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Title	Patterns of health care use among a high cost inpatient population: a retrospective observational study
Authors	Paul E. Ronksley, Jennifer A. McKay, Daniel M. Kobewka, Sunita Mulpuru, Alan J. Forster
Reviewer 1	Laura Rosella
Institution	University of Toronto, Dalla Lana School of Public Health
General comments	This is a descriptive study of high-cost individuals admitted to a hospital in Ontario. Direct in-patient was determined using case-costing information and patterns of use were determined using hospital discharge abstracts. Overall the study offers useful information on the breakdown of costs within a hospital and the distribution across cost gradients. Major Comments: 1. Data sources: Please provide additional detail on the quality or quality checks of that data held within the Ottawa Hospital Data Warehouse. Author response: We have added text within the methods section to address data quality. **Specifically, page 5, paragraph 2 now reads: "Extensive assess**ments of data quality were performed during the development of the data warehouse and are executed routinely as new data are included. Quality assurance initiatives to ensure completeness and accuracy of the data are also **conducted regularly."** **2. It's** important to communicate that the top 5% of costs are relative to the ranking within the Ottawa hospital, which is important for generalizing the findings. The authors should specify how the cost distribution may relate to other hospitals in Ontario or Canada. Author response: We agree with the reviewer that it is important to highlight that our findings are specific to the Ottawa Hospital and may differ from other academic institutions within Canada based on patient case mix (among other things). While we could not compare actual cost distributions with other institutions, we did find that the relative cost estimates incurred by the top 5% within the Ottawa Hospital were similar to those observed in recent work by Dr Walter Wodchis using Ontario provincial data from the Institute for Clinical Evaluative Sciences (ICES). We have included a statement within the interpretation section to discuss the generalizability of our findings and how they compare to other Canadian institutions. Page 13, paragraph 2 states: **"Finally, this study was limited to a single Canadian tertiary care setting and may not be** generalizable to other jurisdictions with variations in primary care delivery, capacity to care for patients within the community, and patient case-mix. Despite this limitation, our cost estimates are **similar to those observed in other acute care facilities provincially (33)."** 3. In the literature we have seen that there are quite different utilization patterns for top 1% versus 2-5%. In that sense, the top 5% cut-off is fairly arbitrary. Did the authors conduct any further analysis looking at different gradients of cost? Author response: The reviewer brings up an excellent point regarding the cut-points used to **define "high cost" patient groups. While the 5% cut**-off to define high cost is common to the medical literature, we agree that it is fairly arbitrary and that health care use and subsequent costs may vary among the top 1% versus 2-5%. We did in fact begin our analysis looking at the top 1% but quickly ran i**nto sample size issues when trying to identify "persistently high-cost" individuals** over multiples years of data. As observed in our manuscript, we only identified 236 individuals that were persistently high cost (based on a 5% cost cut-point). These numbers were significantly smaller for the persistently high-cost patients if we had used the top 1% resulting in unstable estimates. Thus, for practical reasons we used the 5% cut-point as reported. 4. The authors are collectively classifying those in the 5-1**00th percentiles as "persistent-low cost";** however, this is a large heterogeneous group for that title. In addition, those in the higher percentiles (for eg top 5-10%) may actually contribute a large cost over a period of time . I would prefer to see them **called "non-high cost users", or a title that does not include "low-cost"** Author response: Thank you for the suggestion. We have modified the terminology for this **heterogeneous group throughout the manuscript. We now use the term "non-high cost" as** opposed **to "persistently low cost".** 5. The summary Elixhauser comorbidity score does not appear to be discriminating across the categories, particularly persistent and episodic cost). What other co-morbidity measures were explore? Did the authors consider more refined measures such as John Hopkins ACGs? Author response: We also found this summary statistic interesting. While the Elixhauser comorbidity score did not discriminate between the persistent and episodic high cost groups, we consciously included both this measure and the individual comorbidities to allow the reader to identify where any underlying differences may be occurring between groups (i.e. persistently high cost patients had higher proportions of comorbid disease for 21 of the 31 conditions outlined in Table 1). Although there are other means of exploring comorbidity as suggested by the reviewer,

	we felt the current methodology was appropriate for this patient population. With respect to the John Hopkins ACG system, we did not have a current license within the Ottawa Hospital to use this methodology. Minor Comments: **1. Instead of 'cost containment' – it would be preferable to use terms like 'cost efficiency' or better** cost management. Costs for high-users are legitimate given their complex health care needs; therefore it may be best to frame this issue as finding efficiencies in the way we deliver care – and related also improving the quality of care. Also, cost containment terminology may lend the impressions that costs are avoidable or the fault of the users. Author response: Thank you for the suggestion. This has been changed within the background **section on page 4, paragraph 2 to read: "It is important to assess hospital spending in this 'high-user' population** to inform cost management strategies". 2. Table 4 needs a more descriptive title as it is hard for the reader to understand both how those probabilities were created and what their interpretation is based without re-reading the text. Author response: We have included a more descriptive **title for Table 4, which reads: "Transition** matrix estimating the average probability of changing cost states within any 1-year period where **rows represent the current cost state and columns represent the future cost state." Similar changes** have been made to Appendix 2 and 3 to improve the clarity of these transition probability tables.
Reviewer 2	Howard Abrams
Institution	University Health Network, General Internal Medicine
General comments	Well researched and executed study further illuminates Geraint Lewis's identification of "regression to the mean" in this group , and gives a more detailed picture of the "high user" group. It is important to continue to educate practitioners and policy makers that it is a relatively small and transient group that generate most health care costs, and that being able to reduce costs depends on both identifying this group prospectively (very difficult) and then targeting cost-effective interventions (not well understood for patients with multiple co-morbidities) that are likely to be highly individualized. Author response: Thank you for your overall comments. We agree that our results highlight this **potential 'regression to the mean" phenomena in addition to the underlying complexity inherent** in the study of high cost p**atient groups. We have highlighted some of the reviewers' comments within our interpretation section. With respect to future research directions, we state: "Whether** interventions can be put in place to reduce hospital spending for medically complex patients, with multiple comorbidities, remains to be determined. Furthermore, it is difficult to determine if the cost of implementing specialized case management programs for a small group of patients with complex medical needs would offset the current costs imposed on the health system, decrease **health care use in other facets of the** health system, and ultimately improve patient outcomes".