Author's response to reviews

Title: Development of a complex intervention to promote appropriate prescribing and medication intensification in poorly controlled type 2 diabetes mellitus in Irish general practice

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Author’s response to reviews:

Dear editor and reviewers,

We would like to extend our gratitude for this opportunity to resubmit our manuscript, which has incorporated the suggested revisions, based upon the Associate Editor’s and Review’s comments. We believe these additions have significantly improved our paper. We will respond to each specific issue, as they have been raised.

Associate Editor's report:

1- note on p7, the primary outcome of the trial referenced on p7 ref #42 does specifically focus on prescribing and particularly medication intensification in type 2 diabetes for managing HbA1c.

Author response

The manuscript had stated: ‘In recent years, interventions have been developed with a theoretical approach to address the challenges of T2DM (40, 41). However these theory-driven interventions have not specifically targeted the failure to intensify anti-diabetic medications in poorly controlled T2DM.’

We note that the paper by Presseau et al from Implement Sci. 2014, had the following primary outcome in its protocol: ‘proportion of patients appropriately prescribed and examined (using
anonymised computer records), and advised (using anonymous patient surveys) at 12 months’. The population included all patients with T2DM and did not specifically focus on those with ‘poorly controlled’ diabetes.

Author response

We have modified this section to read:

“In recent years, interventions have been developed with a theoretical approach to address the challenges of T2DM and will test a theory-driven intervention, which will address prescription of additional therapy for the management of HbA1c (40, 41). However no theory-based interventions have specifically targeted the failure to intensify anti-diabetic medications for patients with poorly controlled T2DM.”

2- not sure that BCW is a theoretical model (p10, p22). certainly a framework of factors to consider, but not clear that it is being proposed as a model per se.

Author response

We have changed reference to BCW ‘model’ in our manuscript and changed it to framework, throughout.

3- missing key reviews of trials of diabetes quality improvement interventions, e.g.:

http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(12)60480-2/abstract

Author response

Thank you. We have added the Tricco review to our paper and added the review by Seidu as well. We have added the following text to the Introduction:

“The effectiveness of Quality Improvement (QI) strategies on the management of diabetes (both type 1 and 2) was assessed assessing in a 2013 review (37). Looking at 48 cluster RCTs, it suggested that QI interventions, which intervened at a system level on diabetes management, were associated with the largest benefits in glycaemic control and that the effectiveness of interventions targeting healthcare practitioners varied with baseline glycaemic control; being more effective with patients with worse control (37). A 2016 review, of type 1 or type 2 diabetes in primary care, looked at the effects of Clinician Education, Clinician Reminders, Team Changes, Case Management, Electronic Patient Registry, Telemedicine and Audit and Feedback (31). Including thirty studies, it concluded that multifaceted interventions on multidisciplinary teams were most effective. Interventions targeting family physicians were only effective if computerised feedback on insulin prescribing was provided.”
4 - missing reviews of BCTs that have been included in existing trials of diabetes quality improvement interventions, e.g.:


Author response

We have added this reference and a sentence relating to this in the Introduction of the paper, at the end of a new paragraph:

“The BCW theoretical approach has been applied to systematically develop appropriate polypharmacy interventions (44). Clinicians face competing demands, in terms of both appropriate escalation of medications (addressing clinical inertia) and also de-prescribing. Different behavioural factors are likely to influence whether practitioners are being asked to increase or decrease prescribing which emphasises the need for a tailored intervention development approach. Only one quarter of all possible BCTs have been identified in a sample of trials of diabetes implementation interventions, suggesting there is an opportunity for the development of novel initiatives that incorporate underutilised BCTs (45).”

5- it might help to consider the evidence about theoretical factors predict/are associated with healthcare professionals’ prescribing for hBa1c and how this links to the planned intervention? e.g.


and

https://link.springer.com/article/10.1007/s12160-014-9609-8

Author response

We have added commentary related to this in the Results section under ‘Identifying the evidence base’:

