PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (**http://bmjopen.bmj.com/site/about/resources/checklist.pdf**) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Risk factors for recurrent falls in older adults: A study protocol for a systematic review with meta-analysis
AUTHORS	Jehu, Deborah; Davis, Jennifer C; Liu-Ambrose, Teresa

VERSION 1 – REVIEW

REVIEWER	Anabela Correia Martins ESTeSC Coimbra Health School Polytechnic Institute of Coimbra Portugal
REVIEW RETURNED	24-Sep-2019

GENERAL COMMENTS	Very relevant study. Minor marks: 1- Dates of the study are not clear. 2- Please, clarify also in Page 6/28, lines 43 and 50 (Does "i.e., 3 months or longer" match with recurrent faller definition? I admit it can be my misunderstanding.

REVIEWER	Julie Bruce University of Warwick, UK
REVIEW RETURNED	Lead author on a monograph for an NIHR-HTA funded falls prevention trial about to be published.

GENERAL COMMENTS	A well written review protocol. I have minor comments only. Good justification for the review, highlights shortcomings of previous reviews to date. Page 6 Exclusion criteria - suggest you allow longer than 2 weeks for authors to respond with data; unless you mean acknowledge the request within 14 days. Those requesting data usually allow up to four weeks for researchers to find/clean/obtain the requested data. I suggest you define your primary outcome, this has not been explained - you specify rate of prospective falls but do not explain how this will be calculated. Please add a clear definition and time frame. Clear explanation of expected handling of statistical heterogeneity and subgroup analyses. The only major criticism I have of the protocol relates to the search strategy which is very difficult to follow and appears to be overly complex. Why for example, would you not group similar mesh and free text terms together (line 1 = falling; line 12=Fall*) using OR? Similarly, you have some risk terms merged with age rather than grouping all age terms together and grouping various risk terms

	then combining? It is impossible to follow back from line 28 how you arrived at that without working all the way back to line 1! For example: Line 2= recurrence risk; Line 15= falls risk; Line 16=falls risk yet they are not combined together as risk terms. It is difficult to follow the logic and as no 'hits' are provided in the uploaded search, it is not possible to gauge the utility of combinations. Suggest you revise as the format is impossible to follow and am concerned that your introduction of AND in lines 14 and then again use of AND in line 23 reduces your hits too much (e.g. you have restricted to articles which MUST have all of the following terms: ageing+ fall risk+risk factor+recurrent+falling (again)+prospective. Otherwise a well written review and look forward to reading the results.

REVIEWER	Stephen Lord NeuRA, UNSW, Australia previous papers published with two of the review authors.
REVIEW RETURNED	21-Oct-2019

GENERAL COMMENTS	The authors provide sufficient rationale for the need for this review. This is based on previous reviews including retrospective fall data, containing small review periods and not conducting study quality and risk of bias assessments and analyses. The review will be undertaken in line with best practice; i.e. the protocol has been registered on the PROSPERO database and the review will follow methods outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols and Meta-Analysis of Observational Studies in Epidemiology guidelines. I have only a few issues for consideration. Page 6, line 15 – Is allowing two weeks for authors to respond sufficient? It may take some authors longer than this to locate old datasets and reply. I suggest omitting this deadline. Page 9. Consider including the following outcome measures: objective measures of vision, vitamin D deficiency, CNS measures from MRIs etc. Page 10 line 8. Change “insufficient data is” to “insufficient data are”.

