared to interventions for mental health problems or addiction, the management of physical LTCs in the context of homelessness has not been synthesised in the systematic review literature.[12] Physical LTCs disproportionateley affect people who are homeless. They may also be amenable to effective prevention or treatment. Innovative models of care and expanded roles of healthcare professionals offer potential strategies to target physical LTCs. However, no previous systematic reviews have specifically focussed on the potential impact of healthcare professional or other intervention on physical LTCs for adults experiencing homelessness. This is despite calls for more evdence for interventions for health problems that can be improved by equitable access to prevention and early intervention.[12]" Page 5, Lines 96 to 114

Reviewer's comment:
2. Table 3: One of the inclusion criteria was that the intervention be delivered by a health care professional. It would be helpful to know which type of health care professionals delivered the intervention for each of the studies. Was it mostly nurses or did other professional also provide the interventions?

Author's response:
Thank you for this comment. We have added a column to table 3 which lists the healthcare professionals delivering the intervention in each study.

Reviewer's comment:
Instead under "who delivers care", for 6 out of the seven studies where this component of the intervention was included, the statement is self-management. Though an intervention may use a self-management model it would be very helpful to know which health care professionals delivered the actual intervention being examined in all of the studies.

Author's response:
Thank you for making this point. We have deleted the "Who delivers care" prompt from the "Components" column, because we have added a new column for this information, and as you correctly point out, our original text after "Who delivers care" did not follow.

Reviewer's comment:
3. What LTCs were included in the three studies that covered "various" LTCs.

Author's response:
Thank you for highlighting this. We agree that making this explicit will add clarity. We have added a footnote to table 1 detailing the available information for the included LTCs.

Reviewer's comment:
4. On page 6, line 12 the term “substance misuse” is used. The non-pejorative approach is to use the term “at-risk substance use” instead.

Author's response:
Thank you for this comment. We have altered the sentence concerned which now reads:
"Previous systematic reviews have identified the potential benefit of tailored interventions and strategies for addressing mental health and at-risk substance use" Page 6 line 137

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Reviewer: 2

We thank the reviewer for their comments, our responses to which are outlined below.

Reviewer's comment:
My overall recommendations for improvement are to further elaborate in the introduction on 1) why "physical" chronic conditions are selected for focus given the prevalence of isolated or concomitant chronic behavioral health conditions in homeless adults,

Author's repsonse:
Thank you. We have tried to address this point as described above. Our reasons for focussing on physical conditions include:
- the prevalence and severity of physical health problems in this population;
- the absence of evidence for interventions to prevent or treat physical LTCs specifically;
- the availability of effective interventions e.g. medicines to treat and prevent physical LTCs
- the growing options for patients who are homeless, to access more healthcare professionals who have a widened scope of practice, and who can offer these effective interventions e.g. independent prescribing pharmacists or nurses.

We have updated our introduction to include these points:
"This includes physical long-term conditions (LTCs). LTCs are conditions that require care and management over a prolonged priod of time.[9, 10] We use the term physical LTCs to draw a distinction between conditions considered in this review and mental health conditions or addictions. Physical LTCs include non-communicable diseases[11] as well as specific communicable diseases (such as human immunodeficiency virus (HIV), tuberculosis (TB) and hepatitis C) which require long-term management and access to care. This review focusses on physical LTCs because, compared to interventions for mental health problems or addiction, the management of physical LTCs in the context of homelessness has not been synthesised in the systematic review literature.[12] Physical LTCs disproportionateley affect people who are homeless. They may also be amenable to effective prevention or treatment. Innovative models of care and expanded roles of healthcare professionals offer potential strategies to target physical LTCs. However, no previous systematic reviews have specifically focussed on the potential impact of healthcare professional or other intervention on physical LTCs for adults experiencing homelessness. This is despite calls for more evdence for interventions for health problems that can be improved by equitable access to prevention and early intervention.[12]" Page 5, Lines 96 to 114

Reviewer's comment:
and 2) why healthcare provider delivered interventions are selected for focus since, as the authors state in the conclusion, "this review may overlook evidence for housing or social interventions that may impact on physical LTCs."

Author's response:
Thank you. As we address in the point above, the expansion of roles of healthcare professionals, and the availability of a range of treatments and preventative strategies for a number of LTCs, means that there is potential for development of interventions by healthcare professionals to improve management of a range of conditions. While we accept that other interventions are important in addressing health inequalities, the design and organisation of healthcare delivery, as well as development and expansion of the roles of a range of healthcare professionals, are important areas for potential future intervention. As we highlight above these are not well covered in the current systematic review literature.
We therefore chose this focus to summarise the existing evidence base, and to potentially serve as a platform for the development of future interventions by healthcare professionals.
We have altered the introduction, as detailed above, to reflect this.

