PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Co-designing a dashboard of predictive analytics and decision support to drive care quality and client outcomes in aged care: A mixed-methods study protocol
AUTHORS	Ludlow, Kristiana; Westbrook, Johanna; Jorgensen, Mikaela; Lind, Kimberly; Baysari, Melissa; Gray, Len; Day, Richard; Ratcliffe, Julie; Lord, Stephen; Georgiou, A; Braithwaite, Jeffrey; Raban, Magdalena; Close, Jacqueline; Beattie, Elizabeth; Zheng, Wu Yi; Debono, Deborah; Nguyen, A; Siette, Joyce; Seaman, Karla; Miao, Melissa; Root, Jo; Roffe, David; O'Toole, Libby; Carrasco, Marcela; Thompson, Alex; Shaikh, Javed; Wong, Jeffrey; Stanton, Cynthia; Haddock, Rebecca

VERSION 1 – REVIEW

REVIEWER	Chadborn, Neil University of Nottingham, School of Medicine
REVIEW RETURNED	15-Feb-2021

GENERAL COMMENTS	This is an important topic that bridges data communication and implementation science. The project includes co-design of a dashboard of risk factors relating to an individual client's risk of falling or of detriment to quality of life. The study will include feedback on a prototype in order to plan a future evaluation of implementation. There is a lack of clarity throughout the study of the distinction between the programme to develop the dashboard and this study of user's perceptions of the dashboard. Whilst these questions may overlap in the co-design phase, it would be helpful to clarify these as distinct aims because there is a risk that if all research enquiries are framed around the technology, participants may feel that researchers are not interested in their concerns about problems that lie outside of the design of the technology, or are missed by the technology. This is particularly important when discussing a concept such as 'quality of life'; that participants are able to express their views in ways that aren't limited to the outputs of a risk model. An example of this blurring is that the rationale (p13 line11) and also strengths and weaknesses (p7 line18) sections state the aims of the dashboard itself, rather than more specific aims of this study (of the dashboard). The authors state that this is a mixed methods study, but it isn't clear what the quantitative component is? Is there any quantitative data collection of clients or staff perceptions of the dashboard? While risk models are mentioned – this appears to be a part of codesign rather than a method of analysing risk within this study. Specific comments

	Title – does this reflect the study? Would it be clearer to specify falls and quality of life rather than 'predictive analytics'? P3 Line18: "residential and community-based aged care settings" This is an odd phrase. It doesn't contain recognisable terms. Residential aged care facility is well known. Home care or domiciliary care, or care provided in the home are well known terms. If the latter term indicates a person's home - this not a care setting. Observations – it is stated that observations will be direct by from a distance – clarify what this means in practice Some more detail is required about the theoretical approach of 'critical realist' – does this imply realist evaluation following Pawson, Wong et al? More detail is needed about this theory-led evaluation. How do findings of realist enquiry relate to design of the trial and the process evaluation? There is little information about the risk modelling, apart from mention of Discrete Time Survival. What does this entail and what software will be used? Are there different models to consider or is it more a case of weighting of risk factors etc? To what extent is development of the modelling itself part of this study – or is it more about communication of risk factors that are calculated from the model? For example will users (clients and staff) be consulted on balance of risk of falling compared to quality of life, and how these are handled by the model? How will people's understanding of risk be quantitated?

REVIEWER	Dowding, Dawn University of Manchester
REVIEW RETURNED	09-Mar-2021

GENERAL COMMENTS	This is a clearly written protocol

REVIEWER	Alvarado, Natasha University of Bradford
REVIEW RETURNED	07-Apr-2021

GENERAL COMMENTS	This paper describes a protocol to design and test a dashboard to support the identification of patients at high risk of adverse events, in aged-care settings, and decision-making regarding their care. I think the protocol describes an interesting and useful study and that the use of codesign and mixed methods are a real strength of the work planned. Please find below my comments. • The protocol focuses on dashboard design and testing and I think that the title should be reworded to reflect this focus, so that the content is clear to readers. • The introduction provides great detail about the healthcare setting under study, but as the protocol is about the design and test of a dashboard, I think it would be useful to provide some detail about how the findings will contribute to the literature on dashboard design in the healthcare setting also. • On pg. 9 the authors discuss that co-design 'takes into account context '– codesign also draws on the lived experience of potential user groups, so that the end product addresses their expressed needs and experiences. I think this point about codesign needs to be made explicit and how codesign principles influenced choice of methods and data collection activities needs to be explained in more detail in the methods section (see comments below). Methods section

