Author’s response to reviews

Title: Development and testing of indicators to measure coordination of clinical information and management across levels of care

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Author’s response to reviews: see over
Dear Dr Campillo-Artero,

Please find attached the revised version of our paper “A proposal of indicators to measure coordination of clinical information and management across care levels” containing the changes suggested by the reviewers. We would like to thank the reviewers for their comments, which have contributed to improving the manuscript.

In accordance with the instructions received, we have listed all reviewers’ comments with the corresponding modifications in the manuscript, giving a rationale for each change, point by point. The corresponding changes in the manuscript are also highlighted in yellow in the text.

REVIEWER 1

Overall comments

1. The authors only acknowledge one limitation, potential publication bias. This needs to be expanded.

   Following reviewer’s suggestions, the new version acknowledges other limitations apart from potential publication bias.

2. It would also benefit from using the same term consistently rather than synonyms (care coherence vs. care consistency). The manuscript would also benefit from providing operational definitions of key terms such as ‘feasibility’, ‘clinical consistency’, attribute vs. dimension.

   The manuscript has been checked to make the terms consistent and an operational definition has been provided for the key terms.

3. A title that might reflect better: Proposed indicators of coordin… and management across levels and a test of feasibility. The demonstration of feasibility and variability is a huge strength of the study and it would be good to announce it in the title.

   The title has been modified to reflect the content of the study more accurately: “Development and testing of indicators to measure…”

4. It would be important for the authors to acknowledge that they are focusing indicators of the outputs or traces of care coordination rather than on the actions or process of coordination itself. (…) My point is simply that it would be important for the authors to acknowledge that the outputs are only one dimension of coordination, and that the best measurement would be to include various dimensions and perspectives of coordination. This will also allow them to focus on the literature that specifically addresses outputs. This is acknowledged briefly in the conclusion, but it would be beneficial to telegraph this earlier, and then the conclusion will make more sense.

   We agree with the point made by the reviewer and, following her suggestion, we have substituted “process indicators” for “output indicators” and have clarified the focus of the study.

   This set of indicators sits within a wider line of research which shares a single conceptual framework. The indicators allow us to measure the outputs of coordination, but other approaches have allowed us to discover the processes of coordination (by identifying the organizational elements related to coordination) and other intermediate results (coordination and continuity between care levels, from the perspective of professionals and patients respectively, and through qualitative and quantitative methods).

   To further clarify this point in the article, we have improved the description of the conceptual framework of the study, in order to present the analysis of coordination via indicators as one possible approach to the analysis of coordination, and we have returned to the conceptual framework in the discussion in order to better contextualize the scope of indicators.

Introduction
5. Line 133, give a succinct summary of the conceptual framework rather than expecting the reader to looking up. In line 160-163, the authors criticize lack of conceptual frameworks so it is important to better define their own.
We have improved the description of the conceptual framework of the study.

6. Line 156, give specific examples of ‘single attribute or dimension, rather than expecting the reader to look up.
To make the text easier to understand, we have included an example of what a dimension is and what an attribute is in terms of coordination across care levels. These can also all be seen in Figure 1.

7. The study objectives do not really capture the nature of the work that was done. It would be helpful to reformulate them to telegraph the method and expected outcome.
We have improved the description of the objective to better reflect the study conducted. The new version is: “The aim of the study is to develop and test a set of output indicators to comprehensively evaluate clinical coordination across levels of care”

Method
8. It seems to me that there are three phases, not just two. Lit review, expert review, feasibility test.

The study took place in two phases, the first was the development of the set of indicators, which were identified by means of the literature review, then classified according to the conceptual framework by the research team and then selected and adapted with the participation of the expert team. The second phase was the testing of the set of indicators developed. We have improved the introduction of the section and titles of the subsection to facilitate its understanding.

9. It would be improved by: Line 184: name the two types of clinical coordination and four dimensions. Are these the ones uses in the study? If yes, introduce here.
We have introduced the types and dimensions of coordination here; these are also shown in Figure 1.