Reviewer's comment:
- p. 4 Strengths and Limitations: I would strengthen statement to specify that evidence is nearly limited to the United States. I think describing available studies as "high income countries" is an over-generalization, particularly given health system differences that may impact care for homeless adults.

Author's response:
We agree with the reviewer on this point, and have altered the sentence in question:

- Evidence available is mostly limited to the USA, with one study from the UK. Page 4 line 86

Reviewer's comment:
- Apologies if I missed it, but is a definition provided for physical long-term condition? I assume this is a synonym for physical "chronic disease"? I note that "chronic disease" is the MeSH term used in the search strategy, but long-term condition is used throughout the paper. I suspect this is a difference in phrase between the U.S. and U.K., but would suggest simply including a term definition to improve understanding by all readers.

Author's response
Thank you for this comment. We have changed the introduction in response to this and other reviewers' comment:
"LTCs are conditions that require care and management over a prolonged priod of time.[9, 10] We use the term physical LTCs to draw a distinction between conditions considered in this review and mental health conditions or addictions. Physical LTCs include non-communicable diseases[11] as well as specific communicable diseases (such as human immunodeficiency virus (HIV), tuberculosis (TB) and hepatitis C) which require long-term management and access to care. This review focusses on physical LTCs because, compared to interventions for mental health problems or addiction, the management of physical LTCs in the context of homelessness has not been synthesised in the systematic review literature.[12]" Page 5 line 97 to 106

Reviewer's comment:
- p.5-6: Can you further describe your focus on physical LTC given concurrent behavior health LTC in the same population? Is this a specific gap in the literature?

Author's response
We agree that physical LTCs are one among a number of prevalent problems faced by adults experiencing homelessness. Our rationale for focussing on physical LTCs is based on several points (outlined above and repeated here):

- the prevalence and severity of physical health problems in this population;
- the absence of evidence for interventions to prevent or treat physical LTCs specifically;
- the availability of effective interventions e.g. medicines to treat and prevent physical LTCs
- the growing options for patients to access more healthcare professionals with widened scope of practice, who can offer these effective interventions e.g. independent prescribing pharmacists or nurses.

We have updated our introduction to include these points (section also quoted above in response to previous comment):

"This includes physical long-term conditions (LTCs). LTCs are conditions that require care and management over a prolonged priod of time.[9, 10] We use the term physical LTCs to draw a distinction between conditions considered in this review and mental health conditions or addictions. Physical LTCs include non-communicable diseases[11] as well as specific communicable diseases (such as human immunodeficiency virus (HIV), tuberculosis (TB) and hepatitis C) which require long-term management and access to care. This review focusses on physical LTCs because, compared to interventions for mental health problems or addiction, the management of physical LTCs in the context of homelessness has not been synthesised in the systematic review literature.[12] Physical LTCs disproportionateley affect people who are homeless. They may also be amenable to effective prevention or treatment. Innovative models of care and expanded roles of healthcare professionals offer potential strategies to target physical LTCs. However, no previous systematic reviews have specifically focussed on the potential impact of healthcare professional or other intervention on physical LTCs for adults experiencing homelessness. This is despite calls for more evdence for interventions for health problems that can be improved by equitable access to prevention and early intervention.[12]" Page 5, Lines 96 to 114

Reviewer's comment:
- p. 7: Eligibility criteria - can you define healthcare professional here?

Author's response:
Thank you for this comment. By health professional we would include any professional trained and registered to provide specifically health-care services. We do not limit this to physicians and nurses, however would draw a distinction between healthcare professionals and those from a Social Work background.

We have added the following to the methods section, under eligibility criteria, to clarify this:
"Delivery by a healthcare professional (any professional trained to provide any form of health care, but excluding social workers and professionals without a health-related training) was required, either alone or as part of a wider team." Page 8 lines 172 to 174

We have also expanded on the footnote to additional file 1 to add more explanation to this:
"any professional trained to provide any form of health care, but excluding social workers and professionals without a health-related training, including, but not limited to, physicians, nurses, dentists, pharmacists, paramedics, mental health professionals, allied health professionals (e.g. physiotherapists, dieticians, clinical psychologists etc.), midwives."

Reviewer's comment:
- p. 15, Table 2, 10/11 studies were rated as low risk for bias for selective outcome reporting. This was somewhat surprising, as studies frequently do not fully detail outcomes in the methods section to

allow confirmation that results are fully reported for each outcome. Cochrane's risk of bias tool guides reviewers that most studies would fall under "unclear" for this criterion.

Author's response:
We thank the reviewer for this comment. We have reviewed our quality assessment of all included studies in response to this comment. As a result we have revised our assessment of the risk of bias from selective outcome reporting for five of the studies.
Two studies (Ciaranello 2014 and Tulsky 2004) were changed to high risk as on review it was clear that some outcomes were not reported in the results (Ciaranello reported diastolic but not systolic blood pressure, Tulsky mention assessment of number of DOT prescriptions in the methods but did not present this in the results).
A further three (Samet 2005, Tsai 2013, and Typer 2014) were changed to unclear. While these studies did define outcomes in the methods section some of these are only reported in adjusted analyses and the actual values of the outcomes are not clear.
For the remaining five studies reported as low risk of bias, we confirmed that outcomes are explicitly detailed in the methods section of the paper and that each of these is fully reported in the published manuscript or supplementary material.
We have updated table 2 to reflect the changes in risk of bias assessment.