	• The authors are using multiple methods - I think this is great and a real strength of the study, but more explanation is needed about their choices e.g., why are they using mixed methods? • In the study population section, the authors state that they will select a sample of professionals, clients, GPs etc but not why these groups will be sampled or what the recruitment procedure will be. • In the methods for 'Component 1', the authors should describe how data will be collected and managed and how the activities planned reflect the principles of codesign. • I think it would be helpful if the analysis section were presented under a separate heading and choice of approach should be explained - e.g., on pg. 15 they state that 'content analysis' and a 'critical realist approach' will be used but they do not explain why or how they will be used / what this means for their analysis, or how NVivo will help/support use of these approaches. • It would be helpful to explain if/how the analysis from the different methods will be synthesised/ feed into other methods. I hope these comments are of some help. Thank you for the opportunity to review this interesting protocol and good luck with the study.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1	This is an important topic that bridges data communication and implementation science. The project includes co-design of a dashboard of risk factors relating to an individual client's risk of falling or of detriment to quality of life. The study will include feedback on a prototype in order to plan a future evaluation of implementation.	We thank the reviewer for their positive appraisal of the manuscript.

	There is a lack of clarity throughout the study of the distinction between the programme to develop the dashboard and this study of user's perceptions of the dashboard. Whilst these questions may overlap in the co-design phase, it would be helpful to clarify these as distinct aims because there is a risk that if all research enquiries are framed around the technology, participants may feel that researchers are not interested in their concerns about problems that lie outside of the design of the technology, or are missed by the technology. This is particularly important when discussing a concept such as 'quality of life'; that participants are able to express their views in ways that aren't limited to the outputs of a risk model. An example of this blurring is that the rationale (p13 line11) and also strengths and weaknesses (p7 line18) sections state the aims of the dashboard itself, rather than more specific aims of this study (of the dashboard).	We have clarified that the aim is to co-design the dashboard with users and have added a section on co-design on page 13. Technology is only one part of enquiry with users. On page 15 we outline the other interview and focus group topics for residents and family which include: preferences and experiences relating to access to medical and aged care information, involvement in decision-making, and communication of healthcare and aged care information, in addition to design features of the dashboard. For staff members, we intend to ask about experiences with decision support, decision-making guidance, and challenges with current work processes. The risk model is only one component of the dashboard. The dashboard will also integrate data silos to communicate information to clients and their families in ways that are meaningful to them. The study of the dashboard forms a later stage of the project, whereas the focus of the current manuscript is the development of the dashboard.
	The authors state that this is a mixed methods study, but it isn't clear what the quantitative component is? Is there any quantitative data collection of clients or staff perceptions of the dashboard?	The quantitative component is in reference to the development of the predictive models described on pages 19-20. We are not collecting any quantitative data collection of clients or staff perceptions of the dashboard. We have clarified on page 18 that STATA will be used to conduct statistical analysis.

