Author’s response to reviews

Title: Finnish physicians' stress related to information systems keeps increasing: A longitudinal three-wave survey study

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Author’s response to reviews:

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Dear Prof. Jos Aarts,

Enclosed, please find our revised manuscript "Finnish physicians' stress related to information systems keeps increasing: A longitudinal three wave survey study." We highly appreciate reviewers’ valuable comments. We have now revised the manuscript following these comments. We are willing to do additional changes if necessary. All the changes are made with the track changes mode.
A detailed description of the revisions is included on the following pages. We hope that our revised manuscript is now acceptable for publication in BMC Medical Informatics and Decision Making.

With Best Wishes,

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#REVIEWER 1

COMMENT: The manuscript would benefit from editing by a native English speaker, as there are many awkwardly phrased sentences and places where the authors' intended meaning is not clear.
RESPONSE: As suggested, the manuscript is now edited by a native English speaker, and we hope that the language has improved.

COMMENT: In addition, I recommend that the focus of the paper be tighter. The introduction could be shortened considerably. The section on the Finnish context however was quite helpful and should be retained to help the international audience.

RESPONSE: We have shortened the introduction considerably and removed, for example, paragraphs about usability etc. However, as hoped the Finnish context section has remained the same (with some additions that other reviewers suggested).

COMMENT: I suggest that the authors present only their most meaningful data points and associations, rather than what appeared to be all data points, including those for which there was no clear interpretation. For example, the report of the lack of gender differences in the first two waves along with a finding of a gender difference in the third wave feels like distraction rather than meaningful data. This same information was repeated without interpretation or significant added discussion in the Discussion section.

RESPONSE: As suggested, we now focus on important findings and we have removed the unnecessary results and discussion about gender differences and specialization status.

COMMENT: The authors would be wise not to overreach in their conclusions. For example, the statement on p 16, line 17 does not appear to be supported by the data.

RESPONSE: I hope that I got the right sentence, but we have now changed the sentence and it now says:
(page 17) “Our sample included more women, than eligible population and because it was gathered as a random sample in 2006 it also included older physicians, and more specialists than the eligible population in 2015 “

COMMENT: In the conclusion the authors introduce new concepts, such as in lines 40-52. It is best not to introduce new ideas in the conclusion.

RESPONSE: As suggested, we have deleted all these lines

COMMENT: The data may not allow this level of inquiry, but if it does, it would be interesting to explore whether high levels of SRIS in 2006 predict career changes (i.e. from clinical practice to leadership roles, or from public to private practice, or away from on-call responsibilities) in subsequent years.

RESPONSE: This is an interesting topic, and maybe not in the focus of this manuscript, but in the future studies and surveys that we are going to do, we keep this in mind

#Reviewer 2

COMMENT: The authors should examine why those in leadership positions experienced more stress than others. Was it that the leaders were also getting pressure from the other clinicians….in addition to their own stress with using the EHR?
RESPONSE: The reason why leaders got more stress from IS in the last measurement wave is interesting, unfortunately we do not have any variables that would measure pressure coming from other clinicians and subordinates to leaders. This association between leadership position and stress related to IS happened only in the last measurement point, thus perhaps something had happened between years 2010 and 2015 which caused leaders to get more IS-related stress. In separate analyses we found that leaders had higher levels of time pressure at every measurement wave, thus the change in time pressure may not explain the relationship. Other explaining reasons for this, such as pressure from subordinates and colleagues, would be an interesting topic for future research which we keep in mind.

COMMENT: They authors say that the changing system was a source of stress. On the other hand, they also tell us the system may have improved over the time period. So, this is a double-edged sword. It would be helpful to understand this trade off better.

RESPONSE: This sure is a dilemma, on the other hand all new systems and learning how to use them is a source of stress, but on the other hand if the changes are for better they may decrease the stress. This dilemma is discussed further in the revised version of the manuscript for example in these paragraphs:

