Author's response to reviews

Title: Integrated Preoperative Care Pathway - A Study of a Regional Electronic Implementation

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Integrated Preoperative Care Pathway – A Study of a Regional Electronic Implementation

Matt-Mouley Bouamrane and Frances S. Mair

Responses to the Reviewers

Responses to Reviewer 1: Brian Dixon

We would like to thank Brian Dixon for the useful comments he has made on our manuscript and will respond to these in turn.

- “1- Methods: The article does not describe how the key stakeholders interviewed were selected and recruited. Given that the results of the study are so positive, it makes the reader wonder whether the POA nurses were cherry-picked for participation given they were routine users of the eForm. Did the researchers take any steps to ensure balanced participation or responses? A clearer description for why these stakeholders and workshops were targeted would strengthen the methodology.”

Thank you for this useful remark. We now appreciate that we had not provided sufficient information in our previous submission to explain our interview sampling strategy.

We have now added the following information in the methods section:

- Between May 2011 and February 2012, we conducted 6 face-to-face, in-depth, semi-structured interviews and one focus group with stakeholders involved in the preoperative ICP development. Contacts were made with NHS GGC via email in order to identify the key people behind the development and implementation of the electronic preoperative clinical portal. Three main stakeholders were identified and contacted by email. We provided background information on the purpose of this study and suggested arranging a date for an interview. All the three stakeholders approached agreed to take part in an interview. These were:
- **eForm PM:** the NHS GGC electronic patient record programme (EPR) eForm project manager, who led the development of design requirements and technical specifications for the preoperative ICP, (interviewed at Stobhill hospital in August 2011)

- **Anaesthetist CL:** a consultant anaesthetist and preoperative clinical lead at the Gartnavel hospital, who coordinated the consensus process which led to development of the structured clinical content of the preoperative ICP, including the selection of guidelines underpinning the context-dependant, adaptive behaviour of the eForm, (interviewed at Gartnavel General hospital in May 2011)

- **North-GGC POA lead nurse:** the lead nurse for pre-assessment in north NHS GGC, responsible for overseeing and monitoring the PACs at 3 hospital: Gartnavel General hospital, Stobhill hospital and the Glasgow Royal Infirmary. This senior nurse was closely involved in the PCIP review of the NHS GGC PACs and the dissemination of information relating to the programme implementation across the health-board. In addition, she coordinated the eForm user-testing, reporting user requirements and change requests to the eForm development team, (interviewed at Gartnavel General hospital in February 2012)

In addition, to these 3 interviews, we also conducted a case-study at the preoperative clinic at Gartnavel General hospital in Glasgow. This visit was conducted in February 2012 and facilitated by the North-GGC POA lead nurse. On that occasion, we interviewed the lead nurse and 3 out of the 4 nurses who work in the clinic. The nurses were routine users of the preoperative eForm during patient assessment. The fourth member of the POA nursing team could not be interviewed as the time of our visit as she was conducting a patient assessment at the time we concluded our interviews with the other members of the team.”

- **2. Methods:** The article in general refers to ‘we’ yet there is only one author indicated and referred to in the text. Does the work represent independent research by a single qualitative researcher, or was it performed by a team?”

- We have now clarified the matter of authorship and contributions in the “Authors’ contributions” section”. This work was carried out as part of a Scotland Chief Scientist Office (CSO) postdoctoral training fellowship in Health Services research so all the data collection and analysis was performed by one author (Bouamrane), including the writing of this manuscript, under the advice and guidance of the other
(Mair):

‘M-MB and FSM conceptualized the project. M-MB conducted all visits on the site and conducted the semi-structured interviews, focus group, data collection and analysis, performed the literature and internet searches and drafted the original submission of this manuscript. FSM critically reviewed and revised subsequent versions of the manuscript. All authors read and approved the final manuscript.’

- “3. The methods do not describe how audio recordings or transcripts were coded for analysis. There is reference to NPT, but were the categorizations done by multiple individuals or just a single researcher?”

- For qualitative data analysis, we have added the following paragraph in the methods section:

‘The interview transcripts were analysed and coded by one researcher (M-MB). The two co-investigators (MML & FSM) then discussed the coding framework used on the transcripts in “coding clinics” to ensure a consistent approach to coding and the validity and robustness of the proposed coding framework.

This thematic framework was designed on the four key generative mechanisms of NPT: coherence; cognitive participation; collective action and reflexive monitoring.

