**Author's response to reviews**

**Title:** Explaining variation in GP referral rates for x-rays for back pain

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**Author's response to reviews:** see over
Dear Professor Mittman

Re: revisions to manuscript: 1325244823876631 “Explaining variation in GP referral rates for X-rays for back pain”

Thank you for the opportunity to revise this manuscript. In what follows we take each point made by the reviewers and present a response to it, making reference to changes in the manuscript where relevant.

We would like to thank both reviewers for their helpful comments, which have made this a better paper. We hope that we have either responded to them adequately or else made the recommended changes to the paper.

Yours sincerely

Rachel Baker
Response to reviewers’ comments:

Reviewer's report 1:

Abstract:
The abstract adequately outlines the paper. The number of interviews should be stated.
The number of interviews has been added to the abstract

Background:
This adequately explains the background to the study and the research questions.
The literature review, however, is out of date and does not cite the more recent work about decision-making in the consultation, not about current policy drivers in the NHS, and in changes affecting primary care in particular (for example Practice-Based Commissioning).
The authors need to separate the literature of acute back pain as a simple biomechanical problem from that of CLBP which is a more complex biopsychosocial problem to be dealt with in the consultation and in the long-term doctor-patient relationship.
We agree that the literature review has become outdated and have updated it accordingly. We have also made the distinction between acute and chronic LBP.
With respect to recent changes in the NHS, however, this study can have little to say. Such changes may indeed have an effect on GPs’ perceptions of the LBP management options available to them. We would argue, however, that many of the themes we identify which distinguish high and low users of x-ray, relate to fundamental issues which are unlikely to be affected by structural changes in the NHS. However we have amended the discussion section of the paper to acknowledge this as a limitation of the study.

Methods:
The data was collected in 2000 – six years ago, and so the usefulness of the data in a rapidly changing NHS context has to be questioned.
We acknowledge the age of the data but, as in the response above, the fundamental themes which emerge in this paper do not for the most part relate to policy-sensitive issues. Most of our findings relate to the reassurance from negative x-rays, respondents’ perceptions of the risk of radiation, the preservation of the doctor-patient relationship and so on. Some GPs did talk about waiting time in secondary care, and GPs in the high group were more pessimistic about the management options available to them. It is a limitation of the study that we cannot say what GPs would say about these issues in the current context. We now acknowledge this limitation in the discussion

The authors do not state how accurate the data – used to identify high and low referrers - from their local hospitals are (my experience is that such data are not at all accurate).
We obtained our referral data from radiology department records. There are no other existing data sources, to our knowledge, against which we could verify the accuracy of these data and we take the reviewer’s point that there may be inaccuracies in these records. However, the sampling procedure we used did not depend on the precise numerical accuracy of data, but rather a very broad rank-ordering of GPs with respect
to their x-ray use. We selected GPs from the top and bottom of this ordered list in order to get a range of views in the sample. The data would have to have been completely wrong - e.g. x-rays referrals consistently attributed to the same wrong GP - in order to critically distort the sample.

The methods section is adequately described, in particular the process of analysis is detailed.

Results:
The results are presented clearly and the presentation of convergent and divergent themes original and interesting. The data is presented in a rather descriptive manner, with little in-depth analysis, for example, around maintaining the doctor-patient relationship (and linking with the literature), or patient-centredness.

Our analysis is indeed relatively descriptive and we have not related it to psychological or behavioural theory. In essence this paper aims to uncover those factors of the decision (to use x-ray in the context of low back pain) which are important to respondents. Subsequent work will draw on these findings to design interventions and attempt to change GP behaviour, or apply these findings to psychological or behavioural theory. However, we regard that as beyond the scope of this paper and it would be false to introduce such an approach post hoc.

At the recommendation of this reviewer we returned to the interview data which relates to the doctor-patient relationship to investigate whether further analysis would be illuminating, however this was not the focus of the interviews and so an in-depth analysis of this issue is not possible. Whilst many respondents mentioned their relationship, knowledge of, and negotiations with patients in the context of LSX and LBP, the issue of interest in this analysis was of the perceived fragility of the patient-doctor relationship for some high users of x-ray.

Discussion:
The discussion adequately summarises the Results section, but it is limited and needs to take account of the current policy drivers in the NHS and the changing face of primary care, particularly with GPs no longer being the sole gate-keeper to investigations such as LSX.

The discussion has been rewritten in the light of reviewers’ comments, in particular it now includes more detail about the limitations of this study.

Reviewer's report 2:

1. While the data is rich, the sample size is quite small. The implications and limitations of this should be addressed in the discussion section of the paper. We consider the sample size to be reasonable for an in-depth qualitative study. We have added to the discussion issues of qualitative sampling and generalisation in the discussion of the limitations of this study.

2. 55 GPs were invited to participate and 29 agreed. If the data is available it would be helpful to reflect on whether there were demographic differences between those GPs who volunteered and those who chose not to participate. Having checked our records, we can confirm that, unfortunately, in only one of the three areas (Teesside) our GP lists included any additional information other than
name and address. The demographic details we list in Table 1 were collected during the interview and were not collected for those who declined to participate. We cannot, therefore, state whether our sample of 29 is demographically different from the 55 who were invited to interview. However, the central sampling strategy was to achieve a balance of high and low referrers. It is common in qualitative research not to seek a sample representative in terms of their demography, but rather to purposively sample those groups or individuals whose views are likely to be illuminating or important with regard to the topic at hand. Frequency of x-ray use was the most important consideration in this study. However as above, we now recognise the potential limitations of a non-representative sample in the discussion.

3. Only a subsample of 5 of the transcripts were double coded. Again the possible implications and limitations of this should be discussed in the discussion section of the paper
Whilst only 5 transcripts were double coded, line-by-line, the analytic process of generating themes and agreeing them was an ongoing process between all three authors during a large number of meetings where transcripts were examined in detail and themes generated through discussion and debate. The double coding of 5 transcripts was part of this process and did not result in significant discrepancies between coders. Had there not been such agreement, further double coding would have been undertaken. It is our view that the coding process was a thorough and complete.

4. The discussion section should be expanded to include the potential limitations of the study (small sample, potentially non representative sample), and the likely implications of this on the conclusions of the study.
This has now been included in the discussion.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)
1. Consider use of 'GPs who' rather than 'GP's that' (eg Page 8)
This has been corrected.

2. The first sentence, second paragraph of the background lists specific 'red flags' as indicators for x-ray. This is not always the case, with the potential to use other forms of imaging than plain x-ray in these circumstances.
This sentence was misleading. This paragraph has been changed to include more detail.

3. There is a typographical error resulting in an incorrect citation number (201 should be 20) page 4
This has been corrected.