(from page 14 in discussion) “We showed that primary care physicians had the highest increase of SRIS from 2006 to 2015 and their levels of SRIS were highest in 2015. InsteadIn contrast, hospital physicians had the highest levels in 2006 and 2010, but in 2015 their levels had not increased any more further from 2010 levels. Thus, our results suggest that in hospitals, the negative trend related to IS has levelled out. Previous studies with another sample have shown that in 2010 and in 2014, hospital physicians were most critical about of HIS in Finland [4, 28][5, 7]. Also results from the USA suggest that hospital physicians have worse attitudes about EMRs [32][40]. One reason for the levelling out of SRIS among Finnish hospital physicians might be that there may have happened improvements in usability of the systems used in the hospitals may have been implemented. Moreover, the National information services platform (ePrescription and eArchive) have been implemented between 2010 and 2015, supporting medication management and summary views of patient data. It may also be that changes in the the context of other than information technology (IT) context have levelled out the impact of poor usability of IS in Finnish hospitals. The actual effect of IS on the levelling of SRIS in hospitals calls requires for further examination and it would be important to get obtain more information about which changes in the IS are stressful and which are helpful. This seems to be a
double-edged sword.; On the other hand, changing systems are a source of stress, but on the other hand they may offer improvements and reduce strain.

(page 6, introduction) In addition, the ever-changing new functionalities and systems require constant development of physicians’ skills. In Finland in 2014, only 24% of physicians in health centers and 37% in hospitals experienced that the use of thought that HIS does did not require long orientation and only half of the physicians knew where to give feedback about HIS problems in 2014 [19][29]. Also these ratings had worsened from after the year 2010. Many physicians complain about poor service from the information system vendor, including a lack of training and support for problems [20][30]. However, the IS changes may also be for the bettera positive improvement, which might help to decrease the stress levels related to IS.

COMMENT: The basic question asked is very sloppy - actually terrible -- because it has so many elements. They should have asked their question (pasted below) as three separate questions. Combining them was a very bad idea… and weakens their and our ability to understand the results. …

By combining these 5 (or more) questions into one, they have seriously detracted from the value of the work. A real pity. Nevertheless, the paper has an important message and offers useful insights.

RESPONSE: This question format “How often have you been distracted, worried or stressed about (during the past half-year period)” has been widely used in connection with stress factors such as patient-related stress, time pressure, and problems in team work. All these three distracted, worried and stressed measure basically the same underlying feeling (strain and stressfulness of the item) (at least in Finnish) and are not experienced ambivalent. We have had these questions in our questionnaires over twenty years and respondents have not experienced them difficult or sloppy. You can find previous international peer-review articles with this SRIS variable for example in Kuusio H et al. Health Serv Res 2012, 47:68-85. Aalto AM et al. Eur J Public Health, 24:445-451. Heponiemi T et al. Am J Emerg Med, 33:614-619. In addition, for example following articles have used this question format among many others: Elovainio et al. Res Nurs Health 1996, 19:517-524. Pekkarinen et al. Gerontologist 2004, 44:633-643. Kuusio H et al. Scand J Public Health, 41:405-411. Elovainio M et al. Scand J Soc Med 1998, 26:26-33.
However, because this question is experience as flawed, we have added discussion about this measure to our limitation section and mention this measure as a main limitation of the study.

(page 17) “However, our main key limitation is that our main variable SRIS was a mean of only two items measuring rather many than on many elements. However, this variable showed good reliability (0.84-0.85) and has previously been widely used and associated, for example, with employees’ distress (General Health Questionnaire) and higher levels of on-call duties [34, 35].

#Reviewer 3

COMMENT: My main concerns about the quality of this paper are the narrow basis of the primary outcome measure (only 2 self-reporting questions) and the statistical methods used. The authors use GLM, which assumes a continuous response variable with normal distribution and fixed predictor variables. However, the response variable is the mean of two Likert scales (which cannot be averaged straightforwardly) and the predictor variables are not fixed (at least, not all). An additional clustering procedure was needed to fix them artificially (e.g., specialization status was only considered as (a) always specialized (b) always ongoing (c) other). An alternative statistical approach GLMM (using mixed models) would perhaps suit better, since it needs less assumptions.

RESPONSE: We have added discussion about the fact that our outcome measure consisted only on two items as a main limitation of the study. Fortunately, this measure has previously also been used and always that we have used it has shown good reliability. Previous international peer-review articles with this measure can be found for example in Kuusio H. et al. Health Serv Res 2012, 47:68-85. Aalto. AM et al. Eur J Public Health, 24:445-451. Heponiemi T. et al. Am J Emerg Med, 33:614-619. We decided to use these combined measures about specialization, on-call, time pressure, and leadership position because we thought that it would be more informative to use a measure reflecting cumulative strain coming from for example high time pressure in every measurement wave. However, if they are experienced as too problematic we can also use the original variables from suggested measurement wave (for example 2006?).
“However, our main limitation is that our main variable SRIS was a mean of only two items measuring rather many than on many elements. However, this variable showed good reliability (0.84-0.85) and has previously been widely used and associated, for example, with employees’ distress (General Health Questionnaire) and higher levels of on-call duties [34, 35].”

