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Title	Informal regionalization of pediatric fracture care in the Greater Toronto Area
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Reviewer 1	Dr. Andrew Dixon
Institution	Department of Pediatrics, University of Alberta, Edmonton, Alta.
General comments (in bold)	<p><b>The paper is generally well written and is an interesting examination of pediatric practice patterns with the Toronto area. Although it is single centre it seems likely to be applicable to other large urban centres within Canada. The methods are appropriate and are clearly reported. While the methodology is sound as far as it goes, I feel the authors have overstated the interpretation of the results in a few places. My comments on specific points are outlined below:</b></p> <p><b>1. In your introduction page 4 Line 21 you indicate that informal regionalization will not result in benefits -it would be useful to elaborate on what benefits you think informal regionalization will not provide. Given the descriptive nature of our study, we have altered this point in our manuscript: "Future work is required to determine whether 'informal regionalization' of uncomplicated pediatric trauma yields benefits ascribed to 'formal regionalization', which include cost savings and improved quality. (9-12)" Please also see our response to the CMAJ Open Editors' Comment 2 above where we point out half of the operative cases in our study occurred after-hours, and wait times for these procedures did not improve. Since we were unable to measure the time elapsed in transfer from outside hospitals, it is likely that wait times have actually worsened with informal regionalization in this case. In prior literature on the topic, controversy exists about whether lower complication rates are related to treatment at academic facilities for pediatric fractures, (1, 5-7) particularly when transfer delays are expected. (8)</b></p> <p><b>2. Page 8 Outcomes-you determined the rates of these presentations at your hospital increased, is there any general injury data or data from other hospitals to support your theory that this is a result of regionalization?</b>  Agreed. A significant addition to the manuscript is the inclusion of population based data between 2002-2015 of the total annual number of paediatric supracondylar humerus (SCH) fracture operations conducted at SickKids, other specialized paediatric centres, and all community hospitals in Ontario. This data was obtained in collaboration with the Institute for Clinical Evaluative Sciences (ICES) and was derived from a previously existing cohort at the Institute. (1) Using this data, we found that for every 100 SCH cases in 2002, 11 were treated at SickKids, 36 at other paediatric centres, and 53 in the community. For every 100 SCH cases by 2015, 40 were treated at SickKids, 35 at other paediatric centres, and 25 in the community (please see our new Figure 3 and the Supplementary Appendix). These new data, in addition to our previous adjustments based on population changes, provide further evidence of informal regionalization. Interestingly, we only observed informal regionalization occurring within the GTA, and not elsewhere in the Province (i.e. to the other specialized paediatric centres).</p> <p><b>3. Page 10 Section B-costs-you indicated high costs for patients not living within the Toronto Central LHIN. Is it the mandate of SickKids to provide care within its LHIN or to provide pediatric care to a broader area? The mandate may make a difference as to how funding is provided and what the expectations of the province are regarding costs.</b>  We have removed the costing analysis from the manuscript. Please see our response to the CMAJ OPEN Editors' Comment 3 for further explanation.  Although there is no available government mandate, guidance can be obtained from The Hospital for Sick Children Strategic Plan 2015-2020, signed by both the SickKids CEO and Chairman of the SickKids Board. (13) Indeed, the trends observed in this study may influence the hospital's ability to meet its mandate of caring for highly specialized, complex patient needs. In other words, under the current system of healthcare funding in Ontario, informal regionalization risks SickKids spending a portion of their budget on patients that could have received appropriate care in the community hospital, which takes away funds from complex care patients that have no hospital alternative to SickKids. This is particularly true in the absence of a dedicated paediatric trauma program and if general orthopedists and anesthesiologists are being trained to treat patients with paediatric fractures.</p> <ol style="list-style-type: none"> <li>" SickKids has a vital role to play in this network (health care system), caring for highly specialized, complex patient needs." (Page 5)</li> <li>" Our ability to sustain our focus on the most advanced care depends on other health care needs being met by other highly capable providers." (Page 5)</li> <li>Larger academic hospitals are also partnering with community hospitals and providers to ensure patients receive care in appropriate settings, closer to home, which allows the academic hospitals to focus more on care for those with the most severe and complex needs. (Page 16)</li> <li>" SickKids has a vital role to play in our health care system—caring for highly specialized, complex patient needs." (Page 19)</li> <li>" Our ability to sustain our focus on the most advanced care depends on other health care needs being met by other highly capable providers." (Page 19)</li> </ol> <p><b>4. Implications Page 10 Lines 34-41-I do not think you can comment on the need for a competent pediatric surgical workforce in the community without any documentation on how many of these procedures they are performing.</b>  We have removed lines 34-41 from the manuscript and have re-written this discussion paragraph.</p> <p><b>5. Lines 44-56 If other hospitals not treating these injuries is the primary source of increased numbers at SickKids, why did the percentage of patients transferred from other hospitals not increase over the course of the study-i.e. If there are hypothetically 300 supracondylar fractures in Toronto and in 2011 SK sees 100 and the rest are dealt with elsewhere, when in 2014 SK's sees 150 those extra 50 would be transferred in and the percent of transferred patients would increase, but it didn't. I am interested in the explanation of this finding? The simplest explanation would be that there were just more fractures in Toronto over the study - however I accept this may not be the case? What I disagree with is that the authors can attribute the increase to practice pattern changes at community hospitals-at least without further data.</b></p>

