Author's response to reviews

Title: The interRAI Acute Care instrument incorporated in an eHealth system for standardized and web-based geriatric assessment: strengths, weaknesses, opportunities and threats in the acute hospital setting

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Author's response to reviews: see over
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Resubmission of manuscript

Dear Editor,

Please find attached the revised version of the manuscript ‘The interRAI Acute Care instrument incorporated in an eHealth system for standardized and web-based geriatric assessment: strengths, weaknesses, opportunities and threats in the acute hospital setting’

We would like to gratefully thank the reviewers for their comments. We have taken into consideration all comments and have revised the manuscript accordingly.

We hope that we have sufficiently addressed the comments of the reviewers. Thank you for considering this manuscript for publication.

Yours sincerely,

On behalf of all co-authors,
Koen Milisen and Els Devriendt
Point by point letter

Reviewer 1: Jeff Poss

In general, this is an interesting project report that describes an evaluation of a novel pilot implementation of an integrated assessment, focusing on hospital geriatric units. My two chief issues with this draft is i) the lack of separation between the assessment implementation and its utility as a source of information to be exchanged with other clinical settings, and ii) the choice of SWOT analysis as the organizing approach of collecting the findings.

Major compulsory revisions

1. You need to describe the target population – for example, on page 6 you say ‘map a geriatric patient in the hospital’ – was there an age threshold, or were patients on these units based on clinical presentation or some other criteria? Were some patients too ill or unstable to be assessed, and if so how many?

Patients aged 75 years or older and verbally testable who were admitted to one of the participating acute geriatric units or with a geriatric profile according to a geriatric consultation team were included. Patients not speaking the native language, not verbally testable, transferred from another ward, or in very poor health condition (e.g., extreme pain, fatigue, dyspnea, medically unstable) were excluded. A paragraph explaining the target population has been added on page 9. We have unfortunately no exact number of patients that could not participate due to medical conditions.

Method section: Target population: p9:

Patients aged 75 years or older and verbally testable who were admitted to one of the participating acute geriatric units or with a geriatric profile according to a geriatric consultation team were included. Patients not speaking the local native language, not verbally testable, transferred from another ward, or in very poor health condition (e.g., extreme pain, fatigue, dyspnea, medically unstable) were excluded.

2. I have trouble with the SWOT analysis being put forward as a ‘method’, when in fact it’s more of a structure in which to place findings after the fact. What I see here is a year-long pilot that generated evaluative findings as a result of questionnaires, focus groups, and semi-structured interviews –
these are the methods. The SWOT structure would be better applied in a summary discussion section. However, as the paper is written, it’s not clear if the SWOT analysis really represents the results, or whether it’s the authors’ discussion of the results.

The SWOT analysis was used as a method to summarize the findings of the questionnaires, focus groups and semi-structured interviews, and as a consequence does not represent the authors’ discussion of the results. The SWOT analysis was validated by the caregivers who participated in the study. This comment was handled in the method section (evaluation techniques, SWOT-analysis, analysis) on page 9-10.

**Method section: evaluation techniques, SWOT analysis and analysis: p 9-10.**

**Evaluation techniques**

The balanced and detailed opinions of different participants with varying clinical backgrounds, all working in the hospital but playing a different role in the BelRAI-project (coordinator, assessor, …) were evaluated with the following three evaluation techniques: questionnaires, focus groups and interviews. Both the AC assessment and the BelRAI software were evaluated. Interactions with home care organizations and nursing homes were taken into account, based on data transfer from and to the hospital. The evaluation techniques, the healthcare workers who took part in the evaluation and the main topics are summarized in table 1.

**SWOT analysis**

In this study, a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was used to summarize all results of the focus groups, interviews and questionnaires, which was constructed by the researchers reflecting the results of the participants’ opinions. It gives an overview of the feasibility of the interRAI AC instrument and its BelRAI-software in routine clinical hospital practice. The accuracy and correctness of the SWOT analysis was validated by the participating wards by asking the participants to provide feedback on the strengths,
weaknesses, opportunities and threats of the BelRAI-process. Separate SWOT analyses were generated for the interRAI AC instrument and for the BelRAI-software, respectively.