COMMENT: A substantial number of literature references is in Finnish, which makes it unaccessible for a broader audience.

RESPONSE: As suggested, we have substantially reduced the amount of Finnish references and left only those that cannot be replaced with international references. In the original version we had 12 Finnish references, now in the revised version we have 6 Finnish references.

COMMENT: The background chapter spends several paragraphs on properties of specific information systems (usability, reliability, etc.) that are not part of the study. It would be better to leave them for the discussion chapter.

RESPONSE: as suggested, we have deleted those paragraphs about usability, reliability etc. from our background section and we have made the introduction hopefully more concise.

COMMENT: The Finnish context is not clearly described. What is the value of private healthcare if public healthcare covers everything? Do all physicians in Finland use the same EHR (Kanta)? If Kanta mainly includes medication data, is it a complete EHR?

RESPONSE: We have added more information to our Finnish context section and hope it is more clearly written now. Private healthcare covers about 6% of total healthcare budget, thus it is a rather small portion, mainly used for occupational services and for those with private health insurance (private services are mainly used because of the rather long queues to public services). Kanta is a digital repository (not EHR) which includes electronic prescription, My Kanta pages
for citizens, patient data repository, and pharmaceutical database. We hope that this is now more clearly presented:

(from page 6) “1.1 The Finnish context

The Finnish public health care is mainly financed by taxation, while and the entire population has a right to use public health care services. Municipalities are responsible for providing public these health care services, which which include primary health care and specialized hospital care. In addition, the private health care sector provides health care services and all Finnish residents are covered by the National Health Insurance, which reimburses part of the costs of using also private health services. In addition, the private health care sector provides services falling mainly into two types consists of two main parts: occupational health services, in which employers provide services for their employees (there is no charge for employees) and private surgeries, where the customers themselves purchase a major part of their care or pay for it by using private health insurance policies. Municipalities can also arrange their primary health care by purchasing private health care services. The use of private health care services increased from 2000 to 2009, but though in the last few years, the trend has been declining; in 2013, the private sector represented constituted 5.9 % of the total health expenditure [21]. Some municipalities have outsourced all their entire health centers through open tendering in free-for-all competitions. However, the most of services are still provided by municipalities.

HIS have undergone notable recent reforms recently in Finland, adding to the burden of dealing with novel functionalities and systems. The public sector EHR coverage in Finland has reached 100 % in 2010, while and also almost every private sector provider also uses an EHR system [21][31]. The EHR infrastructure is not uniform, however, though but however the number of trade names has decreased since 2014, there were five different EHR service providers trade names operating in public secondary care and six different trade names in public primary care in use [21]. Moreover, in a move towards integrated patient data services, Finland has launched the national digital repository for electronic patient data, Kanta, targeted to health care service providers, pharmacies, and citizens, which has been deployed in phases throughout Finland during the period 2012–2017. Kanta services include electronic prescription, My Kanta pages for citizens, a patient data repository, and a pharmaceutical database. Joining the Kanta services is mandatory for all public health care providers, while. The private service providers using electronic documentation also have to join the Kanta services. By the end of 2014, all the pharmacies and public service providers with the exception of one had joined the national e-Prescription service [21][31]. At that time, a big large proportion of the private sector providers had also joined, and the national e-Prescription system was almost fully implemented. From the beginning of 2017, ePrescribing electronic means was the only and obligatory way means for prescribing and dispensing medications.”
COMMENT: In the discussion chapter, correlations are made between separate predictors (high time pressure, on-call burden, specialist status) which have not been tested in the study.

RESPONSE: We apologize, but we did not understand to which sentence/sentences this comment refers to, therefore we would like to get a clearer indication where this sentence is so that we could change it.

COMMENT: Table 1 presents demographic data that are not aligned with the way these data are clustered and according to the method section. In this they differ are over the points of time, while for the analysis they are fixed.

RESPONSE: We thought that this kind of table which gives information for all the study years would be more informative, given that the numbers for fixed variables used in the analyses are given in the text (measures section in connection when measure is introduced). However, if reviewer still thinks that it would be better to give this fixed variable information in the table instead of text and not give results for different years, we are more than happy to provide a new table.