	While risk models are mentioned – this appears to be a part of codesign rather than a method of analysing risk within this study.	The development of the risk models will form part of the dashboard, i.e., the model is in relation to the residents' risk of falling. This is explained on pages 17-18.
	Specific comments Title – does this reflect the study? Would it be clearer to specify falls and quality of life rather than 'predictive analytics'?	The reviewer makes a good suggestion that was discussed amongst the research team. As outlined on page 11, quality of life and falls are two exemplar indicators. We anticipate that further indicators may be added during this project or by other researchers and providers in the future. Therefore, we have decided to leave the title as is.
	P3 Line18: "residential and community-based aged care settings" This is an odd phrase. It doesn't contain recognisable terms. Residential aged care facility is well known. Home care or domiciliary care, or care provided in the home are well known terms. If the latter term indicates a person's home - this not a care setting.	Community care is defined on page 7 "formal aged care services provided in the home and community" and page 14 "their community-based aged care service outlets which provide services to older people in their homes".
	Observations – it is stated that observations will be direct by from a distance – clarify what this means in practice	Observers will maintain a following distance of approximately 3 metres and will be using a validated time and motion tool. This has been clarified on page 15.
	Some more detail is required about the theoretical approach of 'critical realist' – does this imply realist evaluation following Pawson, Wong et al? More detail is needed about this theory-led evaluation.	Further information on the critical realist approach developed by Pawson & Tilley has been included in the updated manuscript on page 16.
	How do findings of realist enquiry relate to design of the trial and the process evaluation?	On page 15 we have updated the text to explain that the findings of the realist enquiry carried out in components 1

		and 3 will guide the co-design, develop and refinements of the dashboard prototype. The dashboard will then be trialled and evaluated through the methods outlined in the section: “longer-term plans for dashboard implementation and evaluation”.
	There is little information about the risk modelling, apart from mention of Discrete Time Survival. What does this entail and what software will be used? Are there different models to consider or is it more a case of weighting of risk factors etc? To what extent is development of the modelling itself part of this study – or is it more about communication of risk factors that are calculated from the model? For example will users (clients and staff) be consulted on balance of risk of falling compared to quality of life, and how these are handled by the model? How will people’s understanding of risk be quantitated?	Whilst we present the information on the DTS, we will be exploring an array of different models to ensure this one is the best fit or if another model is more appropriate. We will be using STATA to conduct the statistical analysis. This has been clarified on page 18. The predictive model will form part of the dashboard and show clients’ risk of fall in near real-time to the staff, GPs clients and family members. It will also show any recent changes in risk, the reason(s) behind the change, and evidence-based decision support to help prevent a future fall. Hence, the modelling does form a significant part of the study (pages 17-18). This research focuses on both the development of the model, and the communication of risk to users. People’s understanding of risk and what risk indicator scores means will be developed throughout the studies’ journey. This project involves an iterative process of engaging

		with users to design, refine and test the dashboard.
Reviewer: 2	This is a clearly written protocol	We thank Reviewer 2 for their positive feedback.
Reviewer: 3	This paper describes a protocol to design and test a dashboard to support the identification of patients at high risk of adverse events, in aged-care settings, and decision-making regarding their care. I think the protocol describes an interesting and useful study and that the use of codesign and mixed methods are a real strength of the work planned. Please find below my comments.	We would like to thank Reviewer 3 for recognising the significance of the research and the strengths of its design.
	The protocol focuses on dashboard design and testing and I think that the title should be reworded to reflect this focus, so that the content is clear to readers.	This is a great suggestion. We have changed the title to **"Co-designing** a dashboard of predictive analytics and decision support to drive care quality and client outcomes in aged care: A mixed-methods study protocol"
	The introduction provides great detail about the healthcare setting under study, but as the protocol is about the design and test of a dashboard, I think it would be useful to provide some detail about how the findings will contribute to the literature on dashboard design in the healthcare setting also.	On page 9 we identify that dashboards are less commonly used in aged care and this setting comes with specific challenges that our dashboard aims to address. We discussed the reviewer's suggestion amongst the research team, but have decided that commenting on settings outside of aged care would distract from this point.