REVIEWER	Xu Tianma Singapore Institute of Technology, Singapore
REVIEW RETURNED	05-Nov-2019

GENERAL COMMENTS	Thank you for your study protocol. This systematic review paper will definitely value-add to falls prevention in community-living older adults. As you rightly pointed out that older adults who have a history of fall(s) are more likely to fall again. It is one of the main barriers for the restricted community participation in community-living older adults with past fall experience. This is also a prominent issue in the community aged care sector that all healthcare professionals are trying to address. Overall, your study

	protocol is well structured with clear flow and methodology. Below are my comments for your consideration: ABSTRACT The abstract needs a minor revision based on my comments below. METHODS Under “Inclusion criteria" section (page 6 of 28) For the types of studies, please consider the following to ensure good quality papers to be included for your systematic review: - Studies with monthly fall data collection method to minimize recall bias - Follow-up duration of the study (e.g. a minimum of 6 months) Under "Outcome measures and data extraction" section (page 8 of 28) Line 38: Please spell "Timed Up and Go Test" in full. Line 50: What evaluation tools are you going to use to measure "fear of falling" & "dual-tasking"? please specify. Do you intend to extract the odds ratio (OR) or relative risk (RR) since your main objective is to examine the risk factor for recurrent fallers? Under "Study quality and risk of bias assessment" (page 9 of 28) Line 43-45: Do you still include the studies with low quality based on the STROBE checklist result? Page 10, line 8: is the third neutral reviewer part of your research team? please specify. Under "Data synthesis and summary of results" (page 10 of 28) You may want to consider adding the following as part of the study characteristics table: - frequency of fall data collection Look forward to reading your revised manuscript.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Anabela Correia Martins

Institution and Country: ESTeSC Coimbra Health School
Polytechnic Institute of Coimbra
Portugal

Please state any competing interests or state ‘None declared’: None declared.

Please leave your comments for the authors below Very
relevant study.
Minor marks:

3. Dates of the study are not clear.

Response: We have clarified the search dates in the methods as well as in the abstract.

Action: On page 6, it now reads:

"The following electronic databases will be searched: MEDLINE (Ovid interface; 1946-2019),

EMBASE (Ovid interface: 1974-2019), PsycINFO (Ebsco interface: 1597-2019), and CINAHL

(Ebsco interface: 1982-2019) on April 25, 2019."

5- Please, clarify also in Page 6/28, lines 43 and 50 (Does "i.e., 3 months or longer" match with recurrent faller definition? I admit it can be my misunderstanding.

Response: We have clarified our definition of recurrent fallers to falling two or more times within a 12-month prospective period.

Action: On page 5, it now reads:

"A recurrent faller will be defined as a person falling more than once in a 12-month prospective period.2-7"

"Prospective falls data must be collected at least monthly (e.g., phone calls, fall calendars) for 12 months to be included in this study."

Reviewer: 2
Reviewer Name: Julie Bruce

Institution and Country: University of Warwick, UK

6. Page 6 Exclusion criteria - suggest you allow longer than 2 weeks for authors to respond with data; unless you mean acknowledge the request within 14 days. Those requesting data usually allow up to four weeks for researchers to find/clean/obtain the requested data.

Response: Thank you, we modified our protocol as suggested.

Action: On page 6, it now reads:
"Lastly, we will contact authors to inquire about fall outcome data that are not reported and give 4 weeks to respond."

7. I suggest you define your primary outcome, this has not been explained - you specify rate of prospective falls but do not explain how this will be calculated. Please add a clear definition and time frame.

Response: Thank you for the opportunity to clarify. Our primary outcome is fall rate, and we have included the calculation below.

Action: On page 7, it now reads:
"The fall rate per year will be calculated for each study using the following formula: Fall rate = $\frac{\text{average number of falls per participant}}{\text{days in the follow-up time period}} \times 365 \text{ days}$"

8. Clear explanation of expected handling of statistical heterogeneity and subgroup analyses.

Response: Thank you.

9. The only major criticism I have of the protocol relates to the search strategy which is very difficult to follow and appears to be overly complex. Why for example, would you not group similar mesh and free text terms together (line 1 = falling; line 12=Fall*) using OR?

Response and Action: In order to improve the readability of the search strategy, we have moved the keyword "fall*" to after the MESH term Accidental falls/. We have only used the Accidental falls/ MESH term to "AND" it with Recurrence/ as well as Secondary prevention/. Our preliminary searches indicated that the keyword fall* introduced irrelevant topics such as "falling in love" or "falling sick" or "falling short of x". Please see the supplementary material for the updated search strategy structured in such a way to identify the most relevant studies.

