Article details: 2016-0103	
Title	An unconventional combined MD/masters-MD/PhD training program leads to a more balanced output of academic physician-scientists
Authors	Jason T. Bau, BHSc, Alexandra D. Frolkis, BSc, Nabeela Nathoo, BSc, Bryan G. Yipp, MD, MSc, Morley D. Hollenberg, MD, DPhil, Paul L. Beck, MD, PhD
Reviewer 1	Jaime Escallon
Institution	Surgical Oncology, Mount Sinai Hospital and University Health Network, Toronto, ON
General comments (author response in bold)	This paper represents the experience of one university with a long standing program of MD, Masters and PhD programs organized in un unconventional way and the authors manage to collect very valuable information and based on this review the authors propose some changes in the program making it more structured emphasizing some key points like the incorporation of both masters and PhD programs as an integral part of the training program and also the very important role of mentorship in opening opportunities and encouraging the continuation of a productive academic career. The issue of gender differences in productivity especially at the PhD level has to be further investigated, we know that women are at a higher risk of the "Burned out Syndrome", is this a contributing factor? **We appreciate the reviewer bringing this point to light. There are data on the presence of burn out among women throughout the spectrum of medicine, as medical students, residents and senior physicians. It would be worthwhile to explore this issue further in a separate article. We did include some of this data in our manuscript on page 10. As is mentioned in the manuscript, the effect of such burnout on productivity in this particular setting is unknown.** Also I noticed the higher number of graduates from the family medicine program; maybe this reflects the choice of lifestyle that is preferred by the graduates not always interested in an academic career. I suggest to the authors that they look at their academic career and promotion to full professor as another way to evaluate the success of these individuals. **We believe this to be an interesting proposition to examine. Many of the graduates from the combined program are lost to follow-up (i.e. have had no further contact with the program since graduation). As our study was based on using publicly accessible data repositories, we do not feel that it would be possible to ascertain which individuals have been promoted to full professorship, as we did not survey the participants regarding their career promotions.** Another aspect that plays a very important role in an academic career is the productivity as an educator both in publications and dedication to teaching. I think this is also one of the objectives of a complete academic career. It would be interesting to know of the publication how many are dedicated to research in education. **Education forms the third pillar of the 'triple-threat' in medicine (the other two being research and clinical acumen). We discussed at length during our initial planning phases as to how to best capture these data and concluded that within the confines of this project, we would be unable to accurately reflect the role of the educator at this current stage. Furthermore, it would be challenging to compare (and evaluate) between individuals their contributions to education (for example, would teaching one medical school course have the same weight as having clinical clerks year round?). Thus, the 'dedication to teaching' is a factor we continue to study, but remains outside the confines of this study.** **As for individuals who contribute to research in education, in our data set, only two individuals completed graduate work most closely related to education (both of whom are no longer classified as physician-scientists by our model). We did not sub-categorize individual publications into those encompassing educational research, and in keeping with our above point, will be a focus of a follow up study.** The issue of the cost of the program and the lack of funding is a very important one; this paper brings some facts that can be used to create a strong argument for funding this type of programs. Many universities have already in their training program incorporated the "surgeon Scientist Program" or similar for each specialty, at the University of Toronto this program is 30 years old has evolved into a well-structured program and many of our current faculty come from this program. It will be interesting to apply the same methodology used in this paper to compare the results. **We appreciate the reviewer mentioning this paper that looks at the surgeon-scientist program. As you know, we had cited the SSTP paper in our manuscript (page 10) on initial submission to provide support for the concept that receiving graduate training during one's medical training may lead to greater productivity with regards to publications. The methodology used in both papers appears to be quite similar; the SSTP paper also determined research productivity by searching for authors' names online, classified publications by stage of training and by authorship (principal author, senior author, any author). Although we did not directly compare methodologies, we are hopeful that we have adequately discussed the SSTP paper in our manuscript.**
Reviewer 2	Bart J. Harvey
Institution	University of Toronto, Dalla Lana School of Public Health, Toronto, ON
General comments (author response in bold)	This is an interesting description of the experience of those who have graduated from the MD-Masters/MD-PhD programs at the University of Calgary. I do, however, have several questions and comments to offer for the authors and editors to consider: 1. The authors call the study a retrospective cohort study. However, it is not clear what the eligibility criteria are for this cohort. More specifically, it appears that only individuals who successfully completed/graduated from both of the involved programs (i.e., it is an 'exit' cohort and not an 'inception' one). As such, it appears that only the experience of graduates is addressed, but not that of others who were admitted but did not successfully complete both programs. If this is correct, I wonder why the researchers made this decision rather than describing the experience/outcomes of all those who were admitted. This decision appears to eliminate the ability to assess program metrics such as graduation/completion rates, of both the MD and involved graduate programs. This is further confused in the first line of the Results Section (page 6) where it is stated that "A total of 310 individuals were part of the joint-program…". If this is true, I would expect data regarding those who did not successfully complete one or both involved programs would be also be included and presented but this does not appear to be the case. As such, perhaps a more accurate statement would be "A total of 310 individuals successfully completed the joint-program…" **The reviewer brings up a valid point. To clarify, the study is an exit cohort and only individuals who successfully completed both graduate and medical programs are included in the analysis. The reason for excluding**

individuals who enrolled in both programs but did not complete is largely for logistical reasons.

Within the Faculty of Medicine, there are at least eight different graduate programs. For many of these programs, we do not have access to their data regarding why individuals have left their graduate programs. This is in contrast to the Undergraduate Medical Education program (MD). Thus in this study, it would not be possible to assess with any fidelity the population as an 'intake cohort'. To clarify this, we have modified the wording suggested by reviewer in the text.