Analysis

For each focus group and interview, a topic list was prepared and additional questions were asked until saturation was reached. The focus groups were all transcribed verbatim and were coded independently by two researchers (ED and NW), themes were identified and the codes were assigned to the themes. These qualitative analyses were done using QRS NVIVO 8.

3. It’s unclear to me how nVivo was used. You need to be more explicit, for example its use for identification of themes.

NVIVO is a software package that is designed for qualitative research supporting the classification, organization and analysis of textual information on the basis of codes and categories. The topic list of the interviews and focus groups were divided into codes per contextual theme and is ordered in a tree diagram. NVIVO was used for the identification of themes in focus groups and interviews. All interviews and focus groups were coded and assigned to themes. The program is used as a function of triangulation from the data of the different sources (e.g. interviews and focus groups). Additionally it makes it possible to check if saturation was reached. We explain this on page 10.

Method section: Analysis: p 10:

For each focus group and interview, a topic list was prepared and additional questions were asked until saturation was reached. The focus groups were all transcribed verbatim and were coded independently by two researchers (ED and NW), themes were identified and the codes were assigned to the themes. These qualitative analyses were done using QRS NVIVO 8.

4. It’s not clear for many points under the SWOT section which come directly from the evaluation comments, and which are the experience of the authors in conducting this pilot.

We agree with the remark of the reviewer but, experiences of the researchers are not included in the results section of this study. All results of the focus groups, interviews
and questionnaires were summarized in the SWOT-analysis, which was constructed by the researchers reflecting the results of the participants' opinions. The accuracy and correctness was validated by the participating wards. We adapted our text in the method section on page 10.

Method section: SWOT-analysis: p10:

In this study, a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was used to summarize all results of the focus groups, interviews and questionnaires, which was constructed by the researchers reflecting the results of the participants' opinions. It gives an overview of the feasibility of the interRAI AC instrument and its BelRAI-software in routine clinical hospital practice. The accuracy and correctness of the SWOT analysis was validated by the participating wards by asking the participants to provide feedback on the strengths, weaknesses, opportunities and threats of the BelRAI-process.

5. P9: that ‘Separate SWOT analyses were generated for the interRAI AC instrument and for the BelRAI-software, respectively’ – if in fact this was done I do not see it reported separately, and I was confused by the organization of the results, expecting this.

We have reported this separately in the SWOT figure to show the reader that both the AC assessment and the software were evaluated. The results of the SWOT analysis were in the results section ordered as a function of importance. We added a few sentences to clarify this reasoning in the method (page 9-10) and the result section (page 12).

Method section: Evaluation techniques: p 9-10:

The balanced and detailed opinions of different participants with varying clinical backgrounds, all working in the hospital but playing a different role in the BelRAI-project (coordinator, assessor, ...) were evaluated with the following three evaluation techniques: questionnaires, focus groups and interviews. Both the AC assessment and the BelRAI software were evaluated. Interactions with home care organizations and nursing homes were taken into account, based on data exchange transfer from and to the hospital. The evaluation
techniques, the healthcare workers who took part in the evaluation and the main topics are summarized in table 1.

**SWOT analysis: p12**

The SWOT analysis for the BelRAI-pilot implementation was reported and summarized separately for the interRAI AC instrument and the BelRAI-software in figure 3. In the result section below, the results were reported according to their importance for practice.

**Minor essential revisions**

6. **P5: CGA** – would normally be an abbreviation for ‘comprehensive geriatric assessment’, but you introduce it as ‘comprehensive assessment instruments’ – you need to be consistent with the acronym or the thing to which it refers.

We thank you for this remark. This was changed on different places in the text. Please see changes in red.