10. Similarly, you have some risk terms merged with age rather than grouping all age terms together and grouping various risk terms then combining? It is impossible to follow back from line 28 how you arrived at that without working all the way back to line 1!

For example:
Line 2= recurrence risk; Line 15= falls risk; Line 16=falls risk yet they are not combined together as risk terms.

Response and Action: We have ensured that we grouped the MESH and keyword terms for age as well as various risk terms, then combined them. Please see the supplementary material.

11. It is difficult to follow the logic and as no 'hits' are provided in the uploaded search, it is not possible to gauge the utility of combinations. Suggest you revise as the format is impossible to follow and am concerned that your introduction of AND in lines 14 and then again use of AND in line 23 reduces your hits too much (e.g. you have restricted to articles which MUST have all of the following terms: ageing+ fall risk+risk factor+recurrent+falling (again)+prospective.

Response and Action: We have provided the hits for each line for all 4 database searches on April 25, 2019. This search was piloted with a sample of articles and revised several times to better capture relevant articles. Please see the supplementary material.

12. Otherwise a well written review and look forward to reading the results.

Response: Thank you!

Reviewer: 3
Reviewer Name: Stephen Lord

Institution and Country: NeuRA, UNSW, Australia

Please state any competing interests or state 'None declared': previous papers published with two of the review authors.

Please leave your comments for the authors below

13. The authors provide sufficient rationale for the need for this review. This is based on previous reviews including retrospective fall data, containing small review periods and not conducting study quality and risk of bias assessments and analyses. The review will be undertaken in line with best practice; i.e. the protocol has been registered on the PROSPERO database and the review will follow methods outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols and Meta-Analysis of Observational Studies in Epidemiology guidelines.

Response: Thank you for your kind comments.

I have only a few issues for consideration.

14. Page 6, line 15 – Is allowing two weeks for authors to respond sufficient? It may take some authors longer than this to locate old datasets and reply. I suggest omitting this deadline.

Response: Thank you. We have adopted the Reviewer 2's suggestion of 4 weeks.

Action: On page 6, it now reads:

"Lastly, we will contact authors to inquire about fall outcome data that are not reported and give them 4 weeks to respond."

15. Page 9. Consider including the following outcome measures: objective measures of vision, vitamin D deficiency, CNS measures from MRIs etc.

Response: Thank you for the suggestion. We are extracting all fall-risk data that pertain to recurrent fallers. We have provided examples of fall-risk data in the manuscript and added your suggestions.

Action: On pages 7-8, it now reads:

- "Sensory and neuromuscular factors: e.g., visual impairment (e.g., cataracts, glaucoma; %), contrast sensitivity (dB), vision score, hearing impairment (%), pain (%), proprioceptive function (° error), dizziness (%), reaction time (ms), muscle strength (N/m^2)
- Psychological factors: e.g., Mini-Mental State Examination, Trail Making test, fear of falling, Activities-specific Balance Confidence scale, Geriatric Depression Scale, dual-tasking, Central Nervous System measures (e.g., magnetic resonance imaging)"

16. Page 10 line 8. Change "insufficient data is" to "insufficient data are".

Response: Thank you and we have revised our manuscript accordingly.

Action: On page 10, it now reads:

"Sensitivity analyses will be conducted to compare results with low vs high risk of bias. Studies will not be included for meta-analysis if insufficient data are provided."

Reviewer: 4
Reviewer Name: Xu Tianma

Institution and Country: Singapore Institute of Technology, Singapore

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

17. Thank you for your study protocol. This systematic review paper will definitely value-add to falls prevention in community-living older adults. As you rightly pointed out that older adults who have a history of fall(s) are more likely to fall again. It is one of the main barriers for the restricted community participation in community-living older adults with past fall experience. This is also a prominent issue in the community aged care sector that all healthcare professionals are trying to address. Overall, your study protocol is well structured with clear flow and methodology. Below are my comments for your consideration:

Response and Action: Thank you.