“Influencing prescribing behaviour requires both reflective (motivational and volitional) and impulsive (automatic) approaches (48). Therefore quality improvement interventions should consider both reflective and impulsive approaches to behaviour change (48, 49). It has been shown that prescribing behaviour for anti-hypertensive and anti-diabetic medications follows a dual process, operating sequentially through motivational and volitional processes for blood pressure prescribing, whereas motivation was not mediated through volitional processes for prescribing for glycemic control. The reflective process can be used to programme the impulsive process, thus incorporating behaviour change techniques which help clinicians translate their motivation into action provides an opportunity to improve diabetes care (48). Constructs from social cognitive theory (self-efficacy), learning theory (habit) and action and coping planning
consistently predict prescribing behaviour and should be targeted by quality improvement interventions (49). Promoting mastery experiences using graded tasks can be used to increase self-efficacy such as performing the behaviours in challenging clinical consultations identified by clinicians (49). Habit can be targeted by supporting clinicians to use action planning to promote the formation of if–then associations between patient characteristics and pre-planned responses, and by prompting behavioural rehearsal (49). Coping planning can be targeted by supporting clinicians to engage in problem solving by helping them to identify barriers and supporting them in pre-planning alternatives, when such barriers present themselves (49).”

6- why COMB? why not TDF? or others? please justify the selection of the BCW and COMB. There are a plethora of models and frameworks, and rarely do intervention developers justify their selection. It would help to understand why these specific approaches were used and whether others were considered.

Author response

We have inserted the following section into our Discussion:

‘The BCW framework, incorporating the COM-B model and BCT generation, is a comprehensive, conceptually coherent and practical method of addressing behaviour change in any setting and has also been used successfully to develop appropriate polypharmacy and diabetes interventions (44). As there are significant overlaps between frameworks, by choosing another framework over the BCW, would unlikely lead to a focus on alternative BCTs or alternative intervention functions.”

7- note that 'boxes’ are increasingly not used in this journal; consider reformatting the box into a table

Author response

We have changed Box 1 to Table 2 and changed the name of the other Tables accordingly.

We have also added the following sentence in the Results section:

“A new structured process for managing T2DM in the General Practice setting to approximately 40% of the population, through a Diabetes Cycle of Care was noted to provide an opportunity for GPs address medications for patients (Table 2 outlines access to healthcare in Ireland and the structure of diabetes care).”

8- please add an ‘implications for implementation science’ section in the discussion and consider the wider contributions the approach taken might have for implementation scientists

Author response
We have added a new section entitled ‘Implications for Implementation Science’ research in the discussion.

Reviewer reports:

John Furler

Reviewer #1: This is an excellent paper. My only comment is that I recommend avoiding words like "control" in discussing targets in people with diabetes. So instead of poorly controlled I would use words such as "not achieving target HbA1c" etc. A good resource is found here https://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/f4346fcb-511d-4500-9cd1-8a13068d5260.pdf

Author response

We acknowledge that the phrase ‘control’ can be a problematic linguistic phrase, which can be associated with a moral judgment. Therefore we have added a section to the Discussion, including the reference you provided. This now reads:

“We use the term ‘poorly controlled’ diabetes as this is the term commonly used in the studies we included. However, we recognise that negative linguistic phrases directed at patients can create undesirable effects, especially if the factors affecting a patient’s management are beyond their control (51). As an example, using the phrase ‘poorly controlled’ can lead to a moral judgement about an outcome on behalf of a physician. Whilst physicians will continue to utilise phrases such as ‘poor control’, when glycaemic control is far above a target level, it is important that physicians do not use such terms to criticise or judge a patient, especially when the reasons behind ‘poor control’ are multifaceted, including clinical inertia (7, 8, 51).”

We have left in the phrase ‘poorly controlled’ at times in the paper, as it relates to physicians, as we wanted to highlight that there is a difference between those patients who do not achieve ‘target hBA1c’ (e.g. HbA1c 7%) and those patients with very elevated glycaemic or cardiovascular risk factors (e.g. HbA1c 8.5% or BP > 150/ 95mmol/mol). The phrase is also widely used in the literature. Therefore we kept the phrase ‘poorly controlled’ in our title and abstract- and in certain places in the paper. However by addressing this concept in the Limitations, we hope we have provided an important cautionary note that this phrase should not be directed at patients.

Tim Stokes

Reviewer #2: Overall assessment
This paper describes the development of a theory and evidence-based complex intervention to improve appropriate prescribing and medication intensification in poorly controlled T2 DM in Irish general practice.

The paper addresses an important clinical problem and appropriately uses the MRC Complex Intervention Framework for developing and evaluating a complex intervention. It appropriately uses a theoretical model of behaviour change (The Behaviour Change Wheel).

The paper is essentially a descriptive paper of how the complex intervention was developed. This is appropriate for an Implementation Science audience as its findings will be useful to those working in closely related fields.

Specific comments that require addressing:

1. The Discussion Section

This is incomplete. At present there is only a summary of the findings and a strength and limitations section. There is a need to add sections that address: Comparison with existing literature and Implications for other developers of complex interventions.