10. Line 217+ It needs to be much clearer from the beginning that indicators were disease-specific, otherwise the referral to local guidelines doesn’t made sense. The reader is expected to infer this. Later on reference is made to ‘tracer conditions’. This needs to be identified as part of the method (and justified succinctly), naming the specific tracer conditions.
In the methodology we have clarified our selection of the diseases and the reasons why we decided to use them. We have also returned to this topic in the discussion.
One clarification regarding the use of disease-specific indicators: In spite of our initial attempts to develop generic indicators (i.e. not disease-specific), we realised that this approach was not possible, because the standards of coordination on which the indicators must be based have to be precise and be based on what the evidence dictates for the patient. For example, the maximum recommended time that should elapse across a patient being discharged from hospital and a primary care doctor doing a follow-up varies according to the disease. In other cases, such as information transfer indicators, we had to choose a defined population first in order to identify the clinical histories to be reviewed and then interpret the results. For this reason, we chose to adapt most of the indicators to determined diseases. We wish to point out, however, that we selected a wide range of diseases that the expert team considered most appropriate for studying coordination across care levels: diabetes, heart failure, COPD and cancer (lung, breast, bladder and colon).

11. Line 232 – give an example of what is considered ‘when necessary’
We have modified this paragraph in accordance with the above comment.

12. Line 239 – was this really a cross-sectional study? It seems from the method that this was a retrospective review, but the reference period is not given.
There is a lack of unanimous agreement in the literature on the classification of study designs [1]. According to the classification of Argimon et al [2], studies can be described in terms of their time sequence (which would define it as cross-sectional, since the data of each subject essentially represent a moment in time) and from the start of the study in terms of the chronology of events (which would define it as retrospective because the design is subsequent to the events being studied). For this reason we have changed the definition of the design to “a retrospective cross-sectional study”.

13. Line 241-252. Would it be possible to provide descriptive labels for the test ‘areas’ other than 1, 2, 3, and subgroups? Would it be right to characterize these as three sub-systems that represent different types of care integration arrangements? When reading the results it becomes arduous to try to remember the characteristics of the different systems. We have included the names of the study areas, which are demarcated territories of the Catalan health system, in which the functions of financing and purchasing of services (CatSalut) are managed separately from that of provision (the responsibility of various different entities). Provision is divided up on a territorial basis, but the study areas cannot be considered sub-systems within a single system. In one same territorial setting, there may be just one entity that provides primary and secondary care (as in areas 1 and 2) or there may be two different entities (area 3).

14. Line 257. Again, this would have benefited from a previous naming of the tracer conditions. Following the reviewer’s suggestion, we have described the conditions in more detail.

15. Line 263; please define clinical and administrative electronic databases and how they differ from EMRs. By EMRs we mean the clinical histories of the patients; the data they contain are specific to each individual. Clinical and administrative electronic databases, on the other hand, collate the data of patients together. We have explained the difference between the different sources more clearly in the article.

16. Line 267. Justify the margin of error of 0.2. The sample size was calculated to have a sample big enough to firstly evaluate the viability of the indicators and secondly, to illustrate the application of the indicators in three different areas to assess their usefulness in describing clinical coordination across levels of care. Thanks to the reviewer’s comment, we realised that the margin of error was actually 0.15 (not 0.2), which was sufficient to achieve the set objectives. We have corrected this and explained it more clearly in the article.

17. Line 280. I presume this is percentage not rates? The description of the data collected and how it was collected is clear. The analysis is mostly descriptive and straightforward. We agree with the reviewer and have changed “rates” to “percentages”.