- Coherence: refers to the work of making a complex intervention hold together and cohere to its context, how people “make sense” or not of the new ways of working.
- Cognitive participation: is the work of engaging and legitimising a complex intervention, exploring whether participants buy into and/or sustain the intervention.
- Collective action: examines how innovations help or hinder professionals in performing various aspects of their work, issues of resource allocation, infrastructure and policy, how workload and training needs are affected and how the new practices affect confidence in the safety or security of new ways of working.
- Reflexive monitoring: is the work of understanding and evaluating a complex intervention in practice, and how individuals or groups come to decide whether the new ways of working are worth sustaining.’

- 4.”...If the latter, it would be good to understand his role in the development and implementation of the eForm system. Qualitative re-
searchers need to be upfront about their personal biases when reporting their findings."

We have absolutely no idea what in the article might have provided the impression that we might have somewhat been involved in the implementation of the POA eForm. If it is because the study findings are broadly positive, then we will here have to respectfully suggest that the reporting bias would be to present negative findings when all the data collection and analysis point towards a successful eHealth implementation. Although it is perhaps the case that many eHealth implementation are unsuccessful, some eHealth implementation are successful indeed and some eHealth systems do work: otherwise, the health system would probably not be able to operate.

Beside, we will further argue that considering our study as just a description of a successful implementation is completely missing the point indeed. Rather, it is a sociotechnical study of the HUGE efforts and resources – both financial and humans – that were allocated over 2 years to ensure that the implementation WAS INDEED successful! The key lessons we present in the article however is not ONLY that the implementation was successful but to identify and analyse the key factors which contributed to this successful implementation.

The roll-out of the POA eForm did not come about by waving a magic wand or top-down wishful thinking (see also on that matter the responses to comments by Patrick Waterson ): it took the relentless efforts of front-line NHS staff and members of the electronic patient record programme to turn the vision into reality. These included: synergies between clinical quality improvement programmes, the eHealth clinical portal programme, the participation of senior NHS consultants in the design of clinical guideline underpinning the preoperative eForm, the active participation of front-line NHS staff in the iterative development, testing and roll-out of the system and the use of a pragmatic technology capable of pulling information from heterogeneous electronic repositories. We believe that our study makes these aspects absolutely clear and thus makes an important contribution to the field of large scale eHealth system implementation.

So just to be absolutely clear on this matter: this work is an entirely independent research study funded by the Scotland Chief Scientist Office (CSO): http://www.cso.scot.nhs.uk/

The CSO mission is to support and promote independent, high quality research aimed at improving the quality and cost-effectiveness of services offered by NHSS-
cotland. Neither investigators had any involvement whatsoever in the design, development and implementation of the preoperative eForm.

We have also now appended the following statement at the end of the article.

**Competing interests**

_The authors declare that there are no conflicts of interests._

1. The article describes how this work fits into the broader knowledge base for standardizing POA processes and data collection. Yet there is no explanation for how this work fits into the broader knowledge base for understanding complex sociotechnical factors in the development and implementation of health information technologies. This is not self-evident in the article itself as the factors described as the key lessons are extremely similar to those described in previous sociotechnical articles. Is this article simply the application of NPT to a health ICT case study, or does it hold more for sociotechnical approaches in health care?

Your are entirely correct in suggesting that our discussion has clearly put this study in the context of standardisation of preoperative information processes through the use of a sophisticated electronic information management and decision support system. Having had the opportunity to participate in the NHS do-once-and-share development of a national preoperative dataset in 2007 as well as the consultation of the National Institute of Clinical Excellence preoperative testing guidelines review (2011 & 2014), we can assure this reviewer that this is no mean feat by any means.

The preoperative eForm deployment in NHS GGC was a substantial and unprecedented undertaking in electronic information integration in the elective surgical patient pathway, not a mundane technological deployment. We are – to the best of our knowledge – unaware of a similar deployment of a unified information system in preoperative assessment, underpinned by context sensitive decision support and clinical guidelines, covering several major hospitals in a health-board with a population of over 1 million people.

Notwithstanding the important contribution that the submission makes in the field of electronic preoperative assessment information systems and elective surgery
integrated care pathway implementation, we have now also expanded the discussion on related work on the sociotechnical systems approach to eHealth implementation in our discussion (see response to the comments made by the second reviewer, Patrick Waterson).