	On pg. 9 the authors discuss that co-design 'takes into account context '– codesign also draws on the lived experience of potential user groups, so that the end product addresses their expressed needs and experiences. I think this point about codesign needs to be made explicit and how codesign principles influenced choice of methods and data collection activities needs to be explained in more detail in the methods section (see comments below).	This is an excellent point raised by the reviewer. We have created a section under study design labelled "co-design principles". We have added the following text: "draw on their lived experiences to ensure that outputs are tailored to their expressed needs and preferences, and aligns with workflows and available resources." We have also explained how our research is guided by the co-design principles of Blomkamp (2018) (pages 12-13). We have changed the language throughout the manuscript to emphasise the co-design nature of the study.
	Methods section The authors are using multiple methods - I think this is great and a real strength of the study, but more explanation is needed about their choices e.g., why are they using mixed methods?	The quantitative side is in relation to the predictive modelling that will form a large component of the dashboard. The qualitative side is to understand, how best to present this data and what decision support would enable the information to be used in a meaningful way to reduce the risk of falls.
	In the study population section, the authors state that they will select a sample of professionals, clients, GPs etc but not why these groups will be sampled or what the recruitment procedure will be.	On page 13, we have explained why this sample was selected and the recruitment processes for the various participant groups.
	In the methods for 'Component 1', the authors should describe how data will be collected and managed and how the activities planned reflect the principles of codesign.	We have added a section about co-design principles under "study design". This section examples how the research reflect the principles of co-design. Data collection is outlined in the method section. On page 16 we have added that "Interviews, focus groups and working groups will be audio recorded and transcribed verbatim." We have also

		amended the ethics and dissemination section (page 21) to explain that data will be managed and stored in line with Macquarie University policies.
	I think it would be helpful if the analysis section were presented under a separate heading and choice of approach should be explained - e.g., on pg. 15 they state that 'content analysis' and a 'critical realist approach' will be used but they do not explain why or how they will be used / what this means for their analysis, or how NVivo will help/support use of these approaches.	We have added a separate heading for the analyses section. We have provided further explanations regarding the analytical approaches in the updated manuscript on page 15.
	It would be helpful to explain if/how the analysis from the different methods will be synthesised/ feed into other methods.	The reviewer makes an excellent point. We have added text at the end of component 1 (page 15) and the start of component 3 (page 17) to explain how the analysis from the different methods will inform the other methods in the study.
	I hope these comments are of some help. Thank you for the opportunity to review this interesting protocol and good luck with the study.	The comments from Reviewer 3 have helped us to strengthen the protocol and we thank them again for their valuable feedback.

VERSION 2 – REVIEW

REVIEWER	Chadborn, Neil University of Nottingham, School of Medicine
REVIEW RETURNED	17-Jun-2021

GENERAL COMMENTS	Reviewer's initial comment	Authors response	Reviewer's follow-up
	There is a lack of clarity throughout the study of the distinction between the programme to develop the dashboard and this study of user's	We have clarified that the aim is to co-design the dashboard with users and have added a section on co-design on page 13. Technology is only one part of enquiry with users. On page 15 we outline the	Clarity has been improved, but the reader may still find it difficult to understand the 'flow' of the methods

	perceptions of the dashboard. Whilst these questions may overlap in the co-design phase, it would be helpful to clarify these as distinct aims because there is a risk that if all research enquiries are framed around the technology, participants may feel that researchers are not interested in their concerns about problems that lie outside of the design of the technology, or are missed by the technology. This is particularly important when discussing a concept such as 'quality of life'; that participants are able to express their views in ways that aren't limited to the outputs of a risk model. An example of this blurring is that the rationale (p13 line11) and also strengths and weaknesses (p7 line18) sections state the aims of the dashboard itself, rather than more specific aims of this study (of the dashboard).	other interview and focus group topics for residents and family which include: preferences and experiences relating to access to medical and aged care information, involvement in decision-making, and communication of healthcare and aged care information, in addition to design features of the dashboard. For staff members, we intend to ask about experiences with decision support, decision-making guidance, and challenges with current work processes. The risk model is only one component of the dashboard.The dashboard will also integrate data silos to communicate information to clients and their families in ways that are meaningful to them. The study of the dashboard forms a later stage of the project, whereas the focus of the current manuscript is the development of the dashboard.	throughout the study. Maybe a schematic flow diagram would help to show how one method will feed into the next?
	The authors state that this is a mixed methods study, but it isn't clear what the quantitative component is? Is there any quantitative data	The quantitative component is in reference to the development of the predictive models described on pages 19-20. We are not collecting any quantitative data collection of clients or staff perceptions of the dashboard. We have clarified on page 18 that	Thanks for clarification