7. **In figure 1, and in the text (page 7)** the term ‘exchange’ is used, however the arrows only flow out from AC – an exchange suggests a 2-way movement. Was it an exchange, and if so please show it as such in the diagram.

The exchange was indeed a 2-way movement. This was adapted accordingly in figure 1. The word exchange was replaced by transfer of data.

8. **It would be helpful in the introduction to talk about the degree of item correspondence between the AC and the other RAI instruments, for example of the 98 how many map directly to HC and LTCF, and of the HC and LTCF items, the proportion that map to AC.**

This is a good suggestion, but very complex to explain in detail. The AC has seven unique items that are not included in the HC en LTCF assessment. The other details of correspondence between the instruments are too complex to explain in this paper. Please see method section page 7-8.

**Method section: instrumentation: p 7-8:**
The system also offers the opportunity to communicate about the patient’s health condition across wards and across care organizations (data transfer). A core set of items has been standardized across all instruments, enabling the uniformity of the assessment and the transfer of data. About 90-95% of the interRAI AC items are identical to those in the interRAI HC and LTCF. The latter instruments both contain substantially more items, up to 300. The items that are unique to the interRAI AC are for example being confined to bed for medical reasons, length of stay at emergency department, etc. Due to the uniform coding system, transfer of information to or from other participating organizations is possible for each older patient included in the BelRAI-system.

9. Ethics: you state that participants provided consent – I don’t see in the results where you report on anyone not consenting, or dropping out. Please add something about this.

We agree that mentioning dropouts and participants not consenting would be appropriate, but unfortunately we were not able to collect this data. The main aim of this study was evaluating the learning process and the implementation process of the instrument and the software. This limitation was added to the discussion section p19.

Discussion section: p19:

A second limitation is the lack of data on the sample size, sample characteristics and patients not consenting or dropping out from the study. The focus of this research project was on the evaluation of the implementation process but not on the representativeness of the sample.

10. It’s not clear what function SPSS was used for – apart from figure 2 which could have been done with a spreadsheet program, I did not find much quantitative material.

SPSS was only used for small part of descriptive analysis of the data form the questionnaire. We want to avoid confusion and removed this sentence from the paper on page 10.
11. Page 9: completing the assessment – not always possible – can you give a summary of this: of the total, how many had complete pre-morbid, admit, re-assess, and discharge assessments?

This numbers were added on page 11.

Result section: Completing the BelRAI-assessment: p 11:

In the three participating hospitals 194, 173 and 43 older persons were assessed, respectively. A complete assessment (preadmission, admission, reassessment and discharge) according to the respondents was not always possible, due to the workload and the fast turnover of patients. All above mentioned older persons received a premorbid and admission assessment, a reassessment was done in only two cases, and 17 older persons did not receive a discharge assessment.

12. Page 10: exchange – would be helpful if the methods described this process more fully, as it’s hard to interpret what the numbers here mean.

This information was added to the part of instrumentation. The word ‘exchange’ was replaced by ‘transfer of data’.

12.1 How do the sites, whether hospital or home care or residential care ‘receive’ the assessments from another site, i.e., are they requested by the receiver, are they ordered by the sender, are they available on request and if so who requests them? Were there situations where it was available but it went unrequested?

This information was added to the method section, part of instrumentation on page 7-8.