Reviewer's comment:
- Table 2 - for Samet 2005, is the risk of bias tool applied to the fully published study or to the application for the unpublished outcome data the authors provided for the homeless subset of participants?

Author's response:
Thank you for highlighting the need for clarification on this point. The risk of bias assessment was applied to the full published study. We agree also with the reviewer's subsequent comment that performing secondary analyses on unpublished data carries its own potential bias and limitations, and have added to the discussion section to address this point (see below). We have added a footnote to table 2 to make it clear that the assessment was on the full paper.

Reviewer's comment:
- p. 21 - Inclusion of unpublished data is admirable, but I would add discussion under study limitations of the trade-off between comprehensiveness in this systematic review with the quality of included data specifically for unpublished data.

Author's response:
Thank you for this comment, and we agree with the reviewers that there is a trade-off between comprehensiveness and quality of included data. We have added the following to the strengths and limitation section of the discussion to highlight this point:
"Contacting study authors to obtain results pertaining to participants who were homeless (when not reported separately) contributed to the comprehensiveness of the review, however this strength needs to be balanced against the potential bias of performing post-hoc¬ secondary analyses on existing trial data. Furthermore, in such circumstances studies are not specifically powered to assess outcomes in this subgroup." Page 29 lines 495 to 500

Reviewer's comment:
- p. 27, line 17, should "likely" be "unlikely"?

Author's response:
We thank the reviewer for highlighting this sentence. We have changed the wording to make our intended meaning clearer:

"It is likely, given their apparent scarcity, that further evaluation of complex interventions to address LTC management (including aspects of randomization, longer follow-up and consideration of broader outcomes) will be needed to inform practice." Page 31 lines 542 to 544

Reviewer's comment:
- Your discussion of the limitations of randomized/controlled research methods to homeless populations is welcome. As your review demonstrates, such studies are few and have their own limitations.

Author's response:
We thank the reviewer for this comment and agree that highlighting these limitations is important.

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Reviewer: 3

We thank the reviewer for their constructive comments to improve the manuscript, as well as for their assessment that the review is "well done" and has "useful implications".

Reviewer's comment:
1) p. 5 line 40, the authors refer to 'nonmedical' personnel referring to nurses and pharmacists. Shouldn't it be 'nonphysician' personnel as I would consider nurses and pharmacists as medical personnel.

Author's response:
We thank the reviewers for highlighting the potential ambiguity around this terminology. Our core point in this sentence is the expansion and change in roles for a range of professions, and the potential of this to allow improved access to people who are homeless, through alternative models of healthcare. We have therefore changed the sentence to read:
"The expanding role of various healthcare professionals e.g. nurse and pharmacist prescribers, targeting physical LTCs,[23] offers a complementary model of healthcare for people who are homeless." Page 6 line 125

Reviewer's comment:
2) Table 1 -the initial NS are used to indicate missing ethnicity data- shouldn't it be N/A

Author's response
We agree with the reviewer and have changed this table accordingly.

Reviewer's comment:
3) Table 3-the entries under 'where care is delivered' are confusing and perhaps should be changed to 'components of care'? -for example transportation services and outreach services are not 'where care is delivered'

Author's response:
We thank the reviewer for highlighting the potential for confusion around this terminology. The categories included in this table (How care is delivered, where care is delivered, who delivers care,

coordination of care, and finance) were taken directly from the EPOC taxonomy which was used to categorise the components and which groups them by these terms.
The taxonomy qualified “where care is delivered” as changes to the location or environment, and lists transportation and outreach services as some of the components within the category.
As the EPOC taxonomy is well established and widely used, we would favour retaining its terminology. We also recognise the potential confusion that the reviewer highlights. We have therefore changed “Where care is delivered” to “Location/environment” as this is taken from the taxonomy itself and more clearly describes the components in question.

Reviewer's comment:
4) p. 19 the paragraph about access to primary health care results should say something about the quality of the outcome to be parallel with the text for the other outcomes.

Author's response:
Thank you for highlighting this inconsistency. We have added the following text to the section on access to primary care.
"Overall confidence in effect for improvement in this outcome was high, but limited to one study so should be interpreted with caution." Page 23 line 343

Reviewer's comment:
5) p. 21 line 12, what does 'signposting" mean?