Similarly, in the Interpretation Section on page 8 it is stated "In our study, 310 individuals who jointly pursued graduate and medical studies…" but I think this should be more correctly stated as "In our study, 310 individuals who jointly completed graduate and medical studies…"

We agree with the reviewer's suggestion and have altered the wording in the manuscript based on their input.

2. On page 3 the authors refer to "K-selection" and "r-selection". I would suggest that many readers may not be familiar with these terms so perhaps they should be defined/described.

We agree with the reviewer's comments. We have revised the text on page three of the manuscript, removing these terms, in order to avoid any confusion.

3. In the listing in the last paragraph on page 4 I wondered why the authors did not also include whether the individual was identified as the "corresponding author" of a publication.

This is one discrepancy that we discussed at length during the planning and delivery of this research project. Overall, there were few instances where the 'corresponding author' did not correlate with the 'senior-author' position. Therefore, we feel that adding another category for 'corresponding author' would not have greatly affected the overall findings of our paper.

4. On the definition of current occupation on page 5 does the first choice require correction/revision? I also wondered if anyone would identify themselves as "Scientist only" (but perhaps this isn't possible in this restricted/limited retrospective cohort for the reasons I have noted above in my first comment)?

We apologize if there has been any confusion on our part regarding the definitions of current occupation. These are labels meant to designate an individual in their current stage of training. These, by definition, are fixed. While there maybe individuals who might consider themselves as 'scientist only', we did not capture this data point in our current study.

5. I'm not sure what the justification for the criteria listed on page 5 for "Physician-Scientist" is. Was this arbitrarily chosen by the authors? If available, I would suggest providing some sort of justification/rationale/references to justify this choice. Also, did the authors conduct any kind of sensitivity analysis to examine how slight changes in the criteria (e.g., fewer/more total publications than 7, etc.) might affect the study's results?

We agree with the reviewer's comments regarding the need for a sensitivity analysis. While this was completed in our initial preparation, it was not included in the text of the manuscript. We have now included it as a section in the Results section. The conclusions of the sensitivity analysis support the use of the cut-offs that we selected in our model and that changing these publication criteria did not ultimately affect the outcome of our findings in our model.

6. In the middle of page 5 I'm not sure why t-test was used to analyze publication record (i.e., numbers) as I would expect these data would follow a right-skewed distribution for which a non-parametric analysis (e.g., Mann-Whitney Rank-Sum test) would be more appropriate (and more sensitive to identify statistically significant effects). This is also evident at the bottom of Table 2 where the reported standard deviations suggest the data are, in fact, positively/right-skewed. As such, I would suggest that median and inter-quartile ranges should be presented either replacing the means and standard deviations or along with them.

We have incorporated the reviewer's comments into our manuscript and have adjusted the figures to include medians as well as inter-quartile ranges.

7. I would suggest that exact P-values be presented (e.g., the two that are presented on page 6).

We thank the reviewer for his input into the presentation of our data. We have included exact P-values in our manuscript with the exception of describing many tests at once, all of which were not significant.

8. Near the top of page 7 "Table 2" is mentioned but I couldn't find the applicable table in the manuscript (the included Table 2 appears to address different issues and appears to be referenced correctly near the bottom of page 7). In the middle of page 7 "Table 3" is referenced but I also couldn't find such a table in the publication.

We thank the reviewer for their attention to detail. We have corrected this error in our text and the correct referencing to the tables is now inserted.

9. The Interpretation Section that discuss the role of the Masters option in this joint program is interesting, especially the fact that more female physician-scientists appear to have come from the MD-MSc joint program as opposed to the joint MD-PhD program. I think it would be quite valuable for the authors to further examine this to provide some kind of an explanation as it does appear to be counter-intuitive. Is it possibly a chance finding? Have the authors taken an opportunity to follow-up with/interview these individuals to better determine what might underlie this apparent difference? It would also be interesting to determine whether the joint MD-MSc program is better at facilitating physician-scientists in comparison to those who complete the two degrees separately (but perhaps that would be a separate study).

10. **We agree with the reviewer that this is an unexpected finding. For this study, we did not contact any individuals for follow up interviews; however, we agree that this would be a worthwhile endeavor to be addressed in a separate study. We do not believe that this is a chance finding, but concede that the only way to determine this would be to follow those currently enrolled in the program for five and ten years to see if the finding holds true. This is something that is slated for a future, follow-up study.**The four-paper during the joint program marker as a predictor of progressing to be a physician-scientist appears to be biased toward the MD-PhD students as they would have, by design, a longer time as a joint program student in comparison to the MD-MSc joint program students. I would encourage the authors to explicitly acknowledge and discuss this inherent difference/bias.

The reviewer brings up a valid point and we have addressed this concern in the limitations section of the manuscript.

11. Near the bottom of page 10 I would suggest that "supports" be replaced by "suggests" regarding "the need for strong mentorship for female students"

	We appreciate the reviewer's comments regarding the phrasing of the section. We have made the suggested alteration. 12. I wonder if Figure 3 could be re-developed as a stacked bar graph so that the number of physicians versus physician-scientists can be more readily appreciated/presented by medical specialty/training program **Using our graphing program, GraphPad Prism, we attempted multiple methods to adjust the image as to the reviewer's request. Ultimately, we were unable to do so without construing the message of the figure. As a result, we have decided to keep the figure in its original format.**