Author response

We have added two paragraphs to the Discussion section. ‘Implications for Implementation Science’ will address implications for developers of complex interventions. We have also added a paragraph, providing a comparison with existing literature.

2. Systematic Review

It is noted that the systematic review has not yet been published. Reference 27 is a summary of the review protocol. This needs to be made clear in the paper.

Author response

The paper will be published in the August edition of BMJ Open. The reference for this paper has been updated.

Fabiana Lorcencatto

Reviewer #3: Thank you for the opportunity to review this interesting manuscript, which summarises the development of an intervention targeting improved prescribing and medication intensification for patients with poorly controlled Type 2 diabetes in Irish general practice.
I have no major revisions to propose. Whilst I am enthusiastic about the manuscript and its methodological approach, I have a few comments/suggestions at this stage regarding content that could perhaps be better explained and clarified:

The abstract is clear, and provides a concise and representative summary of the manuscript.

Introduction:

The introduction is equally very clear. It provides a strong clinical rationale for the study, citing relevant literature to highlight the clinical 'problem' to be addressed, and the existing evidence base in this area. The intervention development approach (i.e. MRC guidance, and BCW) is also introduced in sufficient, concise detail for the readership of Implementation Science, who are likely quite familiar with these frameworks.

My only suggestion for the introduction would be that there is perhaps scope to draw on broader literature beyond prescribing for patients with Type 2 diabetes, to better contextualise the present study. For instance, there is a related literature on behavioural factors influencing appropriate polypharmacy in primary care, which can involve both escalating medications but equally decreasing multiple medications. Different factors are likely to influence whether practitioners are being asked to increase or decrease prescribing, emphasising the need for a tailored intervention development approach. For example, elements of the BCW approach (i.e. Theoretical Domains Framework, Behaviour Change Technique Taxonomy) has been applied to systematically develop appropriate polypharmacy interventions (see: Cadogan CA, Ryan C, Francis JJ, Gormley GJ, Passmore P, Kerse N, Hughes CM. Improving appropriate polypharmacy for older people in primary care: selecting components of an evidence-based intervention to target prescribing and dispensing. Implementation Science. 2015 Nov 16;10(1):161.).

Author response

We have added the following paragraph to the Introduction, after the concept of BCW was brought up:

“The BCW theoretical approach has been applied to systematically develop appropriate polypharmacy interventions (44). Clinicians face competing demands, in in terms of both appropriate escalation of medications (addressing clinical inertia) and also de-prescribing. Different behavioural factors are likely to influence whether practitioners are being asked to increase or decrease prescribing which emphases the need for a tailored intervention development approach.”

Aims: The authors provide an over-arching aim, but given the multi-staged methodological approach, it would be helpful to have specific research questions/sub-objectives associated with each stage to enable greater linkage between the study objectives/methods/results for each stage.

Author response
We have changed the Aims to incorporate these suggestions. It now includes the sentence:

“This paper outlines the first stage of the MRC framework, incorporating the sub-objectives of a) identification of the evidence base; b) development of a theory to develop and design the intervention; and c) modelling, simulation and creation of the complex intervention (38).”

Methods

- For stage 1, identifying the evidence base: I am unclear whether the intention of this manuscript is to report the methods/results of the systematic review or whether this will be published separately in further detail or is already published elsewhere? The authors cite the PROSPERO registration, but perhaps could make it clearer in the manuscript that full methodological details and findings of the review are described elsewhere?

Author response

The systematic review is one part of the literature review. The referenced systematic review has now been published and the full reference for this has been updated. We have changed this text to reads as follows:

“A literature review identified existing systematic reviews of complex interventions and quality improvement initiatives targeting diabetes care in community settings. We sought to understand existing evidence for of interventions targeting clinical inertia. We also conducted a systematic review which sought to understand the effectiveness of interventions which specifically targeted patients with poorly controlled T2DM in primary care settings (25).”

- The authors mention and cite 'observational research' on p. 9, line 31 but provide no description of what this research entailed, in turn rendering it difficult to understand its contribution to the present study.

Author response

The observational research and systematic review are a subsection of our overall literature review, which is included in the Introduction and Results. The observational research (on geographical variation of prescribing) is mentioned in the Introduction.