	collection of clients or staff perceptions of the dashboard?	STATA will be used to conduct statistical analysis.	
	While risk models are mentioned – this appears to be a part of codesign rather than a method of analysing risk within this study.	The development of the risk models will form part of the dashboard, i.e., the model is in relation to the residents' risk of falling. This is explained on pages 17-18.	P16 line 23 "Two risk models -for each priority area" It remains unclear how the two risk models become "the final model" (p16 line53). On what basis will a model be chosen. P17 line5 states "the most appropriate method is used" – What is the basis for choice of method/modelling? Will falls prevention or quality of life be the favoured priority area? But P18 line 17 states that "risk levels for the two priority risk indicators in real-time" – does this mean that the intention is to build two risk models into the dashboard?
	Specific comments Title – does this reflect the study? Would it be clearer to specify falls and quality of life rather than 'predictive analytics'?	The reviewer makes a good suggestion that was discussed amongst the research team. As outlined on page 11, quality of life and falls are two exemplar indicators. We anticipate that further indicators may be added during this project or by other researchers and providers in the future. Therefore, we have decided to leave the title as is.	As above, the text seems to indicate that multiple risk models will run within the dashboard. Does this imply that further models could be incorporated to address different 'indicators' – in which case is there a risk of

				tension or contradiction between models? Ie decreasing a factor to improve risk of falls may worsen quality of life?
		P3 Line18: "residential and community-based aged care settings" This is an odd phrase. It doesn't contain recognisable terms. Residential aged care facility is well known. Home care or domiciliary care, or care provided in the home are well known terms. If the latter term indicates a person's home - this not a care setting.	Community care is defined on page 7 "formal aged care services provided in the home and community" and page 14 "their community-based aged care service outlets which provide services to older people in their homes".	This remains unclear, which may be partly due to the variety and lack of clarity of international terms. P7 line 3 refers to interRAI-LTCF for use in 'care homes' (the term we would use in UK). The paragraph continues to discuss residential aged care facilities (care homes). So I remain unclear to which settings the following phrase refers "community aged care settings (i.e., formal aged care services provided in the home and community)." Does this include care homes (LTCF/RACF) or not? Does 'in the community' mean what we might call "day centres" (ie non-residential settings?) P9 line 55 "It is expected that the dashboard will be used to identify

				and support older adults at risk of poor outcomes in residential aged care facilities and community-based aged care” P11 line 25 “The aim of this study is to describe the co-design and testing of a dashboard in residential and community-based aged care settings” The latter reflects generally accepted distinction between care provided in a residential institution (ie RACF) and in the community (at home or in day-centres). These statements appear to conflict with the statement on p7 of “home and community” – which would imply that residential institutions would not be included. It would help to clarify the scope if the terms reflecting institutional care (RACF), home care and community care were reflected in the title and abstract. This

			helps future academic activity – such as literature review searches.
	Observations – it is stated that observations will be direct by from a distance – clarify what this means in practice	Observers will maintain a following distance of approximately 3 metres and will be using a validated time and motion tool. This has been clarified on page 15.	This may be clarified by using the term 'non-participant observation'
	Some more detail is required about the theoretical approach of 'critical realist' – does this imply realist evaluation following Pawson, Wong et al? More detail is needed about this theory-led evaluation.	Further information on the critical realist approach developed by Pawson & Tilley has been included in the updated manuscript on page 16.	As this is mentioned only once, I remain sceptical that a realist method will be used within this study. The protocol already contains many different methods and perspectives; I suggest realist approach will not add value.
	How do findings of realist enquiry relate to design of the trial and the process evaluation?	On page 15 we have updated the text to explain that the findings of the realist enquiry carried out in components 1 and 3 will guide the co-design, develop and refinements of the dashboard prototype. The dashboard will then be trialled and evaluated through the methods outlined in the section: "longer-term plans for dashboard implementation and evaluation".	Realist evaluation is a theory-led approach. If the protocol does not at least outline initial ideas of programme theories, I think it unlikely that realist evaluation will add value to what is already a complex set of methods and analyses.
	There is little information about the risk modelling, apart from mention of Discrete Time Survival. What does this entail and what	Whilst we present the information on the DTS, we will be exploring an array of different models to ensure this one is the best fit or if another model is more appropriate.	Could the authors list the alternative models that will be tested?