Results

18. Line 297: suggest adding ‘lit review’ to the subtitle. We have added the subtitle.

19. Although not a systematic review, it would be helpful to include the prisma selection tree. (discretionary); this may generate efficiencies in reporting of methods and results for this section. We have added an annex to the article with further information on the search strategy, including the full list of search terms and the number of bibliographical references obtained for each one. Furthermore we have increased the information given in Figure 2 (Stages in the development of the set of indicators). We consider that this information, together with the explanation in the first paragraph of the results, is sufficient for the reader to be able to understand the procedure followed for identifying the studies.
20. Line 330 – not clear why ‘accessibility’ is not a separate category? Why is it part of FU?
In the conceptual framework of the study, accessibility between levels is a different dimension from follow-up. However, in order to simplify we decided to join them together in the article. On further consideration we have now opted to keep them as separate dimensions and we have modified this in the article.

21. Line 340, briefly mention on what basis a judgement of ‘quality’ was formed; Likewise, what constitutes ‘duly completed’ (line 344)
We have explained this more clearly.

22. Table 1 is very complete and helpful, and worth the price of admission. However, it is very full of content not that easy to read. Some suggestions: Make sure that table headings are repeated on each page; Organize line table 2 – (possibly two tables) but get rid of the left-hand column; Number the indicators to fit with the classifications in the figure.; Avoid redundancies between cells; Switch the denominator and numerator columns, so that the numerator is understood to be a subset of the denominator (avoid having to repeat information); Name only the source of data in the that column; Some information in the cells is confusing or requires some clarification: E.g first secondary care visits of HF patients. Visit should be singular. What is meant by ‘correctly referred’, sometimes I think the denominator should refer to ‘newly diagnosed patients’ (e.g. with HF). It needs to be carefully gone over by a colleague who is not too close to the study to make sure it is absolutely clear. As a reviewer, I do not have time to do this.
We have taken the reviewer’s suggestions into account and have divided the table in two and modified its content to make it easier to read. We have also revised the content to avoid confusing or incomplete information.

23. Table 2 & 3 are also very interesting. Sometimes difficult to read. Again numbering of indicators would be helpful – make sure the same scheme is used as Table 1.
We have numbered the indicators, using the same scheme as in Table 1.

23. Table 2. Why is the unit of time not provided. If the unit was a category of time, then this should be stated.
We have included the unit of time in the table.

Discussion:
24. Start the discussion with a brief summary of the most salient results.
Following the instructions of the editors of the journal, we have not included a summary here.

25. As a reader who is very familiar with the literature in this area, it seemed that the contextualization of the study in light of other studies would be improved by clarifying its focus on output indicators, being more upfront about the limitation of focusing on mostly disease specific indicators rather than coordination as a whole. The discussion can elaborate on the extent to which these constitute ‘tracer’ conditions, and then the extent to which inference about coordination can be extended to other conditions.
We have improved the discussion, pointing out that the focus of the study, in accordance with the structural framework, is the analysis of the intermediate objectives of the services through the use of output indicators.
As we explained in comment 10, despite initially setting out to develop generic indicators (i.e. not disease-specific), we realised that this approach was not possible, because the standards of coordination on which the indicators must be based have to be precise and be based on what the evidence dictates for the patient. For this reason, we chose to adapt most of the indicators
to determined diseases. We wish to point out, however, that we selected a wide range of diseases that the expert team considered most appropriate for studying coordination across care levels: diabetes, heart failure, COPD and cancer (lung, breast, bladder and colon). The indicators have been formulated in detail so that they can easily be adapted to other diseases, once the corresponding standard of coordination has been identified.

26. The section on limitations needs to be expanded, to address the disease-specific indicators, the application to predominantly hospitalized patients and not really 'levels of care' generally, the focus on outputs and not provider processes or patient experience.

We do not consider adapting the indicators to determined diseases to be a limitation of the study, a point upheld by many scientific studies that support the use of tracer diseases as a useful strategy to identify the strengths and weaknesses of health services [3,4]. The diseases selected fulfill all the defined criteria for a disease to be a good tracer for the performance of services [3]: coordinated care across care levels is needed for optimal disease management; the care that should be provided at each care level is well defined; they are among the most prevalent diseases in the population; diagnoses are well defined; and their epidemiology is well known.