	<p>Please see our response to the above comment (#2). A point of clarification is that we found increases in both direct presentations and transfers to the hospital. This would not which change the proportion of transfers to the hospital over time. Based on the new data obtained, the proportion of cases treated at SickKids (likely again by both direct presentation and transfer) did increase during the study period.</p> <p>6. Line 49-51-Do we know that informal regionalization does not confer similar benefits to formal regionalization? We cannot be certain. Please see our response to the above comments (#1 and 3) as well as CMAJ OPEN Editors' Comment 2.</p> <p>7. Line 51-56-This sentence is quite unclearly worded. Again I am not clear what the clinical care/funding mandate for SickKids is, this would be relevant to this assertion around costs Please see our response to the CMAJ OPEN Editors' comment 3 above.</p>
Reviewer 2	Dr. James P. Waddell
Institution	Department of , Orthopaedic Surgery, St. Michael's Hospital, Toronto, Ont.
General comments (in bold)	<p>This manuscript looks at the change in practice patterns at a large paediatric hospital regarding isolated orthopaedic trauma. Supracondylar fractures of the humerus and femoral fractures were the two fracture types selected since they are the two fracture types most requiring surgical fixation in the paediatric population. The authors have found that there has been a steady increase in the number of patients referred to their hospital for care over the past eight years. The reasons for this increase in referral have not been clearly defined or determined by the authors but they have postulated a number of potential reasons some of which are controversial in the opinion of this reviewer.</p> <p>1. First and foremost to promote yourself as a tertiary or quaternary level of care hospital and then complain that more patients are being sent to your hospital seems rather self-serving. The hospital in question is a Level 1 Trauma Centre, the only paediatric Level 1 Trauma Centre in Southern Ontario, and might be expected to receive a number of patients with complex orthopaedic injuries as well as other injuries. The authors have tried to eliminate these patients by referring to uncomplicated fractures. The definition of uncomplicated is not well outlined in the manuscript. It would appear from my reading of the manuscript that a significant number of these patients did have a listed comorbidity according to their admission sheets at the paediatric hospital and this might be one of the reasons for their transfer. Please see our response to CMAJ OPEN Editors' Comment 2 above. We found increases in patients presenting (a) directly and (b) by transfer from another hospital. Greater than 90% of patients in the final cohort were classified as ASA 1 and less than 0.5% of SCH patients required vascular repair (see Tables 1a). Regression modeling also removed the influence of whether these potential reasons for referral, among others, would have changed over time and been responsible for the increases in rates we observed. They were not. Furthermore, rates increased significantly in subgroup analysis restricted to Gartland II SCH fractures and femur fracture patients requiring spica casting. While comorbidity and injury severity may have been a reason for transfer in some cases, it was not the reason for the increasing number of cases received over time.</p> <p>2. The authors make a number of suppositions as to the reason for transfer including lack of availability of appropriately trained orthopaedic surgeons at the referring hospital; a reluctance of orthopaedic surgeons at the referring hospital to take on these cases regardless of their training or the refusal of the hospital to treat these patients. These are all suppositions none of which are proven in the manuscript. This point is well-taken. Ours is a descriptive study and we are not sure as to why these transfers are occurring. We suggest future work in this area is required and have mentioned this in the updated manuscript: 'Future work is required to elucidate reasons for these transfers.' The following supposition has also been removed: 'Although we cannot know whether the indication to transfer patients for definitive treatment was due to the technical difficulty of these cases, our clinical experience is that the indication for referrals our hospital in the vast majority of cases is primarily logistical; that some surgeons and/or hospitals have decided not to treat any patients with these injuries.'</p> <p>3. It is disturbing to me that the authors have suggested that it is ethically improper to train orthopaedic residents in paediatric surgical procedures if these procedures are not going to be practiced by surgeons in the community. I find this almost impossible to comprehend given the general orthopaedic training encompasses paediatric and adult orthopaedic surgery and those people currently practicing paediatric surgery were trained to do procedures on adult patients during their residency. Are the authors seriously suggesting that people entering their first year of training should make a decision list of what they are going to do as a subspecialist and train only in that area? Someone who thinks he wants to be a hip or knee surgeon does only hip or knee procedures for four or five years? What sort of exam would they write? These points are well-taken. We have re-written this discussion paragraph and removed this argument.</p> <p>5. There is considerable discomfort around the cost to the receiving hospital for treating these patients – funding that comes from the global budget of the hospital I think that there is a cost to be borne for treating patients in Ontario through the current funding mechanism for most hospitals and while the authors suggest that a QBP funding model (this should be explained in the manuscript in order to make it more readable for the general medical audience not working in Ontario) might address some of these issues it may well not change the current practice of referral to the hospital in question but only ameliorate some of the financial burden currently experienced by the receiving hospital. We have removed the costing analysis from the manuscript. Please see our response to the CMAJ Open Editors' Comment 3 above.</p> <p>6. In general I like this paper. It points out that informal regionalization does occur and using these paediatric fractures as a nice example of how that works. There are pros and cons to this type of regionalization obviously and the authors have focused primarily on the cons – I'm sure there must be some pros as well perhaps in terms of patient outcomes or fulfilling of parental requests that the child be</p>