Author's response:
By signposting we mean providing information on how to access services. We have changed the wording to avoid any ambiguity:
"An RCT concerning people with HIV and comorbid depression assessed fluoxetine prescription and weekly psychiatric evaluation compared with the provision of information about how to access local psychology services without the prescription of fluoxetine." Page 24 lines 373 to 377

Reviewer's comment:
6) bottom of p. 23-24-the discussion of the results of the cost study could be clearer. what was the comparison? how did the study use the metric of QALY?

Author's response:
Thank you for your suggestion to re-write the discussion of the results of the cost study. We have revised this part to read:
"Cost effectiveness
Only one study assessed cost-effectiveness, within the hospital sector.[30] Using a parallel arm design, people who were homeless and admitted to hospital, received an intervention comprising thrice weekly GP and homelessness nurse led inpatient visits in addition to regular visits by the homelessness nurse, or standard in patient care (an information leaflet describing local services). Patients in the intervention group also had multiagency care plans devised before, and implemented after hospital discharge. Quality of life was a secondary outcome, with health gain measured by translating generic EQ-5D-5L index scores into generic quality adjusted life years (QALYs). EQ5D5L scores were completed by approximately one quarter of participants in both arms. There was a non statistically significant increase in EQ-5D-5L scores at follow up, and there was no impact of the intervention on inpatient costs, therefore the authors compared the costs of the intervention with the effect on health gain as measured by QALYs. On this basis the incremental cost effectiveness ratio was £26,000 with the authors describing circumstances in which the intervention may be cost effective, and an accompanying sensitivity analysis.[30] " Page 27 lines 441 to 458

Reviewer's comment:

7)p. 26 line 19, should clarify that the evidence for adherence involved cash incentives-that is mentioned later in the paragraph but would be clearer here

Author's response:
Thank you. We have clarified the sentence in question to include a mention of cash incentives at this point:
"The evidence for improved adherence was predominantly in the context of DOT for latent TB and in some cases involved cash incentives." Page 30 line 518

Reviewer's comment:
8) p. 26 line 44 -since one of the study used peer advisors and there are other ancillary staff like case managers, care coordinators, health educators that might be used to help populations manage LTCs I think they should be mentioned here along with other types of medical care staff like nurses/pharmacists.

Author's response:
Thank you for highlighting this section. We agree with the reviewer that it would be important to highlight the role of ancillary staff such as those mentioned alongside healthcare professionals. Indeed many of the included studies included healthcare professionals as part of a wider team. We also wish to highlight the point that the range of healthcare professionals studied in the available literature was relatively narrow. We have changed the sentence to draw attention to both these points:
"Finally, the available literature focuses mainly on the role of nurses and physicians, often alongside other ancillary staff (such as peer advisors, case-managers and care coordinators), with little consideration of the potential role of other healthcare professionals e.g. pharmacists" Page 30 line 528

Reviewer's comment:
9) the table on p. 51 has no label. I am assuming this is more detailed information about the included studies but it should be labelled as such.

Author's response:
Thank you for highlighting the lack of label for this table. The review is correct this is a more detailed summary of the included studies, and we have added a header to the table to denote this.

Reviewer's comment:
Finally, the discussion, implications and conclusions sections are a bit repetitive of the same main finding of lack of evidence and need for additional study. These could be edited a bit.

Author's response:
Thank you for drawing this to our attention. On re-examining this section, we agree that the message is clear enough from the majority of the text in our discussion/implications/conclusion, without the additional emphasis from direct statements about their being insufficient evidence. Therefore we have deleted the following two sentences from the 'Implications' , and hope the reviewer agrees that the section now reads less repetitive:
"This review highlights a paucity of controlled trial evidence for the management of non-communicable diseases in people who are homeless."
"The available evidence does not demonstrate a positive impact on these outcomes."

We thank the editor and reviewers for their constructive comments. We hope you agree our responses have improved the manuscript.

Yours sincerely,

Dr Peter Hanlon and Dr Richard Lowrie, on behalf of the research team

VERSION 2 – REVIEW

REVIEWER	Christine L. Savage, PhD, RN, CARN, FAAN Johns Hopkins University School of Nursing United States
REVIEW RETURNED	18-Dec-2017

