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Title	Analyzing supply and demand on a general internal medicine ward: a cross-
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Reviewer 1	Barry Chan
Institution	Internal Medicine, Queen's University, Kingston, Ont.
General comments (author response in bold)	Thank you for initiating the innovative endeavour in utilizing supply-and-demand modeling principles to elucidate the ever escalation tension between the dwindling labour force and escalation duties and complexity of tasks of a Clinical Teaching Unit. More importantly, the authors provided a blueprint methodology for other institutions guide their own analysis. Having worked at academic institutions in Central and Western Canada, the demand parameters, especially with regards to time of highest work intensity, are comparable to anecdotal experience and the occasional administrative analysis reporting. **Thank you. We appreciate this positive feedback of our work.** Scenario 2 and 3: Are post-call resident accounted for in those scenarios? If not, I think it be help to elaborate the reason it is excluded. This is because, depending on the CTU structure of the respective, someone is usually (if not always) post-call for each CTU team. This would certainly further reduce supply of person-hours that can be put to work. **Yes scenario 2 and 3 account for this and we have now updated our Methods section accordingly [final paragraph]:** **"Scenario 2 assumed one resident was away on vacation each week and also accounted for a resident being post-call. Scenario 3 assumed one resident was away on vacation and another resident was away sick, and also accounted for a resident being post-call."** Team with 1 attending and 1 senior resident: Why was this included in the analysis? The reason being the composition of that team is substantially different from the others. I suppose there is never someone post-call from this particular team and, also, Scenarios 2 and 3 would be the same for this team -- just the attending working. Also, having a senior resident independently functioning (and assuming the attending is helping with rounding), would their efficiency change the distribution of the utilization capacity during the day. **We agree that this Team structure of one staff and one senior resident is unique from the other teams. We included it because our study focused on the model at St Michael's Hospital.** Recall Bias when estimating family meetings, medical consultations, and time necessary to complete these tasks: This would be subjected heavily (and likely inflated) to bias. However, the numbers seem reasonable at a glance. **We agree and as noted above in response to the Editor we have now also conducted a sensitivity analysis.** Minor change: Page 10 - line 26: spelling error: "weekedays" **Thank you for spotting this. We have corrected this typo.** Again, this is important work and must be published for other institutions to learn

	as a way to better understand their own supply and demand distributions. Work efficiency is a vital metric. However, it is worthwhile to remember from time-to-time, I believe, the academic center is a place of learning as well. Some degree of permissive inefficiency is expected and tolerated, because learning takes time. Thank you very much for your considerations. **Thank you. We appreciate this positive feedback of our work.**
Reviewer 2	George Farjou
Institution	Medicine, Niagara Health System, St. Catherines, Ont.
General comments (author response in bold)	An excellent paper that attempts to answer a question many residents and staff physicians have asked and commented about casually, but with no methodology to quantify. **Thank you for this positive feedback.** The authors modeled the time estimated for each patient care task for only one year (Feb 2018-2019) but included data on all tasks from 2015-2019. It may be that some tasks' utilization has changed over time as curriculum has changed, such as family meetings, admissions (could any new technology or EMR have been introduced that shortens the time it takes to do a GIM admission?). Has the structure of the makeup of the CTU teams changed between 2015-2019 because that could affect how many patient task hours are being estimated. **We have now updated our appendix to clarify the timeframes for each data included in our model. The structure of the teams did not change from 2015 to 2019 and there was no specific new technology introduced during this timeframe to improve task efficiency.** I think this study is trying to answer another question by also giving the evidence of when the CTU is busiest in terms of consults in time of day, day of the week, and month (figure 1A-D) vs the actual question posed in the abstract of resident utilization (figure 2A). You can make this paper shorter by taking out figures 1A-D and publishing that as a separate paper completely and can expand on why there are differences in CTU admissions activity based on the data points you have collected, or even just publishing it as observational data. There have been many anecdotes amongst teaching units about the statistics for admissions and you have compiled 4 years worth of data, which I think merits its own discussion rather than being included in this paper. [Editors' comment: We are satisfied with these data being included in this current paper.] **We appreciate this feedback but have opted to keep the data in a single paper as suggested by the Editor.** Need a bit more of an explanation in results as to why weekend resident utilization was more consistent across all 3 scenarios - why is staffing more consistent on weekends? Is it because there is always someone contingent for call (e.g. a backup person) for the weekends, vs more variability in the week during the 8-5pm time periods where people can invariably be away on vacation or sick? **We agree and have now added the following to our Discussion [Paragraph 3]:** **"We were able to demonstrate this by modeling the supply and demand across various scenarios of resident absenteeism to empirically quantify how this leads to overutilization (i.e., demand exceeds supply). Notably, the different scenarios we modeled did not affect supply and demand on the**

	weekend, though this reflects the fact that regardless of the number of residents scheduled for a general internal medicine rotation the weekend coverage is fixed at one resident per day. In contrast, the different scenarios clearly demonstrated how weekday demand exceeds supply with increasing absenteeism." Additionally, I know this paper aims to study resident utilization but it does not at all address how many hours of work the staff physician (5 of them on the CTU as mentioned in this paper) are doing. Of course this is variable depending on the comfort of the staff physician but can be mentioned in the discussion. **We agree this is a limitation of our study and have now explicitly noted it in our Discussion [Limitations section]:** **"Another limitation of our study is that our model did not account for how "hands-on" the attending physician was and how this might vary across different levels of resident absenteeism to help balance supply and demand."** Overall, there is no gold standard to compare the resident-utilization model with as the authors have mentioned, scheduling is done on historic practices within each department. I think this addresses a need where high volume times are identified, and the schedule can be adjusted therefore to accommodate for more learners on a CTU block during the typically "busy months" and times where there could be less need for residents on the CTU during "quieter months". **We agree with this feedback and have allude to it in our abstract:** **"Analyzing supply and demand on a general internal medicine ward has allowed us to identify periods where supply and demand are not aligned and to empirically demonstrate the vulnerability of current staffing models. These data have the potential to inform and optimize scheduling on an internal medicine ward."**