ABSTRACT

18. The abstract needs a minor revision based on my comments below.

Response: We have updated the abstract to include the recurrent faller definition, falls monitoring at least monthly, and a minimum follow-up duration of 12 months.

Action: On page 2, it now reads:

"Prospective studies with a minimum follow-up duration of 12 months with monthly falls monitoring, investigating risk factors for recurrent falls in older adults will be included."

METHODS

19. Under "Inclusion criteria" section (page 6 of 28)
For the types of studies, please consider the following to ensure good quality papers to be included for your systematic review:
- Studies with monthly fall data collection method to minimize recall bias -
Follow-up duration of the study (e.g. a minimum of 6 months)

Response: We concur and have adjusted our inclusion criteria to a minimum follow-up duration of 12 months (to align with our recurrent faller definition) with monthly falls collection.

Action: On page 5, it now reads:

"Prospective falls data must be collected at least monthly (e.g., phone calls, fall calendars) for at least 12 months to be included in this study."

20. Under "Outcome measures and data extraction" section (page 8 of 28) Line 38: Please spell "Timed Up and Go Test" in full.

Response: We have made this change.

Action: On page 7, it now reads:

- "Balance and mobility factors: e.g., Tinetti Balance & Gait Assessment, Timed Up and Go Test (s), gait speed (m/s), sit-to-stand (s), sway area (mm^2)"

21. Line 50: What evaluation tools are you going to use to measure "fear of falling" & "dualtasking"? Please specify.

Response and Action: We plan to extract regression coefficients as well as their standard errors, odds ratios, and relative risk as well as means, standard deviations, and percentages of all tools that capture fear of falling (e.g., activities-specific balance confidence scale, fear of falling questionnaires, do you have a fear of falling (yes, no), etc.) and dual-tasking (e.g., timed-up-andgo test cognitive version as well as other cognitive or motor performance measures during standing or walking tasks).

22. Do you intend to extract the odds ratio (OR) or relative risk (RR) since your main objective is to examine the risk factor for recurrent fallers?

Response: Yes, we will be extracting regression coefficients as well as their standard error, odds ratios, and relative risk. We will also use the baseline fall risk data to determine whether moderating effects may occur.

Action: On page 8, it now reads:
"Regression coefficients, standard errors, odds ratios, and relative risk will also be extracted."

23. Under "Study quality and risk of bias assessment" (page 9 of 28)
Line 43-45: Do you still include the studies with low quality based on the STROBE checklist result?

Response: We will include studies with a high risk of bias and low quality of reporting in the narrative synthesis systematic review, with a greater emphasis on those with a lower risk of bias and higher quality of reporting. However, only low risk of bias studies will be included in the meta-analysis. Using the Joanna Briggs Institute Prevalence Critical Appraisal Tool, a low risk of bias will be assigned to each eligible study if most methodological criteria are met, while a high risk of bias will be assigned for studies with few criteria are met. Because the STROBE was not developed to assess the quality of reporting, it will not be used as inclusion criteria for the meta-analysis. We have clarified that studies with a high risk of bias will not be included in the meta-analysis.

Action: On page 10, it now reads:

"Studies will not be included in the meta-analysis if insufficient data are provided or if they have a high risk of bias"

24. Page 10, line 8: is the third neutral reviewer part of your research team? please specify.

Response and Action: Yes, the third neutral reviewer is part of our team.

Action: On page 9, it now reads:

"Disagreements between reviewers will be resolved through discussion with a third neutral reviewer on the team."

25. Under "Data synthesis and summary of results" (page 10 of 28)
You may want to consider adding the following as part of the study characteristics table: - frequency of fall data collection

Response and Action: Thank you for the suggestion, we are extracting this information.

Action: On page 7, it now reads:

- "Sociodemographic factors: e.g., age, sex, fall characteristics (e.g., number of recurrent fallers, frequency retrospective and prospective falls, timeline of retrospective and prospective falls, method of collecting fall data, rate of falls, severity of injury(ies), time to first injury, fall risk)"

Look forward to reading your revised manuscript.