Author’s response to reviews

Title: Physiology of residents in simulation medicine: the PRISM study

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Author’s response to reviews: see over
Esteemed Editorial Board Members of *BMC Medical Education*:

Thank you for your review of our submission, “Physiology of residents in simulation medicine: the PRISM study.” We very much appreciate the kind reviewers’ insightful comments and suggestions. Please see below for our responses to our two reviewers’ comments and questions:

**Reviewer 1 (Daniel Girzadas Jr.):**

1. Regarding the issue of the Flow Score, we have added a more detailed description of this metric and its role in relation to the study question to the final paragraph of the background section as you suggested. Thank you for this recommendation.

2. Regarding the issue of high- versus low-stakes assessment: the annual simulation exam was a mandatory exercise for all residents enrolled in our program during the study period. While residents were required to pass the simulation test, those whose performance was sub-optimal were scheduled for a re-test. Advancement to the next PGY-level was not contingent upon a single performance. However, there is considerable stress and “sense of pride” inherent in the assessment, and no resident ever wants to be “the one who had to retake the sim assessment”. Language has been added to the methods section of the manuscript to clarify this point.

Regarding the description of the “Flow Score”: we have added language to the description of the Flow Score in paragraph two of the methods section.

Regarding the number of faculty raters involved in the study: each resident was evaluated by three to five faculty members. Given the variable schedules of our faculty, both the number of raters and individuals performing the rating varied from session to session. While having a measurement of inter-rater reliability would have been desirable, we were unable to collect this data. Each rater filled out their evaluations independent of one another, and we present a *truncated mean* (high and low scores cut from calculation). We could have used a median score here (the median being a fully truncated mean), but we considered the *truncated mean* to be the most robust statistic (given the potential element of some subjectivity) to offer a stable, reliable, and accurate estimate of performance assessment in the absence of the ability to calculate an inter-rater reliability coefficient. Language has been added to the methods section to clarify these points.

3. Regarding CRM training of faculty and residents: neither the faculty nor the residents received specific training in crisis resource management prior to
the study. CRM skills are fundamental to the practice of emergency medicine, and we feel that residents’ immersion in the Emergency Department environment provides them with exposure to this skill set. Faculty raters received a brief re-introduction to the Ottawa GRS instrument prior to the assessments (“a CRM refresher”). In our opinion the instrument is very intuitive to use, and its ready applicability centers on its descriptive anchors to assist in accurate scoring.

Regarding raters’ familiarity with participants: all of the raters were members of our faculty and therefore had extensive experience working with the study participants. Given the “real world” nature of conducting such a study within an active residency program, we did not have the advantage of using raters blinded to the PGY-status of participants. Language has been added to the methods section to clarify this point.

Regarding the reviewer’s excellent point about caffeine exposure prior to the assessments: yes, thank you – caffeine intake (as a potential confounder) was asked specifically for this reason. We used an investigator-built multivariate regression to assess and control for caffeine exposure vis-à-vis anxiety, heart rate, etc.

4. Regarding the relationship between CRM ability and heart rate: thank you for this comment. We have added a sentence to the results section clarifying that neither Overall Ottawa GRS score nor Flow Score correlated with mean or peak heart rate.

5. Comments concerning the discussion section: thank you for these suggestions, which we have incorporated into the discussion section. It reads more clearly as a result.

6. Comment on manuscript title: we respect this comment, but are fond of the “PRISM” mnemonic and have elected to keep it.

Reviewer 2 (Erik Kulstad)
1. Overall comments: thank you for the additional citation, which we have incorporated into the manuscript. An abstract was included with our submission, and it is unclear why it was not sent to you. Our apologies.

Regarding your question about model construction: thank you, yes, this was an investigator-built model. In the methods section we explain that due to the limited study sample and the guidelines for regression model construction (minimum subjects per variable) we were very limited as to the number of variables. By design, the data collection tool captured a limited number of parameters. We decided to include the most important parameters (as detailed in the results). Only a few parameters were excluded a priori, such as the gender of the resident, his/her age, year of
graduation. (Summative statistics of these are found in Table 1). Thank you for your close read of the methods; we have added language in the discussion to explain further the limits of this model.

2. Regarding the similarity of pre- and post-simulation anxiety scores: while this was surprising to us as well, we suspect it may reflect our using a relatively broad survey item to assess participants’ feelings (a simple Likert-style question addressing global anxiety about the simulation experience). A more detailed survey might have elicited more nuanced self-reflection among participants. We appreciate your suggestion of a plot of individual participants’ pre- and post-survey results, but we feel that the data were homogenous enough that such a figure would not be informative.

Regarding measurement inter-rater agreement, please see comments above.

3. Comments from the “Discussion” and “Limitations” sections: thank you for these comments. We have changed the language in the manuscript to address both of these suggestions.

We sincerely appreciate the time and thought that you have put into this review and we believe that your excellent feedback has made this a stronger manuscript. We hope that you find our responses, adjustments, and clarifications acceptable. We feel that this work will be helpful to educators across medical specialties as well as to simulation practitioners. Please advise us if any additional revisions or supplemental information will be helpful and you consider our work for your excellent journal.

Regards,

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