Author’s response to reviews

Title: Regional variations in trajectories of long-term readmission rates among patients in England with heart failure

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Response to the reviewers,

We appreciate the evaluation of our paper by the reviewers and have tried our best to amend as suggested by them.

1. Comment: Figure 1 has been included twice, in the manuscript and as an additional file. Please remove the figure from the manuscript. In addition, as Figure is a multi panel figure, parts A and B should be submitted together as a single composite file on 1 page.

This is changed now as suggested and figure 1 is one figure.

2. Comment: In the ethics approval and consent to participate section, please include information on the consent to participate.

This is included in the section now. ‘Ethical approval was obtained through the Health and Social Care Information Centre (HSCIC, UK) while obtaining the access to the pseudonymised patient administrative data. Hence, individual consent to participate from the patients was not required.'
3. Comment: What was the time-frame for frequency of readmissions to be categorised into high, intermediate and low impact users - was it the first year after index HF admission?

The timeframe for frequency of readmissions to be categorised into high, intermediate, and low impact users was based on their annual rate of readmissions. This is clarified in the methods section.

‘For each subgroup within the patient population, the average number of readmissions annually was measured and depicted on the graph. The group showing highest annual readmission rate persistently in the follow up period was termed as high risk group and those with consistently low average readmission rate were classed as low risk group. The group with mediocre annual readmission rate in the follow up period was categorised as intermediate group.’

4. Comment: This reviewer could not understand the basis by which the investigators conclude that quality of primary and secondary health care could have impacted the frequency of readmissions. From table 1 and 3, the regions with higher proportions of short term high impact users had higher prevalence of ischaemic heart disease, risk factors such as diabetes and hypertension and clinical variables indicating advanced disease such as atrial fibrillation. Moreover, the association with indicators of healthcare adequacy is not consistently demonstrated across regions with higher prevalence of both types of high impact users. The association seems more evident in intermediate users.

We agree with the reviewer that there is no significant correlation of high risk readmission groups and quality of care. The main point of discussion that we wanted to illustrate is that there was variation in both patient characteristics and use of healthcare. This is now clearly mentioned in the discussion section.

‘The proportion of high-impact users varied from 4% to 15% by region: the proportion of high-impact users and their annual readmission rate was lower in southern regions. There was large variation in the characteristics of the patients and the use of healthcare resources among different regions. GP visits for all types of HF medication review and prescriptions were lower in Northern, West Midlands and East of England regions. These regions had a higher number of patients with hospital admissions and out-of-hours GP visits preceding the diagnosis of HF. The recent national audit on hospitals in the UK showed marked variation in the discharge outcomes
and in the proportion of patients with HF medication prescription, follow-up imaging, discharge planning and referral to a specialist nurse, cardiologist and cardiac rehabilitation.(21)’

5. Comment: The reviewer was having difficulty in following the discussion section and could not crystallise the ideas discussed out.

The discussion section is amended to improve the flow of the content. The section highlights summary of findings, comparison with previous clinical data, strengths and weaknesses of the study and conclusion.

6. Comment: The objective and overall methodological approach seem reasonable. My main criticism is how death was considered in the analysis: patients who die are probably those with more severe disease earlier and will not count towards rates of readmission. How is that information included in the analysis?

Death was included in the analysis to have a more pragmatic view of the follow up of these patients. Those patients with severe disease earlier on and died as a result of it were those part of short-term high-impact group. These patients had very high readmission rate initially followed by rapid decline the readmissions due to their death. This is now mentioned in the discussion section.

‘The patients who died during the follow up period were included in the study to provide a pragmatic picture of the observational data following heart failure diagnosis. Short-term high impact users had very high readmission rate in the first year following heart failure and then rapid decline in the readmissions. These patients were also shown to have severe cardio-pulmonary past medical history. Hence, the decline in their readmission rate could have been the result of increased mortality among them after first year of diagnosis of heart failure.’

7. Comment: Another important issue is that the regions being considered are large and heterogeneous enough (e.g. London) that any observed differences between regions may not be particularly informative. A more thorough discussion of this issue as a potential limitation needs to be provided.
This issue is addressed in the discussion section as a potential limitation of the study.

‘Fourthly, the regional codes in the CPRD data can only demarcate the country in the broader regions as shown in the study. These regions consist of heterogeneous populations of patients which can present with intra-regional variation in the use of healthcare resources. Further studies are required to investigate differences in healthcare use at a smaller regional distribution and assessing other potentially contributory factors, such as, ethnicity, social support, socio-economic deprivation. This study provides an initial assessment and overview of the differences in the healthcare among regions.’