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| Title                                      | A cost-analysis comparing surgical trays with redundant instruments to reduced trays  |
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| Reviewer 1                                 | Dr. Sergio A. Acuna   |
| Institution                                | St. Michael's Hospital, Toronto, Ont.   |
| General comments (author response in bold) | <p>This study evaluates the cost savings associated with reduced surgical trays for five common otolaryngology procedures. The authors have previously demonstrated that a substantial percentage of instruments on each surgical tray opened goes unused. In this study, they compare the cost of a standard surgical tray to a reduced tray (containing only instruments that were used at least one out of every five times in the previous study). In my opinion, there are a few questions and concerns that should be addressed before its acceptance for publication.</p> <p>1. The evaluation of cost in terms of the differences in instrument decontamination and packing times, central processing personnel time costs and the per instrument depreciation cost without including differences in circulating nurse time and more importantly operating time is incomplete.<br/> <b>We acknowledge that our study did not account for impacts on operating room processes. Tray reduction may result in faster operating room set-up, easier retrieval of instruments during operations and faster operating room clean-up. We chose to exclude cost impacts from increased throughput because this approach would have required a different framework to account for the benefits. Faster throughput may result in more surgical procedures, and this would increase hospital efficiency, but more procedures would also increase overall costs. This is an avenue that should be explored in the future but we were unfortunately not able to incorporate this into the current study. We have expanded on this in the Limitations section of the discussion. (Page 13, paragraph 2)</b></p> <p>2. The authors mention that "Due to the promise for cost-savings without affecting patient outcomes, the extent and generalizability of the savings... should be further explored in prospective studies." However, patient outcomes and more importantly safety were not explored. The inclusion of infrequently used instruments in standard trays is in part driven by the critical need to be prepared for multiple scenarios that can arise during a surgical procedure. Therefore, it is important to evaluate the safety of having reduced trays and their impact on the operating room workflow.<br/> <b>We agree with the reviewer's comments. As discussed in response to the editor's comments above, we have added text to the discussion describing our approach to keeping essential instruments on the surgical tray. Surgeons have been asked to identify essential instruments to be left on the tray regardless of utilization rate. This has also been added to the discussion in the section entitled, "Conclusions and Implications for Practice and Future Research." (Page 14)</b></p> <p>3. It would be very interesting to see if the savings in labor time spent cleaning and repacking excess instrumentation can translate into saving or if the central processing personnel time should be considered a fixed cost. The relationship between savings in time and cost is likely not linear.<br/> <b>We feel confident in our assumption of a linear relationship between time savings and cost savings. The central processing personnel time is not a fixed cost, since central processing personnel are paid by the hour. Our assumption is supported by recent events at the hospitals. In response to budgetary challenges managers have reduced the total number of hours worked by staff and not the number of staff. We added this to the discussion in the section entitled, "Limitations". (Page 14, paragraph 1)</b></p> |
| Reviewer 2                                 | Dr. Julie Hallet  |
| Institution                                | Sunnybrook Health Sciences Centre - Odette CancerCentre, Division of General Surgery, Toronto, Ont.   |
| General comments (author response in bold) | <p>In this paper, Ava et al present the results of an economic analysis to estimate the savings associated with reduced surgical trays in ENT surgery. They focus on 5 common ENT procedures and base their analysis on prior work done by their group to create the reduced surgical trays.</p> <p>With increased scrutiny into healthcare spending and pressure to reduce costs, this analysis is highly topical and timely. However, it focuses on a very small part of operating room costs, and does not provide much information as to how this information could be practically applied to other surgical specialties.</p> <p>1. In methods, some of the costs incorporated in the model are presented in USD. How were those transferred into CAD\$? What is the potential impact on the model to have included non local costs from another country with an entirely different healthcare system? This should be addressed in the discussion.<br/> <b>The United States health care system differs from the Canadian system in many ways.</b></p>  |

Perhaps the most important is the significant role of private payers and insurance companies in the financing of health care services. It is well known that US hospitals charge more than the cost of delivering health services in order to subsidize shortfalls from treating individuals who are unable to pay. We are confident that in our study, the cost distortions resulting from these systematic differences are non-existent. The papers from which we retrieved US prices, reported the per unit depreciation cost of instruments based on the purchase price. Thus these prices are free from distortions resulting from charging patients or insurers for health services in order to cover administrative costs. We used the preferred approach to converting prices for health and related services from US to Canadian dollars. The Purchasing Power Parity for health is estimated by comparing the price of a standard package of health-related goods and services, including hospital services, between the two countries. We highlight this in the limitations section. (Page 13, paragraph 1)

2. The study focuses solely on ENT and thus the results represent, as stated by the authors, only a small cost reduction. Could the authors comment on other studies that could have addressed different surgical specialties or included more procedures?

**The literature on this topic is limited. Stockert's study [Reference 7] looked at 49 procedures across 4 different specialties (Otolaryngology, Bariatrics, Plastics, and Neurosurgery). They, too, demonstrated the potential for large cost-savings if instrument redundancy was removed. We have highlighted the breadth of surgical specialties implicated in the evidence. (Page 4, Paragraph 2). Another paper has been recently published looking at adenotonsillectomy trays in Otolaryngology and this has also been referenced.**

3. Sensitivity analyses were performed for a number of parameters. Was surgical or hospital volume one of them? It would be interesting to know at what minimal surgical volume does the reduced trays become cost-effective. Also, it would interesting to know more about the clinical setting at the institutions for which costs were obtained to populate the model (how many of each procedure performed per year? how many surgeons performing them? etc.). Providing sensitivity analyses based on institutional level variables would improve the potential to apply results to other institutions.

**Sensitivity analysis for surgical volume has been added to the analysis. (Page 8, paragraph 1) The results suggest that the cost savings are very sensitive to the surgical volume. (Table 3)**

4. Reduced surgical trays seem a very interesting and simple solution to cost reduction. The authors mention how they created the reduced trays. However, how was care impacted by those trays in their experience and that of others? Are surgeons and nurses satisfied? Comments on this aspect would add value to the discussion when considering the pros and cons of the intervention.

**The trays are currently being reorganized and tray reductions have been implemented in clinical practice. We are in the midst of studying nurse and surgeon satisfaction. We anticipate there will be a reduction in setup time as seen in other studies (Reference 11, Farrokhi FR et. al.). We plan to have all other instruments available (for instance on a "sinus extras" tray) in an attempt to reduce the time needed to acquire the extra instruments if needed. We have added this to the manuscript in the section entitled, Conclusions and Implications for Practice and Future Research. (Page 14)**

4. There is definitely potential in reducing costs on a broader scale if this strategy was applied to additional surgical procedures. In order to increase the impact of this paper, it would be interesting to provide the readership with strategies on how to implement such a change in their practice. How to proceed? Is there a suggested process? What does it mean for hospitals, surgeons, nurses, personal in sterilization rooms?

**We have proposed strategies on how to implement tray reduction at other institutions, and this has been added to the Discussion in the section entitled, "Conclusions and Implications for Practice and Future Research" section. (Page 14) We have also alerted the readers of the manuscript to the fact that commercial solutions have been developed to address tray redundancy.**