GENERAL COMMENTS	Comments to authors: Your revisions have definitely strengthened the article. Again, your methodology for the review is sound and this is a very important topic. However, you have not adequately addressed my central concern in relation to your use of the term Physical Long-Term Conditions. What you have done is lump NCDs and CDs together in a way that has allowed you to make generalizations that may not adequately represent the full spectrum on NCDs. It looks like there are a number of NCDs covered in three of studies based footnotes in the table. It is extremely important to include this in the findings section. Major Revision 1. Though the added definition for "physical LTC" is clear, what is not clear is why you would create a new term. It is extremely (emphasis on extremely) important to use recognized terms instead of creating a new term when existing terms adequately describe the variables in question. This reduces reader confusion and allows for easier alignment with other studies published in the literature. The preferred terms at the global level are non-communicable disease and communicable disease not long-term conditions. Though both may require long term care, they are very different and grouping them together is confusing. Instead use this clarifier: "For this review the focus was on both non-communicable diseases (NCD) [I am not aware of any NCD that only requires short term treatment] as well as communicable diseases (CD) that require long term (LT) treatment, excluding mental health and substance use disorders". Then add to the exclusion criteria in the text and in your table - any study that only included mental health and substance use disorders. Then use NCD and LT CD as acronyms throughout the paper. 2. Your stated aims need further clarification. It is important to include that the interventions are ones delivered by HCPs.: a. Aim one "What are the key components of interventions aimed at optimizing physical LTC management including theoretical underpinnings?." It would read better as "What are the key components of interventions delivered by health care professionals aimed at improving management of NCDs and LTCDs including theoretical underpinnings?" b. What impact has been demonstrated of trials of interventions aimed at optimizing physical LTC management? Should be instead: "What impact has been demonstrated by trials of interventions delivered by health care professionals aimed at improving management of NCDs and LTCDs." 3. When using the term health care professionals, the implication is that they have completed professional level education. Reword your definition of this group to clarify that it is not just "any training" since that would imply that a medical technician is a health

	care professional. a. Revise: "The expanding role of various healthcare professionals e.g. nurse and pharmacist prescribers, targeting physical LTCs." To "…registered nurses and licensed pharmacists". What other professionals did you include that were "trained to provide any form of health care"? Clarity here is needed. It looks like there were peer health advisers as well who would not be considered health care professionals and most likely provided interventions under the direction of the HCP, since they are not licensed to provide direct care. b. This aspect of your review is important and is at no time summarized or included in your discussion. It is not only that further research is needed, but the use of sustainable, effective models of delivery of care are needed. It appears that the majority of the studies used the nurse as the primary professional delivery the care with some using peer health advisors. Please include this important information in your results, discussion and conclusion. 4. In your description of the studies please group under LT CD only, NCD only or combined (did any of the three studies with various diseases include CD?). It appears that 7 out of 11 were related to LT CD only. This is important. As currently presented in this manuscript, understanding what the three studies included in relation to the range of conditions requires reading a footnote – which does not adequately address my concern from the previous review. Include a comparison of NCD only and CD only studies in your discussion and conclusions. What is striking about this review is that despite the high mortality rate related to NCDs in this population very few studies have focused on NCDs alone. 5. Define what constitutes an intervention. For example, the delivery of case management is considered a nursing intervention and should not be categorized as "no intervention". It might work better to differentiate between direct and indirect interventions and then specifically define these terms. Minor 6. It would help to include the actual prevalence and mortality rate of NCDs with LT CDs in persons experiencing homelessness and present this information to help support the importance of this review. For example, according to the CDC though only 1% of the US population reports being homeless, 5% of all TB cases are among the homeless. This supports your inclusion of studies focused on TB. 7. Replace the term addiction with substance use disorders (aligns with current diagnostic criteria) and the term mental health problems with mental health disorders (aligns with current terminology and reduces confusion since some "mental health problems" could be minor).

REVIEWER	Carole Upshur University of Massachusetts Medical School Worcester MA USA
REVIEW RETURNED	21-Dec-2017

GENERAL COMMENTS	The manuscript has addressed prior reviewer concerns and is worth publication in its current form. The only suggestion is that the summary, conclusions and implications sections at the end of the paper are somewhat repetitive and might be streamlined but if this is not a concern in terms of word length for the journal then it should not hold up acceptance.

REVIEWER	Rebecca Bernstein Medical College of Wisconsin United States of American
REVIEW RETURNED	21-Dec-2017

GENERAL COMMENTS	The authors have made substantial improvements to their manuscript in response to its original review and provided satisfactory responses to all reviewer concerns and recommendations.

VERSION 2 – AUTHOR RESPONSE

Pharmacy and Prescribing Support Unit General Practice and Primary Care
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Dr Edward Sucksmith
BMJ Open Managing Director
London, UK
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30th Jan 2018

Dear Dr Sucksmith,

Manuscript ID bmjopen-2017-020161:
"A Systematic Review of Interventions by Healthcare Professionals to Improve Management of Physical Long-Term Conditions in Adults who are Homeless"

Thank you for the opportunity to revise the above named article and to respond to the reviewers' comments. There are detailed below along with any changed to the article text.

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Reviewer 1:

We thank the reviewer for commenting that the previous revisions have strengthened the article, and for again commenting that the methodology was sound and the topic important.

We are grateful, too, for the opportunity to respond to the reviewer's concerns about the term 'physical long-term conditions', particularly around clarity and generalization. In short, we agree with the reviewer's comments and have revised our paper describing a focus on both non-communicable diseases and communicable diseases requiring long-term care. We have sought to make this distinction throughout and avoid generalizations overlapping the two entities.

In addition to the alterations detailed in this response, we have also edited the document to reduce word count in order to accommodate the additions made in response to the reviewer's comments.