• 5. “The abstract promises “clear” synergies between the policy and technical implementation of the eForms. Yet the Discussion section does not make these synergies clear. The reader must re-read the article a couple times before making all of the connections in the Results section. A more streamlined and cogent synthesis in the Discussion section should help tie together the loose ends making the realization more clear for the reader.”

That is a fair comment as the analysis was previously grouped into the 4 NPT thematic themes of: coherence, cognitive participation, collective action and reflexive monitoring so the synergies between all the components of the implementation was described across the 4 themes instead of being analysed in a holistic manner, which perhaps somewhat occluded the said synergies.

We have now entirely redrafted the discussion and added an additional Figure (5) which we hope now highlights explicitly how the parallel efforts of the planned care improvement programme and the eHealth programme have both contributed to the standardisation of preoperative documentation, guidelines and integrated care pathways which have then allowed the new preoperative clinics developed as part of the PCIP in NHS GGC to operate using the same electronic information system, under coherent clinical processes.

“Our results on the study of the design and deployment of the POA eform in NHS GGC suggest that this electronic health implementation has been broadly successful and that the electronic portal is now embedded in clinical practices. The number of regular users of the system (over 180 nurses and anaesthetists across the health-board) and routine assessment now performed ( over 700 weekly assessment in January 2013) indicate that the use of the POA eForm is now normalised in routine assessment, both for preoperative nurses and anaesthetist consultants. Our study set to identify the factors which facilitated this successful implementation in
order to instruct future large scale eHealth implementation in this sphere. Clear synergies between the parallel efforts of the planned care improvement programme and the eHealth programme have both contributed to the standardisation of pre-operative documentation, guidelines and integrated care pathways which have then allowed the new preoperative clinics developed as part of the PCIP in NHS GGC to operate using the same electronic information system, under coherent clinical processes. These synergies are illustrated in Figure 5.

- to start with, there was an obvious and clearly identified clinical need for streamlining the elective patient pathway across NHS GGC. Prior to the PCIP, preoperative assessment practices across the health-board were fragmented, ad-hoc and inconsistent. Many hospitals had basic and surgical-specific pre-assessment procedures; others, none at all. This situation was indeed not suitable for operating modern and coherent integrated elective surgery pathways across the health-board.

- The impetus for the redesign of elective patient pathways was thus provided by the PCIP. The programme oversaw the rationalisation and streamlining of services and the development of new dedicated preoperative clinics, servicing the whole elective surgery population at a hospital instead of each services operating in silos.

- In addition, the HEAT target for BADS procedure – requiring that all NHS health-boards reached a measurable efficiency target by March 2011 of 80% of BADS procedures as day-cases or outpatients – provided an immediate incentive for NHS health-board and hospital managers to operationalise new POA clinics and elective pathways without delay.

- The NHS GGC electronic patient record programme provided resources to streamline and standardise POA documentation and guidelines across the health-board. In doing so, it not only consulted widely with a range of stakeholders across the health-board, but also ensured that the implementation was clinically-led by a senior anaesthetic consultant in order to lead the POA guideline and protocol standardisation and the system clinical decision support functionalities. Furthermore, the EPR also liaised closely with the POA nursing staff throughout the iterative phases of the POA eForm design, development, testing and implementation [...]”

- 6. “The article is very long, even for qualitative research. Consider whether all of the included quotes are truly necessary for illustrating concepts described in the Results section.”
We appreciate that this is a rather lengthy submission but as we have previously argued this is the study of a complex eHealth intervention. Each section on: the policy context (PCIP, development of preoperative clinic), the eHealth infrastructure context (national document indexing standards, eHealth infrastructure), the development context (clinical leadership, preoperative documentation and guidelines standardisation, decision support functionality requirements, user engagement and testing) and implementation context (Gartnavel case study) are all essential in order to provide an accurate description and analysis of the factors that led to the successful implementation of the POA eForm into routine preoperative practice across the health-board. As for the qualitative data – unless the reviewer can point to specific excerpts that are perceived to being redundant to the analysis – all the participants quotations were carefully selected to support the data analysis and interpretation.

We have already provided additional qualitative data as additional material to the submission. Finally, although the submission appears lengthy using the current document template, the final journal document format would reduce this to approximately half the size (e.g. 15-16 pages) which is perhaps slightly on the longer-end of articles but not unreasonably so.
Responses to Reviewer 2: Patrick Waterson

1. “I found this an interesting and worthwhile paper. In many respects, your conclusions make sense and relate to other studies which have championed a ‘whole systems’ or ‘sociotechnical’ approach to the implementation of eHealth.”