The reference to the observation study in the Introduction reads:

‘Several new classes of anti-diabetic medications have been added to clinical guidelines in the last ten years (3). The availability of multiple new medications and the changing clinical guidelines have created challenges for physicians, in terms of choice and the complexity of decision-making, with many patients requiring two to three anti-glycaemic medications (3, 21). In Ireland, high geographical variation has been recorded for newer agents, suggesting that there is variation in effective T2DM care, possibly through different application of clinical guidelines
Clinical management is further complicated by the changing evidence in relation to treatment targets for risk factor management.’

We have removed reference to observational research later on p9, line 31.

- COM-B behavioural diagnosis form (p. 9 line 53)- could this be described in greater detail or provided as supplementary material?

Author response

The COM-B behavioural diagnosis form is incorporated into Table 3:

‘The COM-B behavioural diagnosis form was utilised as an aid in the GP workshops. Data from this was coded to COM-B functions by the research team (MEM and SMS) (Table 3).’

We also added this sentence to the Methods:

‘The COM-B behavioural diagnosis form was created through gathering wider information including evidence from systematic reviews, randomised controlled trials, workshops, literature reviews and theoretical analysis (42)’

We added this section to the Results:

‘The COM-B behavioural diagnosis form was utilised as an aid in the GP workshops. Data from this was coded to COM-B functions by the research team (MEM and SMS) (Table 3). It was noted that addressing prescribing behaviour can be performed using challenging clinical consultations identified by clinicians, by supporting clinicians to use action planning to promote the formation of if–then associations between patient characteristics and pre-planned responses, and by engaging in problem solving (49). Using a structured discussion, having been presented with the evidence base and sample cases studies, each COM-B component (capability, opportunity and motivation) was discussed in terms of whether target behaviour should be changed and how that could happen.’

- For the workshops, were the stakeholders presented with the findings from the review? And observational research?

Author response

Yes they were and this informed the workshop discussions. This sentence has been inserted into the paper in the Methods section:

‘The results of the literature review, systematic review, observational research and theoretical analysis was presented to the stakeholders to inform their discussion (22, 25).’
- How were findings from the systematic review, observational research and expert workshops triangulated/combined to inform the COM-B behavioural diagnosis? This is a key step but isn't described in sufficient detail on p. 9.

Author response

This is now described in the Methods section:

‘At the first workshop and with the research team the COM-B behavioural diagnosis form was created through gathering wider information including evidence from systematic reviews, randomised controlled trials, workshops, literature reviews and theoretical analysis (42). Using a structured discussion, having been presented with the evidence base and sample cases studies, each COM-B component (capability, opportunity and motivation) was discussed in terms of whether target behaviour should be changed and how that could happen.’

We have also added to Table 3, which provides an overview of the COM-B behavioural diagnosis form. Table 1, which provides an overall summary, links the processes/methods to key findings.

- I found the sequencing in the methods at times confusing. On p. 10 the authors describe each stage of the BCW approach, but it is unclear how this was actually operationalised in the present study? How were the target behaviours defined, how was the COM-B diagnosis conducted to identify the salient influences on the target behaviour? I believe this is likely linked to the content presented on p. 9 but it isn't clear which data is feeding into each stage of the BCW approach.

Author response

We agree that this lacked clarity. We have added the following sections to the Methods:

‘At the first workshop and with the research team the COM-B behavioural diagnosis form was created through gathering wider information including evidence from systematic reviews, randomised controlled trials, workshops, literature reviews and theoretical analysis (42). Using a structured discussion, having been presented with the evidence base and sample cases studies, each COM-B component (capability, opportunity and motivation) was discussed in terms of whether target behaviour should be changed and how that could happen.’

‘At both workshops the nine possible intervention functions were cross-referenced with the relevant COM-B components identified in Stage 1. The study authors (MEM and SMS) then confirmed which intervention functions were relevant. After the interventions were identified, the study authors then used the APEASE criteria (affordability, practicability, effectiveness and cost-effectiveness, acceptability, side effects and equity) to consider the wider social context of the intervention functions. Consideration of the APEASE criteria is recommended as part of the BCW framework.’
We have now added a new Table 1, which summarises both the methods and results for each step in the BCW process. We hope this clarifies the process.

Similarly, stage 2- how were the intervention functions selected? Were the mapping matrices that link intervention functions to COM-B components consulted? The authors mention later in the results on p. 15 that the APEASE criteria were applied, however this is methods content and should thus be described at this stage in the methods section instead.