	<p><b>transferred to the "specialist hospital".</b> These are not addressed in the manuscript. Agreed. We have tried to balance the tone of the updated manuscript: "Future work is required to determine whether 'informal regionalization' of uncomplicated paediatric trauma yields benefits ascribed to 'formal regionalization', which include cost savings and improved quality. (9-12)" We have also added the following point: 'Significant increases in direct presentations of SCH cases were also observed, which may reflect parental preference for treatment at a dedicated paediatric centre.'</p> <p>Please also see our response to the CMAJ Open Editors' Comment 2 above where we point out half of the operative cases in our study occurred after-hours, and wait times for these procedures did not improve during the study period. Since we were unable to measure the time elapsed in transfer from outside hospitals, it is likely that wait times have actually worsened with informal regionalization in this case. Also, In prior literature on the topic, controversy exists about whether lower complication rates are related to treatment at academic facilities for pediatric fractures, (1, 5-7) particularly when transfer delays are expected. (8) For these reasons we have suggested that future work is required in these areas, as ours is a descriptive study.</p> <p><b>7. I think rewriting the manuscript, removing some of the more judgmental comments, getting rid of the unnecessary comments regarding surgical training and putting a little more balanced argument in favour of formal regionalization would make it publishable and of great interest to the readership.</b></p>
Reviewer 3	Saad Shakeel (MPH)
Title	Health care policy_researcher
General comments (in bold)	<p><b>1. Pincus et al. examined trends towards informal regionalization of uncomplicated paediatric fracture care in the Greater Toronto Area (2008-14). The manuscript addresses an important issue as it provides further evidence of informal regionalization of surgical care across the country. Similar trends have also been observed for cancer surgeries in recent years across Canada. The strengths of this study lie in considerably large number of patients; detailed chart extraction of relevant information as opposed to relying on administrative data; appropriate methodology; and sophisticated statistical analyses. However, few clarifications are proposed in order to provide the readers with a holistic view of the findings.</b> Thank you very much for these comments and for the reference, which we have included above and in the updated manuscript.</p> <p><b>2. Did the authors use a standard definition to determine 'complicated' fractures or was it derived based on their clinical understanding of the relevant fractures?</b> Please see our response to the CMAJ Open Editors' Comment 2 above.</p> <p><b>3. Are there any diagnosis/procedure codes available for the two uncomplicated fractures included in the study? If yes, it might be beneficial to provide a list of codes that could be used in any future investigations covering these two types of fractures.</b> As mentioned in the manuscript: "Consecutive patients admitted to the hospital and requiring operative intervention for a SCH or femur fracture between April 1, 2008 and March 31, 2015 were identified using the hospital's <i>Surgical Information System</i> database (SIS 4.7.10a, Surgical Information Systems LLC). (14) The beginning of the study period was chosen on the basis of when recording detailed data regarding every surgical case became routine." Thus, diagnoses in this study were based responsible surgeon's diagnosis written on the booking slip for each operation. The SCH fracture diagnostic and procedure codes used to obtain the supplementary population based data in the updated manuscript have been published previously in the Supplementary Appendix of the referenced study. (1)</p> <p><b>4. Can the authors elaborate on why patients residing outside of GTA were excluded? Or any possible speculation of how this might have impacted the study results. For instance, SickKids being one of the 3 children's' hospitals in Ontario may also be receiving more and more referrals from the nearby LHINS outside of the GTA for this age group.</b> Agreed. We did observe similar trends for patients in certain LHINs outside the GTA. However, the small absolute number of these patients (approximately 10% of all patients, distributed between LHINs 1, 2, 3, 4, 10, 11, 12, 13) may have been identifiable, infringing on the privacy requirements of our ethics approval to conduct this study. In response to this comment we have updated the manuscript: 'patients residing outside these regions were excluded due to their low number.' As we mention in the updated manuscript, different from what we observed for paediatric fracture care was that informal regionalization of cancer surgery occurred quite uniformly across Canada. In contrast, the annual rate of SCH cases remained stable at specialized paediatric centres other than SickKids (IRR = 1.008, 95% CI = 0.992-1.024, p&lt;0.3561, Figure 3). In other words, we only observed informal regionalization occurring within the GTA, and not elsewhere in the Province (i.e. to the other specialized paediatric centres).</p> <p><b>5. It is a bit unclear in the methodology section if the cost presented in this manuscript correspond to fiscal year (FY) 2014 (page 5, lines 16-18). It becomes clear in the results and discussion sections that the cost corresponds to FY 2014. Further concerns about cost are presented below.</b> We have removed the costing analysis from the manuscript. Please see our response to the CMAJ Open Editors' Comment 3 above.</p> <p><b>6. The only recommendation in this section is a brief description of Figure 2, as mentioned in 'Patient location of residence' section (page 9, lines 3-5). For instance, a majority of the patients resided in LHIN 7 for both types of the fracture.</b> The following is added: 'Patients for both fracture types presented from each LHIN within the GTA; the majority being from the Central Toronto region (LHIN 7).'</p> <p><b>7. Can the authors speculate on the findings that an increase in adjusted femur fracture rates was observed for transferred patients? Whereas the rate increased for transferred patients and those who presented directly for SCH.</b> The following is added: 'Significant increases in direct presentations of SCH cases were also observed, which may reflect</p>