	software will be used? Are there different models to consider or is it more a case of weighting of risk factors etc? To what extent is development of the modelling itself part of this study – or is it more about communication of risk factors that are calculated from the model? For example will users (clients and staff) be consulted on balance of risk of falling compared to quality of life, and how these are handled by the model? How will people's understanding of risk be quantitated?	We will be using STATA to conduct the statistical analysis. This has been clarified on page 18. The predictive model will form part of the dashboard and show clients' risk of fall in near real-time to the staff, GPs clients and family members. It will also show any recent changes in risk, the reason(s) behind the change, and evidence-based decision support to help prevent a future fall. Hence, the modelling does form a significant part of the study (pages 17-18). This research focuses on both the development of the model, and the communication of risk to users. People's understanding of risk and what risk indicator scores means will be developed throughout the studies' journey. This project involves an iterative process of engaging with users to design, refine and test the dashboard.	How will authors judge between models or will models be combined?

Minor comments:

Keywords –suggest including falls, Residential Aged Care Facilities

P15 line 54: "groups and a community forum, as we as GPs during a working group."

Typo should be 'as well as GPs'

VERSION 2 – AUTHOR RESPONSE

Reviewer's comments (R1)	**Authors' response (R1)**

There is a lack of clarity throughout the study of the distinction between the programme to develop the dashboard and this study of user's perceptions of thedashboard. Whilst these questions may overlap in the co-design phase, it would be helpful to clarify these as distinct aims because there is a risk that if all research enquiries are framed around the technology, participants may feel that researchers are not interested in their concerns about problems that lie outside of the design of the technology, or aremissed by the technology. This is particularly important when discussing a concept such as 'quality of life'; that participants are able to express their views in ways that aren't limitedto the outputs of a risk model. An example of this blurring is that the rationale (p13 line11) and also strengths and weaknesses (p7 line18) sectionsstate the aims of the dashboard itself, rather than more specific aims of this study (of the dashboard).	We have clarified that the aim is to co-design the dashboard with users and have added a section on co- design on page 13. Technology is only one part of enquiry with users. On page 15 we outline the other interview and focus group topics for residents and familywhich include: preferences and experiences relating to access to medical and aged care information, involvement in decision-making, and communication of healthcare and aged care information, in addition to design features of the dashboard. For staff members, we intend to ask about experiences with decision support, decision-making guidance, and challenges withcurrent work processes. The risk model is only one component of the dashboard. The dashboard will also integrate data silos to communicate information to clients and their families in ways that are meaningful to them. The study of the dashboard forms a later stage ofthe project, whereas the focus of the current manuscriptis the development of the dashboard.
The authors state that this is a mixed methods study,but it isn't clear what the quantitative component is? Is there any quantitative data collection of clients or staff perceptions of the dashboard?	The quantitative component is in reference to the development of the predictive models described on pages 19-20. We are not collecting any quantitative data collection of clients or staff perceptions of the dashboard. We have clarified on page 18 that STATA will be used to conduct statistical analysis.
While risk models are mentioned – this appears to bea part of codesign rather than a method of analysing risk within this study.	The development of the risk models will form part of thedashboard, i.e., the model is in relation to the residents' risk of falling. This is explained on pages 17-18.
Specific comments Title – does this reflect the study? Would it	The reviewer makes a good suggestion that was discussed amongst the research team. As outlined on page 11, quality of life and falls are two