Comment 1:
Though the added definition for "physical LTC" is clear, what is not clear is why you would create a new term. It is extremely (emphasis on extremely) important to use recognized terms instead of creating a new term when existing terms adequately describe the variables in question. This reduces reader confusion and allows for easier alignment with other studies published in the literature. The preferred terms at the global level are non-communicable disease and communicable disease not long-term conditions. Though both may require long term care, they are very different and grouping them together is confusing. Instead use this clarifier: "For this review the focus was on both non-communicable diseases (NCD) [I am not aware of any NCD that only requires short term treatment] as well as communicable diseases (CD) that require long term (LT) treatment, excluding mental health and substance use disorders". Then add to the exclusion criteria in the text and in your table - any study that only included mental health and substance use disorders. Then use NCD and LT CD as acronyms throughout the paper.

Author response:
We thank the reviewer for highlighting the need for clarification and the use of accepted terms. We have revised the manuscript to remove all mention of 'physical long-term conditions' replacing with non-communicable diseases (NCD) and communicable diseases requiring long-term care (LT-CD) as appropriate. Each of the iterations are indicated in the highlighted version of the manuscript which has been uploaded. We summarize the changes below:

Changes to article:
Title – now reads:
"A Systematic Review of Interventions by Healthcare Professionals to Improve Management of Non-communicable Diseases and Communicable Diseases Requiring Long-term Care in Adults who are Homeless"

Abstract – objectives:
"To identify, describe and appraise trials of interventions to manage non-communicable diseases (NCD) and communicable diseases requiring long-term care (LT-CD), excluding mental health and substance use disorders, in homeless adults delivered by healthcare professionals"

Abtract – conclusions:
"Evidence for management of NCD and LT-CD in homeless adults is sparse."

Strengths and limitations section
"This is the first systematic review to explicitly focus on NCD and LT-CD management for adults who are homeless"

Introduction
"This review focuses on both non-communicable diseases (NCD) and communicable diseases that require long-term care or treatment (LT-CD), excluding mental health and substance use disorders. We take this focus because, compared to interventions for mental health problems or addiction, the management of NCD and LT-CD in the context of homelessness has not been synthesised in the systematic review literature.12 Such conditions disproportionateley affect people who are homeless. They may also be amenable to effective prevention or treatment. Innovative models of care and expanded roles of healthcare professionals offer potential strategies to target NCDs and LT-CDs."
Page 5 lines 97 to 107

Other changes are detailed with reference to the specific comments below.

Comment 2
Your stated aims need further clarification. It is important to include that the interventions are ones delivered by HCPs.:
a. Aim one "What are the key components of interventions aimed at optimizing physical LTC management including theoretical underpinnings?." It would read better as "What are the key components of interventions delivered by health care professionals aimed at improving management of NCDs and LTCDs including theoretical underpinnings?"
b. What impact has been demonstrated of trials of interventions aimed at optimizing physical LTC management? Should be instead: "What impact has been demonstrated by trials of interventions delivered by health care professionals aimed at improving management of NCDs and LTCDs."

Author response:
We thank the reviewer for their suggestions to clarify our aims, and agree with the suggested wording. Our aims section now states:

"This review aims to systematically identify, describe and appraise trials of interventions focusing on the management of NCDs and LT-CDs, delivered by healthcare professionals for adults who are homeless. It addresses the following two research questions:
1. What are the key components of interventions delivered by healthcare professionals aimed at improving management of NCD and LT-CDs including theoretical underpinnings?
2. What impact has been demonstrated by trials of interventions delivered by healthcare professionals aimed at improving management of NCD and LT-CDs?"
Page 7 lines 140 to 150

Comment 3
When using the term health care professionals, the implication is that they have completed professional level education. Reword your definition of this group to clarify that it is not just "any training" since that would imply that a medical technician is a health care professional.

Author response:
We thank the reviewer for the highlighting the need for clarification around these definitions. We have added the following to the methods section, which is supplemented by the illustrative list in the additional file:
"Delivery by a healthcare professional was required, defined as a person with professional training or registration to provide healthcare."
Page 8 lines 169 to 171

Comment 3, continued.
a. Revise: "The expanding role of various healthcare professionals e.g. nurse and pharmacist prescribers, targeting physical LTCs." To "…registered nurses and licensed pharmacists".

Author response
We have revised the indicated sentence as suggested by the reviewer, however, as 'Pharmacist' is a protected title, which comes following professional training and subsequent professional registration, we do not feel that the word 'licensed' is necessary since unlicensed pharmacists do not exist in healthcare.

"The expanding role of various healthcare professionals e.g. registered nurses and pharmacists, targeting NCD/LT-CDs,23 offers a complementary model of healthcare for people who are homeless"
Page 6 lines 117 to 120

Comment 3 continued:
What other professionals did you include that were "trained to provide any form of health care"? Clarity here is needed. It looks like there were peer health advisers as well who would not be considered health care professionals and most likely provided interventions under the direction of the HCP, since they are not licensed to provide direct care.