Method section: instrumentation: p 7-8:

The system also offers the opportunity to communicate about the patient’s health condition across wards and across care organizations (data transfer). A core set of items has been standardized across all instruments, enabling the uniformity of the assessment and the transfer of data. About 90-95% of the interRAI AC items are identical to those in the interRAI
HC and LTCF. The latter instruments both contain substantially more items, up to 300. The items that are unique to the interRAI AC are for example being confined to bed for medical reasons, length of stay at emergency department, etc. Due to the uniform coding system, transfer of information to or from other participating organizations is possible for each older patient included in the BelRAI-system. All assessments of one patient are grouped and centrally stored in the BelRAI-system. All involved health professionals (within and outside the hospital) with permission to access the software, can consult this history of previous assessment data, on condition the patient has agreed that his or her file can be shared with others involved in his or her care. Both recent and older assessments are saved, and all items of each instrument are accessible. When consulting the record of a specific patient, an overview is given of all assessments labeled with date of the assessment, care setting, name of assessors and person responsible for the record. A previous assessment can be consulted in its entirety or the history of a specific item over different assessments can be checked. A history button on the screen allows the assessor to look at previous assessment dates, assessor’s names, type of instruments and scores. A health summary report of overall functioning and potential problem areas can be generated. This can be used as a transfer document.

12.2 Only 4 assessments were received from home care; out of how many who were home care recipients prior to hospital admission, and of these how many had an HC assessment, and if so, how recent was it? Some context would be helpful here for many of the numbers reported in this section.

Unfortunately we do not have these data.

12.3 For residential care where assessments are repeated quarterly, did the hospital always get the most recent assessment, or was there a history?
All assessments of the patients were saved in a central BelRAI-driver. Caregivers were able to consult the most recent assessment but also the history of assessments. This was added to the method section on page 7-8.

Method section: instrumentation: p 7-8:

The system also offers the opportunity to communicate about the patient’s health condition across wards and across care organizations (data transfer). A core set of items has been standardized across all instruments, enabling the uniformity of the assessment and the transfer of data. About 90-95% of the interRAI AC items are identical to those in the interRAI HC and LTCF. The latter instruments both contain substantially more items, up to 300. The items that are unique to the interRAI AC are for example being confined to bed for medical reasons, length of stay at emergency department, etc. Due to the uniform coding system, transfer of information to or from other participating organizations is possible for each older patient included in the BelRAI-system. All assessments of one patient are grouped and centrally stored in the BelRAI-system. All involved health professionals (within and outside the hospital) with permission to access the software, can consult this history of previous assessment data, on condition the patient has agreed that his or her file can be shared with others involved in his or her care. Both recent and older assessments are saved, and all items of each instrument are accessible. When consulting the record of a specific patient, an overview is given of all assessments labeled with date of the assessment, care setting, name of assessors and person responsible for the record. A previous assessment can be consulted in its entirety or the history of a specific item over different assessments can be checked. A history button on the screen allows the assessor to look at previous assessment dates, assessor’s names, type of instruments and scores. A health summary report of overall functioning and potential problem areas can be generated. This can be used as a transfer document
12.4 Did only those items from HC or LTCF that correspond with the AC assessment items get transferred and/or displayed for use? What about the additional items that have no equivalent in the AC, such as informal care from the HC?

All items of the different instruments (e.g. HC, LTCF and AC) can be consulted by the caregivers of other settings. While filling in the electronic form, the items that are identical across the interRAI instruments can be demanded to show up on the screen reporting an overview of the previous assessment dates, assessor’s names, type of instruments and scores. This was added to the method section on page 7-8.

Method section: instrumentation: p 7-8:

The system also offers the opportunity to communicate about the patient’s health condition across wards and across care organizations (data transfer). A core set of items has been standardized across all instruments, enabling the uniformity of the assessment and the transfer of data. About 90-95% of the interRAI AC items are identical to those in the interRAI HC and LTCF. The latter instruments both contain substantially more items, up to 300. The items that are unique to the interRAI AC are for example being confined to bed for medical reasons, length of stay at emergency department, etc. Due to the uniform coding system, transfer of information to or from other participating organizations is possible for each older patient included in the BelRAI-system. All assessments of one patient are grouped and centrally stored in the BelRAI-system. All involved health professionals (within and outside the hospital) with permission to access the software, can consult this history of previous assessment data, on condition the patient has agreed that his or her file can be shared with others involved in his or her care. Both recent and older assessments are saved, and all items of each instrument are accessible. When consulting the record of a specific patient, an overview is given of all assessments labeled with date of the assessment, care setting, name of assessors and person responsible for the record. A previous assessment can be consulted in its entirety or the history of a specific item over different assessments can be checked. A history button on the screen allows the assessor to look at previous assessment dates,
assessor's names, type of instruments and scores. A health summary report of overall functioning and potential problem areas can be generated. This can be used as a transfer document.