be clearerto specify falls and quality of life rather than 'predictive analytics'?	exemplar indicators. We anticipate that further indicators may be added during this project or by other researchers and providers in the future. Therefore, we have decided toleave the title as is.
P3 Line18: "residential and community-based aged care settings" This is an odd phrase. It doesn't contain recognisable terms. Residential aged care facility is well known. Home care or domiciliary care, or care provided in the home are well known terms. Ifthe latter term indicates a person's home - this not a care setting.	Community care is defined on page 7 "formal aged care services provided in the home and community" and page14 "their community-based aged care service outlets which provide services to older people in their homes".
Observations – it is stated that observations will be direct by from a distance – clarify what this means inpractice	Observers will maintain a following distance of approximately 3 metres and will be using a validated time and motion tool. This has been clarified on page 15.
Some more detail is required about the theoretical approach of 'critical realist' – does this imply realist evaluation following Pawson, Wong et al? More detailis needed about this theory-led evaluation.	Further information on the critical realist approach developed by Pawson & Tilley has been included in theupdated manuscript on page 16.
How do findings of realist enquiry relate to design ofthe trial and the process evaluation?	On page 15 we have updated the text to explain that thefindings of the realist enquiry carried out in components 1 and 3 will guide the co-design, develop and refinements of the dashboard prototype. The dashboardwill then be trialled and evaluated through the methods outlined in the section: "longer-term plans for dashboard implementation and evaluation".
There is little information about the risk modelling, apart from mention of Discrete Time Survival. Whatdoes this entail and what software will be used? Are there different models to consider or is it more acase of weighting of risk factors etc? To what extent is development of the modelling itselfpart of this study – or is it more about communicationof risk factors that are calculated from the model?	Whilst we present the information on the DTS, we will be exploring an array of different models to ensure this one is the best fit or if another model is more appropriate. We will be using STATA to conduct the statistical analysis. This has been clarified on page 18. The predictive model will form part of the dashboard andshow clients' risk of fall in near real-time to the staff, GPsclients and family members. It will also show any recent changes in

For example will users (clients and staff) be consulted on balance of risk of falling compared toquality of life, and how these are handled by the model? How will people's understanding of risk be quantitated?	risk, the reason(s) behind the change, and evidence-based decision support to help prevent a future fall. Hence, the modelling does form a significant part of the study (pages 17-18). This research focuses on both the development of the model, and the communication of risk to users. People's understanding of risk and what risk indicator scores means will be developed throughout the studies'journey. This project involves an iterative process of engaging with users to design, refine and test the dashboard.

Reviewer's comments (R2)	**Authors' response (R2)**
Clarity has been improved, but the reader may still find it difficult to understand the 'flow' of the methods throughout the study. Maybe a schematic flow diagram would help toshow how one method will feed into the next?	We appreciate the reviewer's suggestion and have created a flow diagram (now Figure 2) to provide an overview of the study. This new figure shows the relationships between the methods and replaces the original Figure 2.
Thanks for clarification	No further action required.

P16 line 23 “Two risk models -foreach priority area”. It remains unclear how the two risk models become “the final model” (p16 line53). On what basis will a model be chosen. P17 line5 states “the most appropriate method is used” – What is the basis for choice of method/modelling? Will falls prevention or quality of life be the favoured priority area? But P18 line 17 states that “risk levels for the two priority risk indicators in real-time” – does this mean that the intention is tobuild two risk models into the dashboard?	There will be two predictive risk models developed as part of the dashboard, one on falls and the other on quality of life. We have revised the text in the methods section to add further clarity on this. This section has been updated to provide examples of other techniques that we will be exploring and how the most appropriate method will be decided. Whilst falls can impact on quality of life, for the purpose of this study, the two risk models will be independent from one another. The reviewer is correct in their interpretation that the risk models will be built into the dashboard. This is explained on page 18: “Client health and care information, along with the risk models, will be integrated into the dashboard to a) provide an overview of clients’ information (e.g., current medications) and b) alert users to changes in clients’ risk levels for the two priority risk indicators in real-time.”
As above, the text seems to indicate that multiple risk models will run within the dashboard. Does this implythat further models could be incorporated to address different ‘indicators’ – in which case is there a risk of tension or contradiction between models? Ie decreasing a factor to improve risk of falls	The dashboard will comprise risk models for falls and for quality of life, presented in the dashboard as risk indicators. On page 11 we explain that other models could be incorporated into the dashboard in the future: “These two exemplar indicators will serve as an initial model to test embedding risk indicators in an electronic dashboard within aged care settings. Other indicators may be added during the study in