We would also like to point out that the indicators are not directed at the care of hospitalized patients, but rather at coordination across care levels: for example, the coordination of specialist care with primary after being discharged from hospital or the coordination of primary care with specialist care in referrals, so all of these measure clinical coordination across care levels. We have clarified this in the text.

Lastly, we also do not consider that developing a set of indicators to analyze coordination across care levels from the perspective of the health services is a limitation of the study. As we stated in our response to comment 4, the indicators are a useful strategy to measure clinical coordination across care levels from the perspective of the services in a comprehensive way (that is to say, including its two types (information and management) and its dimensions and attributes (Figure 1 of the manuscript)). This does not negate the fact that it is still advisable to complement the indicators with studies which analyse the perspective of health professionals and patients, as is also pointed out in the conceptual framework of the study [5].

27. But the many strengths of the study should equally be acknowledge: the comprehensive process of identification, but most of all the feasibility testing which demonstrates variability even in a small sample.

The strengths of the study are set out in the first part of the discussion. However we have reinforced these, including the aspects pointed out by the reviewer.

28. Finally it would be helpful to have some indicators about the application of the indicators. Are they only applicable to bounded health systems? Can they be assessed from a single hospital? What are the conditions for being able to apply the indicators.

At the end of the discussion section we have described the conditions in which it would be possible to apply the indicators.

REVIEWER 2

Major Compulsory Revisions

1. The authors conflate the term ‘clinical coordination’ (which they define as transfer of clinical and management coordination across care levels) with ‘care coordination’ which has a separate definition and meaning (i.e. it is about care and care management around people’s needs through pro-active care co-ordinators). To overcome this problem the authors need to better state in their background section the limitations in the scope of their thinking (i.e. that they are not looking at care co-ordination as experienced by patients and service users; that they are not looking at care co-ordination by professionals and teams that is undertaken to support people's
needs; that they are not looking at the patient as a partner in the care process who pro-actively co-ordinates care in a co-productive partnership with care professionals) and to then recognise that what they are seeking to examine is only a limited set of aspects of what care co-ordination represents in the wider literature. Hence, the term ‘clinical coordination’ must be used throughout in line with the definition provided in the background.

Firstly, we think there has been some confusion over the terms used in the article, which is due to us having used the terms “care coordination” and “clinical coordination” interchangeably. We have now made the vocabulary consistent throughout the article, referring only to “clinical coordination”. Clinical coordination is defined as “the harmonious connection of the different healthcare services needed to provide care to a patient throughout the care continuum in order to achieve a common objective without conflicts” and is made up of two dimensions: clinical information coordination and clinical management coordination [5].

This set of indicators sits within a wider line of research which shares a single conceptual framework. The indicators allow us to measure the outputs of coordination, but other approaches have allowed us to discover the processes of coordination (by identifying the organizational elements related to coordination) and other intermediate results (coordination and continuity between care levels, from the perspective of professionals and patients respectively, and through qualitative and quantitative methods). To further clarify this point in the article, we have improved the description of the conceptual framework of the study, in order to present the analysis of coordination via indicators as one possible approach to the analysis of coordination, and we have returned to the conceptual framework in the discussion in order to better contextualize the scope of the indicators.

2. As with the above statement, the authors further need to clarify that they are only considering people with single diseases (so not multiple morbidity/needs) and that they are similarly ruling out care coordination in care provided in other settings (e.g. social care or from community volunteers etc).

3. The issues in 1 and 2 need to be addressed as they significantly limit the articles intention to develop ‘comprehensiveness’ measures between levels - it’s really only focusing on specific diseases, so has significant limitations that must be discussed and justified.

Firstly, the majority of the indicators measure clinical coordination across levels of care for specific diseases. This does not mean to say that the data comes from patients with one disease only, since the majority of patients with diabetes, COPD, and heart failure suffer from multiple diseases. Secondly, we acknowledge the importance of coordination between the health system and social care; however this set of indicators is restricted to coordination within the health system (it is the focus of our study) and we do not believe that this constitutes a limitation to the scope of the indicators.