We would like to thank Patrick Waterson for his useful and encouraging comments on our manuscript.

2. “Your sample is quite low – and I think you need to explicitly acknowledge / highlight this as a limitation. One suggestion would be to use some of the quotes from your supplementary files – these might help to strengthen your arguments – e.g., the importance of iterative testing.”

We accept that the interviewees sample was low. However, we did succeed in interviewing three key architects of the implementation (all the key stakeholders approached agreed to participate, as we have now highlighted in the methods section) and 3 out of 4 nurses working at the preoperative clinic of Gartnavel general hospital. In addition, we also held a large focus group at Stobhill hospital and participated in 2 workshops organised by the NHS GGC electronic patient programme, so we did collect a large volume of qualitative data as should be self-evident by the length of the submission, as Brian Dixon has commented upon in his review.

The only way we could have collected additional qualitative data for this study would have been to visit all the preoperative clinics of NHS GGC. The issue with this however is that – as part of the research protocol agreed with the funder, the CSO – this was a national study and one preoperative clinic was to be visited in each of the 14 territorial health-board of Scotland.

See for example:

Bouamrane, M.-M. & Mair, F. A study of Information Management in the Patient Surgical Pathway in NHS Scotland Studies in Health Technology and Informatics. MEDINFO 2013. Proceedings of the 14th World Congress on Medical and Health Informatics, Copenhagen, Denmark. IOS Press., 2013, 192, 557-561
Thus visiting all the preoperative clinics of NHS GGC – although perhaps desirable – would have singled out the health-board for special treatment and have consumed more resources (time, transcription cost) than the project could allow for.

In the course of the national study, we interviewed 25 general practitioners and carried out 45 interviews with members of the preoperative multidisciplinary team and 4 members of NHS IT / eHealth programme. Excluding the GPs, this means that there were 49 interviews with the POA MDT and members of the eHealth programme across Scotland. With an average of 3.5 participants / health-board, and adding data collected as part of the focus group and 2 workshops to the 6 individual interviews, then it is clear that the number of participants in this specific study is well above the national average for our broader study.

We have now added this information to the methods section.

None-the-less, we still do accept that the sample is low and have now added a ‘Study Strength & Limitation’ section in the Discussion:

- ‘Study Strength and limitations: The main study limitation is the small number of participants which we interviewed. However, we also attended a focus group at Stobhill hospitals with members of the POA MDT of NHS GGC and NHS Tayside and members of the EPR programme as well as 2 workshops organised by the EPR programme. We have collected a wealth of qualitative data as should be self-apparent in this study. One of the study strength is that we succeeded in interviewing three of the main key architects of the POA eForm implementation (all prospective participants approached agreed to take part in the study). Another strength is that we interviewed participants who were members or stakeholders of both the Planned Care Improvement programme and Electronic Patient Record / Clinical portal programme. In addition, as part of the case study conducted in Gartnavel General hospital, we interviewed 3 out of the 4 nurses who work at the clinic.

It would be useful in future to conduct a broader survey of a larger sample of users of the POA eForm in order to ascertain perspectives on the usability of the system, match to work practices and how it may have impacted clinical processes and patient care.’

- 3.“A more important point is that I think your paper doesn’t cover some areas of other work on eHealth that are relevant. You mention ‘frag-
mentation’ for example on page 7 – much of the work from sociotechnical systems covers this and has argues that this is a big problem for electronic support for healthcare pathways – have a look at: Eason, K., Dent, M., Waterson, P., Tutt, D., Hurd, P., Thornett, A. (2012) Getting the benefit from electronic patient information that crosses organisational boundaries. Final report. NIHR Service Delivery and Organisation programme.

You mention at the end of the paper that you ‘analysed the sociotechnical factors. It might be worth looking at other work in this area as your ‘story’ is very similar to this work: Waterson, P.E. (2014), Health information technology and sociotechnical systems: a progress report on recent developments within the UK National Health Service (NHS). Applied Ergonomics.

Eason, K.D. and Waterson, P.E. (2013), Fitness for purpose when there are many different purposes: who are electronic patient records for? (Invited paper for special issue on electronic medical records), Health Informatics Journal. ”

Thank you for these useful reference suggestions. In particular, the Applied Ergonomics 2014 article on the 3 case studies from the National Programme for IT. This is of particular interest to us and has been acutely under-reported. The national eHealth strategy pursued in the NHS in Scotland has been fundamentally different from the National programme for IT in England so the diverging policies and implications for implementation is certainly something we would like to further explore in future work.