Author response:
Following on from the definition which has been added above, we have sought to further clarify our criteria regarding peer health advisors and social workers. A healthcare professional possessing professional training had to be part of the team for a study to be included. In many cases these professionals worked alongside others, who may not fit our definition. We included these if a healthcare professional was part of the wider team, and also included details of the additional team members. With regard to peer health advisors, as the reviewer highlights, we have added the following clarification to the methods:
"Peer-health advisors (lacking professional training or registration) and social workers (lacking health-specific training) were not considered healthcare professionals, however interventions involving a wider range of roles were eligible for inclusion if a healthcare professional was involved in delivery as part of a wider team."
Page 8 lines 171 to 175

Comment 3 continued:
b. This aspect of your review is important and is at no time summarized or included in your discussion. It is not only that further research is needed, but the use of sustainable, effective models of delivery of care are needed. It appears that the majority of the studies used the nurse as the primary professional delivery the care with some using peer health advisors. Please include this important information in your results, discussion and conclusion.

Author response:
We agree with the reviewer that further emphasis is required on the available evidence regarding the role of healthcare professionals. We have added this to the results, discussion and conclusion, as the reviewer suggests.

"Results (Intervention components and theoretical underpinnings)
Multidisciplinary teams including both a physician and nurse working alongside social workers delivered two of the interventions. The nine remaining interventions were delivered primarily by a nurse, alone or alongside psychiatrists, peer health advisors, or outreach workers."
Page 13 lines 291 to 294

"Discussion (summary of findings)
Seven interventions were identified targeting specific LT-CDs. All of these involved a nurse primarily delivering the intervention, sometimes with support of peer-health advisors."
Page 29 lines 485 to 487

"Discussion (implications)
Despite the social complexity and exclusion that typify the experience of homelessness, a patient-focused case-management approach was shown to positively impact disease specific knowledge and self-efficacy in the management of selected LT-CDs.40-42 49 These interventions were primarily delivered by a study nurse, with or without peer-health advisors, adopting a case-management approach."
Page 31 lines 534 to 539

"Conclusion
In the context of specific LT-CDs (HIV, TB and hepatitis C), patient-centred case-management interventions may improve knowledge and self-efficacy. Available evidence supports interventions delivered by a nurse and incorporating peer-health advisors. These interventions, as well as incentives, may also improve adherence in specific contexts. The impact on biological outcomes and mortality remains largely unexplored, as does the effectiveness of alternative models of care involving different professions."
Page 32 to 33, lines 577 to 583

Comment 4
In your description of the studies please group under LT CD only, NCD only or combined (did any of the three studies with various diseases include CD?). It appears that 7 out of 11 were related to LT CD only. This is important. As currently presented in this manuscript, understanding what the three studies included in relation to the range of conditions requires reading a footnote – which does not adequately address my concern from the previous review. Include a comparison of NCD only and CD only studies in your discussion and conclusions. What is striking about this review is that despite the high mortality rate related to NCDs in this population very few studies have focused on NCDs alone.

Author response:
We thank the reviewer for indicating the need for greater clarity and distinction here. We agree with their assessment. We have made three main alterations:

- Drawing a distinction between mixed NCD and specific LT-CD studies in the initial description
- For each outcome, we have indicated at the outset which studies (mixed NCD, specific LT-CD, or both) considered these outcomes
- Changed the summary of findings in the discussion section, as well as the conclusion, to highlight very few studies focused on specific NCDs.

With regard to NCDs, as the reviewer highlights, three studies included a range of NCDs. None of these studies included participants on the basis of diagnosis. One recruited homeless people at hospital admission, the other two identified participants at homeless accommodation or transitional housing and sought to provide a general health assessment, access to primary healthcare and management focused on the patients. From the detail of recruitment if was clear that a number of NCDs were included in these populations, however specific conditions, as well as the presence of LT-CD (which is likely but was not specifically stated) was not clear. We have changed our presentation of the description of included studies to clarify this:

"Three studies included a range of NCDs.34-36 None of these studies included specific diagnoses as inclusion criteria, but rather recruited at hospital admission or from homeless accommodation targeting access to community health services. It was not specified if participants included also had LT-CDs. The three studies including a range of NCDs each focused on access to care and services. Identification and management of health needs were included in this, however the interventions did not target specific conditions or management strategies. With the exception of one small (n=9) pilot study in type 2 diabetes, all other studies focusing on management of specific conditions concerned LT-CDs: four studies concerned latent tuberculosis;32 33 40-44 one concerned Hepatitis C;49 two studies concerned HIV.46-48 50"
Pages 12 to 13, lines 262 to 271

The results section considers each outcome in turn. Our primary outcome of unscheduled healthcare utilization, as well as access to primary care, was only considered in those studies of mixed NCDs. Our other secondary outcomes (knowledge, adherence, biological markers of disease) almost

exclusively concerned studies of specific LT-CDs. We have therefore edited the opening section of each outcome to make clear which group of studies concerned which outcomes.