parental preference for treatment at a dedicated paediatric centre. In contrast, direct presentations of femur cases did not increase. These findings are consistent with our clinical experience that transporting a child to hospital is more sensible when the injury is to the upper extremity (ex. SCH) as opposed to the femur.'

8. On page 11 (lines 51-56), the authors make a point that **"although 193 uncomplicated fracture patients living outside the Toronto Central LHIN were treated at our hospital in 2014, cost (\$715, 026) required for care did not follow". From a reader's perspective it is hard to understand this number without having an idea of how these services are paid for. A common understanding is that these surgeries are paid based on fee-for-service model from the OHIP. From the way this information is presented, it appears that the hospital is going at a loss because they are carrying out more surgeries without appropriate reimbursement per procedure from the OHIP.**

We have removed the costing analysis from the manuscript. Please see our response to the CMAJ Open Editors' Comment 3 above.

10. Also, without a comparison of cost with any other year(s), It is difficult to establish if the cost of care is going up or down with this informal regionalization. If feasible, the cost of care for these 2 fracture types per year will help with comparison over the years to better understand if the cost is increasing or decreasing over time.

As above.

11. Wait times being one of the key indicators of access to care should be focussed on in results and discussion sections. Currently, they are only mentioned briefly towards the end of discussion section (page 12, line 16-19).

Please see the following re-written paragraph: " 'Informal' regionalization of care has also been observed in Canada for high-risk cancer surgery.(3) Unlike general orthopaedic surgeons who are being trained to care for paediatric fracture patients, however, high-risk cancer surgery is not expected competency for general surgeons without fellowship training.(2, 4) Furthermore, informal regionalization was associated with improved outcomes for high-risk cancer surgery.(3) In contrast, controversy exists about whether lower complication rates are related to treatment at academic facilities for pediatric fractures.(1, 5-7) particularly when transfer delays are expected.(8) In our study, half of the operative cases occurred after-hours, and wait times for these procedures did not improve. Since we were unable to measure the time elapsed in transfer from outside hospitals, it is likely that wait times have actually worsened with informal regionalization in this case. Future work is required to determine whether 'informal regionalization' of uncomplicated pediatric trauma yields benefits ascribed to 'formal regionalization', which include cost savings and improved quality.(9-12) "

12. Overall, the revisions are categorized as minor since they can be reckoned by further elaborating on the existing content. The findings of this study and any further work done in this area will help with appropriate allocation of resources in large, specialist centers as well as modifying (if considered appropriate) the curriculum for orthopedic surgery residency training.

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