With regard to the use of disease-specific indicators, initially we set out to develop generic indicators (i.e. not disease-specific), however we realised that this approach was not possible, because the standards of coordination on which the indicators must be based have to be precise and be based on what the evidence dictates for the patient. For example, the maximum recommended time that should elapse between a patient being discharged from hospital and a primary care doctor doing a follow-up varies according to the disease. In other cases, such as information transfer indicators, we had to choose a defined population first in order to identify the clinical histories to be reviewed and then interpret the results. For this reason, we chose to adapt most of the indicators to determined diseases. We wish to point out, however, that we selected a wide range of diseases that the expert team considered most appropriate for studying coordination across care levels: diabetes, heart failure, COPD and cancer (lung, breast, bladder and colon). The indicators have been formulated in detail so that they can easily be adapted to other diseases, once the corresponding standard of coordination has been identified.

To make the process clearer, we have explained the selection of the tracer conditions in more detail in the methods section and we have reflected on its implications in the discussion section.

4. The methodology for the literature review is sound, but I would like to see the full list of search terms provided (191-194).
We have added an annex to the article with further information on the search strategy, including the full list of search terms and the number of bibliographical references obtained for each one.

5. Also, paragraph 1 of the 'results' section (294-302) should be moved to the end of the methods section - otherwise the methodological process in identifying the indicators is not provided

Following the instructions of the editors of the journal, we have not moved paragraph 1 of the Results section to the Methods section.

6. I would also like to see here an understanding of the nature of the studies included - my feeling is that they are probably skewed by country (USA?) and by disease condition - so the actual set of evidence comes from a very limited source. In other words, an argument has to be made against the observation that the evidence base itself does not have the depth of information within it through which to legitimately develop a comprehensive set of measures and indicators to judge clinical coordination.

The bibliographic search conducted was exhaustive and was not focused on any specific country or healthcare context. As a result, we identified indicators generated in different countries with different types of health system (for example, USA, Canada, Spain). Moreover, our study was based not only on the literature review but also on the knowledge gained by experts in health services and on a conceptual framework which steered us throughout the process and which defines two types of clinical coordination (clinical information coordination and clinical management coordination). Because of this we were able to identify the aspects of coordination across care levels which are not represented by any indicator in the studies and this was pointed out in the discussion (for example, we were unable to identify or develop an indicator to measure the effective use of information). We have added our reflections on this point in the limitations of the study.

7. Application of indicator set (from line 237) - the purpose of this needs to be better explained. Is it about validating the measures for feasibility of collection? for validation of use? to assess degree of clinical coordination between case sites?, 8. The section line 265-270 is unclear - sample size of what? why the expectation and what does the figure of 0.50 represent? what do you mean by precision? why was a sample size of 42 required - more details here, and again related to what purpose this work was being done (see 5 above), and 9. Data analysis (line 279-285) - unclear what this is measuring

The purpose of the application of the indicators was, firstly, to evaluate the viability of the calculation of the indicators, and secondly, to illustrate the application of the indicators in three different areas to evaluate their usefulness in describing healthcare coordination across care levels. After consulting a statistic, we decided that a margin of error of 0.15 (not 0.20, as the article originally stated) was sufficient to achieve the set objectives, and since we had no previous data on the performance of the study areas, we used the figure of 0.50 because it is the one of greatest uncertainty.

10. results - the literature review and process of selecting indicators is well done, BUT what the authors are left with is a highly incomplete (not comprehensive) set of possibilities as some refer to heart failure, others COPD, others cancer - and by the authors own admission there is no way of effectively knowing whether any effective communication of the information between settings has been achieved - rather, the indicator set gives a partial picture, at best, of the nuances required in clinical coordination. I see this as a hugely significant limitation of the work - whilst the indicators have been developed in a sound scientific manner, what they say to me is that we have significant problems in assessing clinical coordination - both in how clinical information is sent, received and used, and in how management information can support this analysis.