You may also be interested in some of the other articles we have recently published in the BMC Medical Informatics journal on the implementation of primary care electronic health records in NHSScotland:

Bouamrane, M.-M. & Mair, F. A study of general practitioners’ perspectives on electronic medical records systems in NHSScotland BMC Medical Informatics and Decision Making, 2013, 13

http://www.biomedcentral.com/1472-6947/13/58
and electronic referrals:

Bouamrane, M.-M. & Mair, F. A qualitative evaluation of general practitioners’
views on protocol-driven eReferral in Scotland BMC Medical Informatics and Deci-
sion Making, 2014, 14, 30

http://www.biomedcentral.com/1472-6947/14/30

...and you can also find a general summary of Scotland eHealth strategy here,
although it is slightly dated now and does not include the latest eHealth Strategy
(2011-2017):

Bouamrane, M.-M. & Mair, F. An overview of electronic health systems devel-
opment and integration in Scotland Proceedings of Managing Interoperability and
Complexity in Health Systems, MIXHS’11, 20th ACM Conference on Information
and Knowledge Management, CIKM 2011, Glasgow, United Kingdom, October 24-

As suggested by both reviewers, we have now expanded the discussion on related
work sociotechnical approaches in eHealth evaluation in the discussion, as well as
included the references that you have suggested:

‘A recent study by Bardhan & Thoin on the impact of ICT on the quality of
healthcare delivery highlighted that the usage of healthcare IT solutions could have
a positive impact on clinical processes, compliance to evidence-based guidelines and
quality of care (Bardhan & Thoin, 2013). From the perspectives of sociotechni-
cal systems, it is clear that implementing and embedding new technologies involves
complex processes of change both for health professionals and patients at the local
level and for the organisation of health services (Mair et al., 2012). Maguire has
suggested that for a sociotechnical systems approach to be effective, the following
fundamental considerations are essential: (i) having realistic expectations about the
system development and a grasp of the potential complexity of the tasks that a new
system will require from users, (ii) having realistic expectations about the impact
of the new system on work processes, (iii) allowing for some flexibility of systems
functionalities in order to address preliminary feedback from users, (iv) having a
flexible software environment which allows for some adaptation to users’ needs and
finally, (v) involving users early on, so that they can specify the benefits that they expect from the new system (Maguire, 2014).

Our results suggest that the design and development of the POA eForm met most of those fundamental considerations. Specifically: the early involvement of health professionals and preoperative nurses in the functionalities development and iterative testing phases almost certainly significantly contributed to the successful deployment. As an example, at the other end of the implementation spectrum, the study of 4 EHR implementation case-studies by Eason & Waterson concluded that strategic and management needs often took precedence over front-line staff, who were consulted only once the systems were implemented (Eason & Waterson, 2013). One of the major drawbacks of such a ‘top-down’ approach to implementation was that the information needs of health professionals were often not adequately met, resulting in ad-hoc work-around such as data-entry tasks duplication in a variety of information systems. In a recent analysis of 3 implementation case-studies within the National Programme for Information Technology, (NPfIT), Waterson highlighted the tensions which often existed between the national policy and local clinical priorities (Waterson, 2014). A clear opportunity was missed when the dire needs for electronic solutions (i.e. electronic health records, virtual wards and electronic portals) to support clinical tasks, care coordination and integrated care pathways were ultimately not met, as systems were not perceived to be fit-for-purpose by clinical staff. The lack of interoperability of diverse IT systems within the patient pathways often became an insurmountable issue for integration. Ad-hoc work-around developed as a result of this lack of system integration could be considered to increase the risk of information or decision-related errors and potentially be detrimental to patient safety. In one of the three case studies (Stroke Pathways), the IT support for clinical tasks was fragmented and conflicted to some extent with the community-care team clinical practices (Waterson, 2014). Waterson further suggests that the key lesson to emerge for future eHealth system deployment is that using a sociotechnical systems approach to implementation, including consulting with clinical staff prior to designing eHealth systems in order to capitalise on the potential enthusiasm for new electronic solutions and conducting a thorough mapping of work-flows and task-related roles are among some of the essential requirements to deploying fit-for-purpose eHealth systems. Our study results certainly support these recommendations.'