Examples:

"Unscheduled Healthcare Utilisation
Three studies assessed the impact of interventions on hospital admissions and emergency department (ED) attendance.34-36 None focused on a specific conditions, however participants reported a range of NCD and each intervention included identification and engagement with medical, as well as wider needs…
Page 22 lines 320 to 325

"Access to primary healthcare
One RCT, including a range of NCDs, concerned access to primary healthcare.36…
Page 23 lines 351 to 352

"Adherence to specific treatment
Six studies (7 papers), all of which concerned LT-CD, assessed adherence to treatment or attendance at appointments.32 33 40 44 46 47 50 Four recruited patients with latent tuberculosis undergoing directly observed therapy (DOT)32 33 40 44, one included participants with HIV and alcohol problems,50 and one (2 papers) concerned participants with HIV and co-morbid depression.46 47…
Page 24 lines 363 to 368

"Knowledge and Self-efficacy
Three studies (5 papers) assessed the impact of interventions on disease specific knowledge and self-efficacy.40-42 45 49 Two (4 papers) concerned LT-CDs (TB, HIV and hepatitis) and one concerned type 2 diabetes…
Page 26 lines 413 to 416

"Biological markers of disease control
Two studies (3 papers) concerning LT-CDs assessed the impact of interventions on disease control outcomes."
Page 27 lines 451 to 452

We have also edited our summary of findings in the discussion to make a distinction between NCD and LT-CD, to avoid generalization, and to highlight that very few studies considered specific NCDs.

"The available evidence from controlled trials of interventions by healthcare professionals improving access to care for people with NCDs who are homeless does not show any convincing effects on unscheduled healthcare utilisation.34-36 There is also a lack of evidence to inform the management of specific NCDs in this context. One multidisciplinary intervention did demonstrate improved access to primary healthcare. 36

"Seven interventions were identified targeting specific LT-CDs. All of these involved a nurse primarily delivering the intervention, sometimes with support of peer-health advisors."
Page 28 to 29, lines 478 to 487

Comment 5

Define what constitutes an intervention. For example, the delivery of case management is considered a nursing intervention and should not be categorized as "no intervention". It might work better to differentiate between direct and indirect interventions and then specifically define these terms.

Author response
We considered any alteration to the design, delivery, organization or implementation of care to be an intervention. This is in line with the EPOC taxonomy which we used to classify and describe the interventions. We agree with the reviewer that the delivery of case management would be considered an intervention by this definition, and indeed we included a number of studies in which this formed an important part of the intervention. We have removed the term "no intervention" from table 3 when describing a comparator group, as in fact "usual care" would be a more accurate description. We have added the following to the methods section to clarify this.
"We considered any change to the organization or delivery of care to be an intervention."
Page 8 lines 168 to 169

Comment 6
It would help to include the actual prevalence and mortality rate of NCDs with LT CDs in persons experiencing homelessness and present this information to help support the importance of this review. For example, according to the CDC though only 1% of the US population reports being homeless, 5% of all TB cases are among the homeless. This supports your inclusion of studies focused on TB.

Author response
We thank the reviewer for this suggestion to help contextualize the focus of the review. We have added the following to the introduction section, after introducing NCDs and LT-CDs.

"Such conditions disproportionateley affect people who are homeless (e.g. TB rates between 20 times higher than general population, generally poorer control of diabetes and hypertension and higher cardiovascular mortality)."
Page 5, lines 103 to 106

Comment 7
Replace the term addiction with substance use disorders (aligns with current diagnostic criteria) and the term mental health problems with mental health disorders (aligns with current terminology and reduces confusion since some "mental health problems" could be minor).

Author response
We thank the reviewer for this comment and have changed all references to addiction to read "substance use disorders" and of mental health problems to read "mental health disorders".

Reviewer: 2
We thank the reviewer for their comments that we have made "substantial improvements" and that our previous responses were satisfactory. We have revised in line with other reviewers' comments while retaining the changes made to the previous version.

Reviewer 3:

We thank the reviewer for their assessment that we have addressed the prior concerns and that the manuscript is worth publication. We have further reduced the word count of the concluding sections in addition to the alterations detailed in response to reviewer 1.

Yours sincerely,

Dr Peter Hanlon and Dr Richard Lowrie, on behalf of the research team

VERSION 3 – REVIEW

REVIEWER	Christine L. Savage, PhD, RN, CARN, FAAN Johns Hopkins University
REVIEW RETURNED	19-Feb-2018

GENERAL COMMENTS	The authors have addressed my prior concerns and the manuscript as revised is much clearer. Again, this is an important topic and adds to our knowledge. I recommend acceptance with no further revisions needed.