Reviewer's report

Title: The health services burden of heart failure: an analysis using linked population health data-sets

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Reviewer: Peter Pang

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The authors present the results from large database analyses of heart failure patients in New South Wales, Australia. Their goal was to identify the trajectory of HF patients in terms of risk for admission, re-admission, LOS, and survival and to determine if a ‘typical’ profile might be determined to inform health policy. They contextualize their study further by highlighting an important point: although the epidemiology of heart failure has been studied in both Europe and the United States, the authors suggest further indepth epidemiologic studies of heart failure in Australia are needed. Furthermore, the authors analyze individual patient level data; not aggregated data.

Methods: The authors linked data from hospital discharges with a death registry over a 7 year period.

Statistical Analysis Plan: deferred

Results: They identified 29,161 index admissions. Overall, there was a significant decrease in admissions for heart failure after age standardization. Readmission rates as well as all-cause mortality were very high however.

The paper is well written, with judicious use of tables and figures.

The context is also very important. To improve outcomes requires a thorough understanding of the patient population and baseline event rates. An excellent example of this is clinical trials, where marked differences in outcomes based on geography. In other words, there are significant differences between Eastern Europe, Western Europe, the United States, and South America. This suggests that “heart failure” in one location may not be the same as another. A better understanding of baseline events, as well as factors associated with these outcomes, is important knowledge.

Major issues

No data are presented regarding background medication therapy or device therapy, both of which have proven evidence to improve outcomes. Whether this may or may not have changed the results is likely, but to what extent is difficult to answer. However, some mention of this limitation is required in the limitations section. Furthermore, this knowledge would greatly facilitate initial attempts to improve outcomes. For example, would a program such as get with the
guidelines heart failure (in the United States) be of benefit or not?

The author’s discussion of potential policy changes are timely and important. However, they do not address sufficient choices. Rather there is only one suggestion per highlighted point. Given, that the data does not specifically point towards an intervention (e.g. improve evidence based uptake of CRT), a broader perspective needs to be presented. (e.g. greater adherence to guidelines? Improved research in acute heart failure? Better risk stratification? Improved access to transplant/VAD? Better palliative care?)

Minor issues

Page 4 background, 1st paragraph, 2nd sentence. Although ischemic heart disease is a substantial contributor to heart failure, other etiologies deserve mention. (e.g. Hypertension, valvular disease). In addition, evidence-based therapies for heart failure (e.g. beta blockers, ace inhibitors, aldosterone blockers, device therapies) have also contributed to the improved outcomes and longer survival seen in chronic heart failure.

Page 9, last paragraph. Although the authors do list percentages later in the sentence and manuscript, it would be helpful to have the percentages or proportions immediately after the numbers. For example, what is the percentage that 7415 represents?

Results: depending on the target audience, the authors may want to consider inserting the average length of stay in the United States as well as the average length of stay from the European heart failure surveys (as well as mortality) to put the authors results into additional context. Furthermore, this may help the reader who is not familiar with the Australian health care system. For example, the mean length of stay of 4 days in the US contrasts sharply with what is reported here. Do these differences allow for different opportunities to improve outcomes?

Discussion: Consider adding reference2 which also supports the authors findings.

Page 13, last paragraph, last sentence, length of stay: this last sentence, “this highlights the need to stabilize patients with heart failure before discharge…” is not fully supported by the data presented. While it is possible that the reason for readmission is due to lack of, or limited stability of patients prior to discharge, more data or references are needed to support the statement. It is also possible that the patients are just sick, and those are the ones who come back irrespective of what happens during hospitalization. Another possibility is that patients are not treated well or treated inconsistently when compared to guidelines, and it is this lack of adherence that is contributing to poor outcomes. Or perhaps they were unable to obtain timely follow up. There are other possibilities as well.3 Given the importance of this topic, and the impressive data presented, some other possibilities as to why there’s such a high readmission rate is important to discuss. However, this discussion needs to be broader than what is currently present.
A similar point can be made, for the 1st paragraph at the top of page 15. Why certain patients are readmitted, versus those that are not is unclear. It may be that hospitalization identifies a high-risk subgroup. If that is the case, then chronic disease management, while important for both groups, may need to be tailored differently for those who never get admitted, versus those who are admitted frequently. Although this reviewer agrees that the authors data in general identifies a typical patient, the heterogeneity of the patient population is something that should not be ignored. While general principles may be used, also identifying which patients may benefit most from certain tailored interventions is also important. If the authors want to suggest health policy implications, a broader discussion is needed. One possibility would be to present the data and discussion, but avoid policy suggestions.

Conclusion: this should be strengthened. The authors highlight several key points both from their data and in the discussion. These should be briefly highlighted.

Table 7: Please list all the other confounding factors.


**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I have no conflicts of interests related to this manuscript. However, these are my disclosures over the last 6 years.

• Consultant for: Astellas, Bayer, EKR Therapeutics, J & J, the Medicines Company, Medtronic, Novartis, Otsuka, Palatin Technologies, PDL BioPharma, Pericor Therapeutics, SigmaTau, Solvay Pharmaceuticals, Trevena
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