Author response

We have added to the Methods section to address these comments:

‘At both workshops the nine possible intervention functions were cross-referenced with the relevant COM-B components identified in Stage 1 of the BCW. The study authors (MEM and SMS), using the mapping matrix outlined in the BCW, then confirmed which intervention functions were most pertinent in targeting the core behaviour. After the interventions were identified, the study authors then used the APEASE criteria (affordability, practicability, effectiveness and cost-effectiveness, acceptability, side effects and equity) to consider the wider social context of the intervention functions. Consideration of the APEASE criteria is recommended as part of the BCW framework.’

Stage 3, BCT selection is clearly described.

- Given the complexity of the multi-staged, multi-component approach to intervention development, a diagram/figure illustrating the process, research question and the data contributing to each stage would provide a helpful summary for the reader.

Author response

We agree that this would provide clarity to the reader. On your suggestion, we have added a new table (called Table 1), which is introduced in the Results section, which summarises the development of the intervention across the all the BCW steps focusing on the methods/ processes and the findings in all BCW steps.

Results

- Overall, the results provide a detailed narrative of the overarching findings for each stage/step in the intervention development process. However, at times it reads like a description and/or repetition of the methods section (particularly Step 8, p.16-17). It is also not particularly clear what analyses/data led to each conclusion for each stage. The authors mention that their decisions/findings draw on the literature review, systematic review, observational research, workshops, contextual knowledge of the team etc. However, I think an important and interesting methodological point is how to integrate these different sources, which to prioritise as evidence, to reach a behavioural diagnosis. The structure of Table 1 is helpful, but again, it isn't clear which data contributed to each decision/description in each cell. Could the authors clarify, or
perhaps add adjacent columns with supporting 'evidence' for the decision (e.g. findings from the review, quotes from workshop, etc?)

Author response

As above, we have added a new table (Table 1) providing a graphical overview of the processes and findings involved in each BCW step.

In relation to the COM-B generation, we have added the following sentences to clarify how decisions were reached, using the workshops. We have also updated the COM-B behavioural diagnosis form (formally Table 1, now Table 3), which similarly tries to clarify this:

Methods:

‘At both workshops the nine possible intervention functions were cross-referenced with the relevant COM-B components identified in Stage 1 of the BCW. The study authors (MEM and SMS), using the mapping matrix outlined in the BCW, then confirmed which intervention functions were most pertinent in targeting the core behaviour (42). After the interventions were identified, the study authors then used the APEASE criteria (affordability, practicability, effectiveness and cost-effectiveness, acceptability, side effects and equity) to consider the wider social context of the intervention functions. Consideration of the APEASE criteria is recommended as part of the BCW framework.’

Results:

‘The COM-B behavioural diagnosis form was utilised as an aid in the GP workshops. Data from this was coded to COM-B functions by the research team (MEM and SMS) (Table 3). It was noted that addressing prescribing behaviour can be performed using challenging clinical consultations identified by clinicians, by supporting clinicians to use action planning to promote the formation of if–then associations between patient characteristics and pre-planned responses, and by engaging in problem solving (49). Using a structured discussion, having been presented with the evidence base and sample cases studies, each COM-B component (capability, opportunity and motivation) was discussed in terms of whether target behaviour should be changed and how that could happen.’

A lot of the key findings regarding the resulting intervention development are presented in the supplementary tables. Would it be possible to include a summary table in-text that illustrates the progression from behavioural diagnosis (including relevant findings/evidence that informed the diagnosis) to relevant functions, relevant BCTs and how they are operationalised in the context of the DECIDE intervention? Such as the intervention development tables included in the following papers:


Author response

We have added a new table (Table 1), which summarises the each step of the BCW framework.

Discussion:

The discussion provides a concise summary of the development process for this study. However, it could perhaps benefit from the inclusion of content that might help illustrate the contribution of this study to the literature more broadly. For instance, are there any methodological suggestions, lessons learnt or reflections on using this intervention development approach? This was a complex study involving multiple data sources. Are there any comments to be made regarding research efficiency? Did one data collection approach yield more insight over another etc? This may help increase the relevance and interest of the present study to the readership of Implementation Science, and readers looking to adopt a similar intervention approach.

Author response

We have added the following paragraphs to the Discussion paper:

“Comparison with existing literature”

“Implications for Implementation Science”

We have also added to the Discussion in terms of research efficiency:

“Our study involved a complex process with the intervention being informed by multiple data sources. We used repeated simulations with individual GPs during the modelling phase of the CDSS development, which was essential to retain the identified BCTs, whilst also reducing the complexity of the intervention, ensuring the CDSS was part of workflow, focussed on the core behaviour and provided a rapid response in terms of intensification of medications.”