may worsen quality of life?	response to feedback from users." We agree with the reviewer that a decreasing factor to improve risk of falls may worsen quality of life. It is a good point and something we have considered, however, for the purpose of this study we are keeping the two risk models exclusive of one another.
This remains unclear, which may bepartly due to the variety and lack of clarity of international terms. P7 line 3 refers to interRAI-LTCF for use in 'care homes' (the term we would use in UK). The paragraph continues to discuss residential agedcare facilities (care homes). So I remain unclear to which settings the following phrase refers "community aged care settings (i.e., formal aged care services provided in the home and community)." Does this include carehomes (LTCF/RACF) or not? Does 'in the community' mean what we might call "day centres" (ie non-residential settings?) P9 line 55 "It is expected that the dashboard will be used to identify and support older adults at risk of poor outcomes in residentialaged care facilities and community-based aged care" P11 line 25 "The aim of this study is to describe the co-design and testingof a dashboard in residential and community-based aged care settings" The latter reflects generally accepted distinction between care provided in a residential institution (ie RACF) and in the community (at home or in day- centres). These statements appear to conflict with the	Thank you for the opportunity to clarify. In Australia, there are two main streams of aged care services – the first is community aged care settings which provides services to older adults in their homes (e.g., transport, gardening, domestic assistance, day centres), and the second form is residential aged care services which are services provided to older adults residing in a residential aged care facility, also known as a care home (in the UK) or nursing home (in the US). This research is being conducted in both residential aged care facilities and in community aged care settings, as outlined on page 12: "This study involves Anglicare's 23 residential aged care facilities, and their community-based aged care service outlets which provide services to older people in their homes". We further make the distinction between the two settings on page 7. This includes alternative names for residential aged care facilities for context: "residential aged care settings (also known as assisted living facilities, nursing homes, care homes, long-term care facilities, and skilled nursing facilities)" and a definition of community-based aged care settings: "community aged care settings (i.e., formal aged care services provided in the home and community, such as domestic assistance, social support, gardening, transport)." We have now added "care homes" to the list of residential aged care terminology, and provided examples of services in our definition of community-based aged care. The review is correct in their interpretation community care may include services such as day

statement on p7 of “home and community” – which would imply that residential institutions would not be included. It would help to clarify the scope if the terms reflecting institutional care(RACF), home care and community care were reflected in the title and abstract. This helps future academicactivity – such as literature review searches.	centres, which are often classified under social support services for older adults who are residing independently in their own homes. We have used the term “aged care” in our title to encompass the different settings we are including. We discussed the suggestion of including “residential aged care facilities and community-based care settings” in the title, however, this would increase the length of an already long title, and the term “aged care” is inclusive. We have amended the abstract to clarify the scope of the study settings.
This may be clarified by using theterm ‘non-participant observation’	Thank you for this suggestion, we have included this term on page 14.
As this is mentioned only once, I remain sceptical that a realist methodwill be used within this study. The protocol already contains many different methods and perspectives; Isuggest realist approach will not add value.	The critical realist approach has now been removed.
Realist evaluation is a theory-led approach. If the protocol does not at least outline initial ideas of programme theories, I think it unlikely that realist evaluation will add value to what is already a complex set of methods and analyses.	The critical realist approach has now been removed.
Could the authors list the alternativemodels that will be tested? How will authors judge between models or will models be combined?	We have updated the method section to include alternative models that will be tested such as joint regression and landmark models. We have also mentioned that we will conduct statistical model performance techniques such as the concordance index that will support in determining the most appropriate models.

Minor comments: Keywords –suggest including falls, Residential Aged Care Facilities	This is a good suggestion; however, BMJ Open has pre-determined keywords. We are unable to add our own.
P15 line 54: “groups and a community forum, as we as GPs during a working group. Typo should be ‘as well as GPs’.	This has been fixed.