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Title	Vascular injury hospitalization trends in Ontario: a population-based study
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Reviewer 1	Daniel Yavin, MD
Institution	Departments of Clinical Neurosciences and Community Health Sciences, University of Calgary
General comments (author response in bold)	<p>An accurate estimation of the rates of hospitalization associated with vascular injury is of interest to both clinicians involved in these patients and policy makers. The authors should therefore be commended for addressing this relevant clinical concern. They have also performed an in-depth descriptive analysis of demographic, economic, and geographic features associated with vascular injury. I therefore recommend the manuscript is accepted for publication in CMAJ Open after the following minor concerns have been addressed:</p> <p>1. The authors report that the mechanism of vascular injury is predominantly due to other causes. The etiologies of these injuries and their incidence in time would be of interest to readers. If available, the etiologies of injuries should be presented in greater detail than simply other causes. Authors' response: See above comment please</p> <p>2. The authors should consider the potential role the advancement and proliferation of non-invasive diagnostic imaging has played in the recognition of vascular injury over their period of study. Improvements and greater availability of CT angiography may have contributed to an underestimation of the decrease of vascular injury in time. Authors' response: We have added this as a limitation in the Discussion section as this information was not collected.</p>
Reviewer 2	Dr. Patrice Nault
Institution	CHVO de Hull, Chirurgie Vasculaire, Gatineau, Quebec
General comments (author response in bold)	<p>A. Statistical Analysis</p> <p>1. This type of study is used mostly to look at the prevalence of disease/event. In this study, they looked at the incidence of the event. To do so, they had to get supplemental population data and adjust for factors like seasonality which led to a lot of supplementary statistical analysis which could have introduced some bias. Even to a seasoned reader of medical literature, it is a lot of work to understand the approach used in this study. Authors' response: The reviewer brings up an interesting issue but that the primary type of bias in this type of study is temporal confounding, which we don't feel to be an issue. These methods have been widely used by this research team and clarity of the methods have not been an issue in the past. If there are any specific suggestions to improve the clarity of the methods it would be appreciated. Otherwise, we will keep the text as is.</p> <p>2. Authors need to be congratulated on the fact that they verified ICD10 coding using direct chart audit in major trauma centers (Can J Surg. 2013;56:4058). But, since study was conducted over two decades, with the changes in hospital coding to ICD9/10 in 2001 2002 and with the diversity of hospitals included in the study (children's hospital, trauma center, community hospital, etc.) it is hard to believe that this context could not have introduced some important bias/poor generalization. Authors' response: I would like to thank you for the comment, the concern was about the ICD10 codes which was started to be used 2001/2002 that was we did the separate validation study (Can J Surg. 2013;56:4058). However, another validation study for ICD9 codes is beyond the scope this current study given these codes been validated and used in multiple studies previously.</p> <p>3. It should be important to address the issue of location of MVA since it correlates directly with the secondary goals of the study which consisted in identifying highrisk population for public health targeted initiatives. Authors' response: In our study, the geographical location was the residential location instead of the location on MVA due to lack of information/coding for that.</p> <p>B. Clinical significance</p> <p>1. Keeping in mind the public health orientation of this article (disease burden), it would pertinent to look at mortality, duration of hospitalization and severity of traumatic injury. Authors' response: We agree with the reviewer that reporting mortality, duration of hospitalization and severity of traumatic injury is valuable information. However, given that the study was a retrospective analysis of databases, reporting these data was out of scope of the study.</p> <p>2. Effectively, we cannot compare major trauma of the thorax from an MVA to a venous cut of the upper extremity in a farmer with only a short hospital stay. We may never be able to prevent trauma of the upper extremity in manual workers in a rural setting or high risk vocation. The authors put too much emphasis on this population (rural) which in fact we should address the fact that MVA cause the most severe arterial OR venous injuries resulting in a higher rate of mortality and morbidity. Authors' response: Emphasis on rural population is based on the finding that while the overall trend in the annual vascular injury-related hospitalization rates in Ontario declined in the urban</p>

population ($p < 0.01$) they remained stable in the rural population ($p = 0.62$). This necessitates attention be directed towards the rural population from a public health perspective. Additionally, it is known that rural areas are more susceptible to motor vehicle accidents than urban areas.²

3. We would have liked for the authors to demonstrate within this study the higher mortality rate and longer hospital stay for a vascular injury in a rural setting as the authors cited on page 13, line 6 (reference 18). Because the authors don't have the data to support this hypothesis, we find that the authors cannot strongly take position on the implications for public health measures using their own data.

Authors' response: **We agree that mortality rate is useful data from a public health measures perspective. Our study provides vital insights into the impact of vascular injuries on public health burden using hospitalization data. We show that while the overall the annual rate of vascular injuries that require hospitalization have declined significantly over the past 2 decades, certain population subgroups exhibit relatively higher rates of vascular injuries – this provides valuable information showing disparity in burden for effective projection of future resources toward these groups. We also provide geographic distribution of rate of vascular injury-related hospitalizations across Ontario that can be utilized for not just emergency preparedness but also influence policy decisions. Yet we believe multiple measures of public health burden, including the broader measures of quality of life, would provide a more accurate assessment of public health burden due to vascular injuries.**

4. During the period covered by the study (1991-2011), there was a significant change in the treatment of thoracic aortic rupture (almost exclusively seen in MVA). TEVAR is now used instead of an open procedure. This is a very important change in the approach to vascular trauma, and probably the most significant (and probably only) change in its management in the last two decades. Since MVA represents a big proportion of vascular traumas, and based on its clinical significance (mortality, morbidity), it is disappointing that the data failed to show this change in practice. From a public health perspective, this data should be looked at.

Authors' response: **There are several factors that govern the mechanism of injuries. For example, injuries due to motor vehicle accidents are known to be disproportionately high in rural areas compared to urban areas.² Given that our study considered population of Ontario, a majority of which resides in urban areas,¹ the incidence of transport-related injuries was relatively lower than non-transport related injuries. Yet it is noteworthy that over time, there was no decline in transport-related injuries. Assessing the treatment protocols for transport related injuries is an interesting avenue and could be looked at in the future studies, preferably using a more suitable population (such as rural) that is more prone to motor vehicle accidents.**

C. Conclusion

This study is well conducted, the first study addressing the epidemiology of vascular trauma in the Ontario province and the authors had access to a great amount of data that they summarized nicely with well-designed figures. But we felt that the scope of this study is very large: it was conducted over a significant period of time which could have led to some bias. Because they did not include the clinically significant factors like mortality, morbidity and duration of hospital stay; its conclusion (the highest incidence of vascular trauma is among young men in rural areas) did not come as a surprise and failed to adequately show the significance for public health policies implementation.

Authors' response: **We again thank the reviewer for commending our work. The reviewer raises some important points around clinical details that were lacking in this study (and mention this in the discussion section) but given the nature of the design we don't believe clinical variables would confound the analysis and conclusions since the analysis is population-based and temporal in nature.**

References

1. Population, urban and rural, by province and territory (Ontario). Ottawa: Statistics Canada; 2011. Available www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo62g-eng.htm (accessed 2015 Dec. 11).
2. Zwerling C, Peek-Asa C, Whitten PS, et al. Fatal motor vehicle crashes in rural and urban areas: decomposing rates into contributing factors. *Inj Prev* 2005;11(1):24-8.