13. I expected to find more description of any technical or operational challenges, for example what to do with incomplete assessments, would they be eligible for transmission? What about detecting logical errors, such as non-agreeing birthdates or sex values? Or perhaps opportunities for clinical insight, such as differentiating CAPs that were newly triggered on the AC versus those already triggered in the previous setting.

Thank you for this valuable comment. These issues are very important as they can highly affect the quality of the patient data. Therefore we addressed this topic in a previous pilot study, performed in 2008 in 9 Belgian hospitals. The results of inconsistencies within the scores of a specific patient, the missing data, and invalid codings were extensively evaluated to underpin the validity based on test content of the (at that time novel) instrument. Based on these results the software was adjusted to improve the data quality. Software improvement, focusing on data quality and usability are ongoing challenges. This was added to the discussion section on page 19. Please see also the reference below (ref 8):


Discussion section: p 19:

Third, technical challenges to deal with incomplete assessments, inconsistencies and invalid codes were not addressed in the current study as these aspects of validity based on test content were extensively evaluated in a previous study (ref toevoegen). These problems were tackled by adjusting the BelRAI software aiming to improve the quality of data.

Discretionary revisions

14. P5: the second paragraph begins with an assertion about first and third generation CGA, but you have not yet introduced what you mean by this – consider restructuring this section such that you introduce the concept of first, second, and third generation CGA, and then talk about the specifics related to this work.
The restructuring was done in the introduction as suggested by the reviewer. Please see introduction section.

15. The same paragraph, consider adding an example of a first, second, or third generation instrument, and tie this to the limitations of both comparisons of measurement, and also of transfer between settings. I believe you need to establish the nature of consistent, valid, and standardized measurement, and then bridge this to electronic transfer. The strength of the interRAI suite is that important things like physical dependency or incontinence are scored the same way – please make this point stronger, possibly using an example.

Examples of the first and second generation instruments were added on page 5. We hope we clarified this by the reorganization of the introduction paragraph and the text added to the methods section, paragraph instrumentation on page 7-8.

Background section: p 5:

Given the evolution of comprehensive geriatric assessment (CGA), three generations of CGA instruments are currently used in practice. First-generation CGA instruments use a collection of individually validated instruments that each focus on a single clinical domain of the patient (e.g. Mini Mental State Examination testing cognition, mini nutritional assessment evaluating nutritional status) The assessment of a specific domain is usually triggered by the ‘impression’ of clinicians. Second-generation geriatric assessment instruments include all geriatric domains, are setting-specific and have been validated in each specific setting (e.g., the Minimum Geriatric Screening Tools).

16. Throughout the paper, and especially early on as early as the bottom of page 5, there is an emphasis on the BelRAI-software as a ‘platform’ – I think the paper would read better if the authors were to more clearly separate the functionality of software used with any assessment system like RAI, and the more advanced features like security and data transfer with multiple instruments and settings. The function of capturing assessment information and producing an assessment report (with scale values, summaries, CAPs, etc.), and saving this information consistently and securely is not a novel or
interesting thing. The novel contribution as I see it is around moving data from setting to setting, capitalizing on the standardized items of the RAI suite, and giving a picture of recent health status using a language already understood. In this paper there is too much attention to the assessment capture and challenges that go with that in a hospital setting, and not enough substantive detail about the other. For example, in the steps described on page 7, the first 4 are not unique to this implementation; only step 5 (with little description to support it) is of great interest.