The literature review and the identification of indicators was not limited to specific diseases. The diseases were used to adapt the indicators (see our response to comments 2 and 3). However, as a result of the reviewers’ comments, we have further clarified our explanation of the reasons for which the diseases were chosen and have discussed its implications.
When we refer to the indicators being comprehensive, we mean to say that they measure the two types of coordination across care levels (information and management) and their main dimensions and attributes (Figure 1 of the manuscript). However, none of the indicators measure the use of information (one of the dimensions of clinical information coordination), which could instead be evaluated through other strategies, such as qualitative interviews or surveys of health professionals. We have clarified this in the limitations of the study.

11. Discussion - Linked to what I reflect upon in points 1-3 above, I see this problem of lack of data and information as the major finding of this work - that we really lack the sophistication to measure clinical co-ordination effectively (briefly mentioned in 389-391) but requiring greater elaboration on what this means for health care policy and practice that is investing heavily in systems that ought to improve care coordination to improve care experiences, costs and outcomes. So an agenda to examine weaknesses important

We agree with the reviewer on the need to improve information systems, as we point out in the discussion: “…which points to the need for further improvements in information systems and record-keeping skills before we can systematically measure certain relevant aspects related to clinical management coordination across care levels in these healthcare areas”.

12. I am wondering to what extent there is more information on this that was not reviewed - for example, contained in clinical care pathway developments in these disease areas, may of which will have put key criteria in place on the steps in the care process by different partners. I think this is a missing set of ‘evidence’ since additional information to inform the indicator domains and indicators would have been helpful here

We are not sure that we understand what the reviewer is referring to here, but in the development of the indicators we have taken into account the clinical practice guidelines and protocols of the Catalan health system and of the organizations involved in the study. Furthermore, experts in health services collaborated in the different stages and in the assessment of the indicators.

13. The study overstates its impact and the use of its indicators and it certainly does not represent what is claimed in lines 398-401. Similarly, whilst contributions are indeed made, they are limited to disease specific areas and the full pathways of care are incomplete, so paragraphs 405-417 need reconsideration.

We have described the scope of the indicators more clearly, presenting them as a tool with which to measure the outputs of coordination across care levels, both in the introduction and the discussion. We have also pointed out the possibility of complementing the results with those obtained through studying the perspective of health professionals and patients. We have modified the phrasing of paragraph 405-417.

14. Also, whilst some limitations are portrayed, I am not sure that the claims in line 445-447 can really be substantiated by this research - also it is a bit of stretch to claim what is in lines 451-453 - the conclusions also need a re-think

We have modified the explanation of the implications of having used specific diseases to adapt the indicators and the section on the applicability of the clinical management indicators.

Minor Essential Revisions
15. Line 148/149 - add ‘and policy’

This has been added.

16. Line 153-155 - I would dispute this - there is plenty of evidence in other work that making sensible assessments of care coordination can only be done at an aggregate level because it is not possible to attribute values to the intricate complexities of the care coordination process - see major revision points above
We do not know exactly what the reviewer means by ‘aggregate’. What we mean by this phrase is that when outcomes attributed to coordination are described (such as the percentage of hospital readmissions or avoidable hospital admissions) without describing the outputs (such as the percentage of follow-up visits in primary care after hospital discharge, evidence of communication between the two levels) it is difficult to attribute these outcomes to coordination or to some specific coordination strategy. We think that having explained the conceptual framework and the focus of the study more accurately, we have clarified this aspect in the article.

17. **Line 184-185 - the conceptual framework needs reasserting at this point**

We have added the types and dimensions of clinical coordination.

**Discretionary Revisions**

18. **Line 156-7 - add information here to illustrate point - such as ....**

We have included examples.

19. **Line 158-160 - add information here to illustrate point - such as ....**

We have included examples.

20. **Line 239 - use of the word 'calculation' of indicators (repeated elsewhere) is confusing - perhaps 'generation' or 'development of' is more appropriate**

We have substituted this for “application”, to avoid confusion in the terms used.

**Bibliography**


4. Nolte E, Bain CF, McKee M: Diabetes as a tracer condition in international benchmarking of health systems.