The software used to transfer the information in a safe way is worldwide novel. A national implementation of a uniform computerized and standardized assessment used by several disciplines is new for Belgium. Before the implementation of RAI all disciplines and organizations used several first generation assessment instruments. We prefer to keep the text because of the novelty for Belgium.

17. Use of the word ‘moment’ as in ‘after each assessment moment’ – consider leaving this word out, or consider ‘date’ or ‘completion’

We deleted the word moment on page 7.

18. Page 7: ‘complexity of the BelRAI-process’ – it isn’t clear at this point what this complexity is composed of – is it in learning/mastering the assessment itself, the software, the security and privacy protocols? Would be helpful to give some idea of the emphasis in the 3 day training, and how much of it would be necessary for any RAI implementation.

More information on the content of the 3-day course was added in this paragraph on page 8.

Method section: procedure: p 8:

Each participant was extensively trained during a 3-day course, including information on the interRAI instruments, the BelRAI-software, the security and privacy measures, and practical exercises on coding, patient cases and hands-on training.

Results on the amount and content of training were added under the paragraph of threats page 16-17.

Result section: threats: p 16-17:
Health professionals underline the importance of ‘practical’ training and exercises with the instrument and the software. Theoretical background about the development of the system was to a large group of participants considered as less important. Two to three days of training in small groups was seen as an appropriate duration.

19. The paper would read better, in my view, if some of the details that are included in the SWOT sections were broken out and brought forward into either the introduction or the methods. For example, the description of the security of Belgian E-health and BELRAI secure access (P12) could be placed earlier, and then the results could focus more clearly on what aspects the qualitative data (or however this was determined, it’s not clear to me) found to be strengths.

We moved the paragraph to the methods section on page 7-8.

**Method section: instrumentation: p 7-8:**

The access to the BelRAI-system is limited. Care professionals get access with their electronic identity card, with which the Belgian E-health systems checks their identity and subsequently, their profession via authentic sources (e.g. an official list that identifies each profession involved). Consequently, a person only gets access to the data of patients if he has a current care relation with the patient and on the condition the patient gave informed consent. The data moreover is encrypted and stored in secured servers. Access to aggregated data, e.g. for research, is only possible with the approval of the privacy commission.

**Reviewer 2: Darryl Wieland**

**Reviewer’s report:**
The authors provide an interesting study of a pilot implementation of the interRAI© Acute Care [AC] instrument on geriatric acute-care wards in three
hospitals in Belgium; the AC implementation is a secure web-based software system (BelRAI-software). The authors’ descriptive and analytic objectives are well described, and their selection of a “Strengths-Weaknesses-Opportunities—Threats” [SWOT] analytic framework of the pilot is useful.

While the authors show that implementation of the platform may have been feasible (at least within the context of the pilot), what comes across—at least to this reviewer—is (a) an uneven or incomplete implementation of interRAI© AC across the geriatrics wards (e.g., lagging collections of ‘preadmission’ and ‘admission’ health status data against prescribed timeframes; the preponderance of completed assessments from one hospital and among a small number of assessors); and (b) little evidence of any uptake of interRAI© AC data by clinicians for clinical management of elderly patients in acute and transitional care. Perhaps this merely reflects inadequacies of the BelRAI platform, or the very early development of reforming clinical decision making and management in acute care to integrate interRAI© AC structures and processes. If the latter, perhaps the rationale for such reforms was not made clear to ward staff and others, particularly the geriatricians, who maintained targeted use of their favored (“first-generation”) assessment tools, and evidently did not much consult the interRAI© scales or client assessment protocols [CAPs]. Or perhaps the basic rationale for the reform of geriatric acute care structures and processes around interRAI© AC is as not well founded as assumed by its developers (see attached file).

I do not see any necessary revisions in this version of the ms. It should be of some interest in the geriatrics world, which seems to be dividing into two "camps" concerning the value of the interRAI enterprise overall and in particular settings.