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Title	**Improving transfusion appropriateness through an online educational module: a controlled before–after quality improvement study**
Authors	Todd C. Lee MD MPH, Jennifer Murray MScPH, Emily G. McDonald MD MSc
Reviewer 1	Emily Mulligan
Institution	Winchester District Memorial Hospital, Research
General comments (author response in bold)	1. The background section could use some work in explaining your rationale - Perhaps some comments around the general research history on this topic would help the reader understand the gap/s you are trying to fill with this study - you did a better job of this in the discussion but it should be mentioned earlier to really drive this home. **We have updated the background to further explain our rationale with reference to studies where a restrictive transfusion strategy decreases the risk of receiving a blood transfusion without any negative impact on clinically important outcomes such as mortality, length of stay, cardiac ischemia and infection.** **(Page 4)** 2. In the methods, I wondered if it should be mentioned if the physicians were given a certain time frame that they were supposed to complete the training in. **This is included in the methods (training was required to be completed within the first week of service on the clinical teaching unit). (Page 6)** 3. Shouldn't one of your outcomes be the score of the physicians on the test? **Thank you- we have included this as one of the outcomes. (Page 8)** 4. I found overall in this study, for someone reading this who is not deeply familiarized with the study, the primary outcome was well-described how it was chosen and it was easy to understand and follow throughout the paper but the other outcomes / secondary outcomes were more difficult to understand and could have been explained more. **Thank you for this feedback. In the discussion we have tried to clarify the secondary outcomes and their associated limitations. These metrics look at overall transfusions based on the number of patients admitted to the unit but do not properly show whether the transfusion is appropriate or not. As an example, a unit with patients who have leukemia will have a lot of blood transfusions and transfusions per 100 admissions will be much higher than other units. That said, the transfusions could be entirely appropriate, as patients with leukemia often require multiple blood transfusions, and this would not be reflected in a population-based metric. Put another way, the volume of blood used on a unit does not always reflect the appropriateness of use. It reflects an unclear combination of patient population and appropriateness.** **We continue to include both of these metrics in our secondary outcome and discussion because many centres use population-based metrics out of convenience and we felt that it was an important counter-point to our primary outcome. Had we relied on either of these metrics, we would have paradoxically concluded that education worsened transfusion practice. We think the discussion (and supplement) may be important for others who are looking at improving their transfusion appropriateness to consider.** 5. The table was very useful and helped in showing the trends & comparisons. **Thank you**

Reviewer 2	Jeffrey Lipton
Institution	Princess Margaret Hospital, Allogeneic blood and marrow transplant program
General comments (author response in bold)	1. Was there any difference in the balance between R1, R2 and R3 on the units during the study period? **We have now included a flow diagram of participant characteristics; the distribution between junior and senior residents was similar between the two sites. (Figure 1)** 2. You state that 13 R1s did rotations at the intervention site at various times. Was this on units where transfusions were given? **Yes, these residents (junior residents only) rotated mainly on the control unit but also occasionally rotated for 1 month of the year on the intervention unit. We have included this a limitation of the study. Although if anything it would have made the intervention look less effective and biased towards the null. (Page 13)** 3. Was there any oversight from the blood bank questioning the appropriateness of a transfusion in either of the two sites at any time? In some centres, the blood bank will question red cell or platelet transfusions after checking hemograms. Was this routinely done in either site at any time. **At our center, the blood bank is not involved in determining appropriateness of transfusions. This has been added the manuscript. (Page 5)** 4. Was there any difference in routine practice as to how many units were transfused at one time – i.e. a single unit or more than one? Did this differ depending on the hemoglobin? **We were unable to obtain this data because even with multiple unit transfusions ordered at one time, the blood bank treated them as individual orders in the software. We include our reflections on the advantages and limitations of single vs. multiple transfusion metrics in the supplement.** 5. The authors present no data on the reason for a transfusion, other than the hemoglobin. Although the patient populations were said to be similar, is there any data as to symptoms or other triggers for transfusions that may have differed between the sites. **Unfortunately, an in-depth chart review of symptoms prior to transfusion was not performed and was beyond the scope of this study. We performed a random convenience sample review of 75 charts with hemoglobin over 80 and determined that most were inappropriate. Full review of the 1400 transfusions would be impossible. Symptoms or triggers for transfusion are not routinely recorded in our electronic medical record at the time of transfusion ordering and require someone to manually read the chart around the time of the transfusion. In the future, we are looking into adding electronic decision support to our transfusion order, whereby we will request the orderer to select what is prompting a transfusion (particularly at higher hemoglobin levels). Currently though, we do not have this technology.** 6. How much oversight is there from senior staff when transfusions are given, or was it all up to the discretion of the residents? The hospitals are different, and I would presume the attending staff are different. **The senior residents have a lot of discretion in the day to day care of their patients. As with all practice on medical clinical teaching units throughout Canada, each attending physician will have their own style vis-à-vis how much direct supervision is provided and how much "macro" vs. "micro" management they perform for their trainees. We have no reason to believe that the faculty at the Montreal General Hospital provided a different level of direct supervision or oversight as compared to**

	the Royal Victoria Hospital. **The attending staff were indeed different during the intervention, but there is cross-coverage of the two sites and we are all contained within one larger university centre "The McGill University Health Centre".** **The authors state that no faculty or senior residents from the control group received any training. One must therefore conclude that some faculty and senior residents in the intervention group received training, so are you really looking at the impact on residents or a hospital in general?** **Essentially all junior and senior residents who worked on the intervention unit received the intervention (exceptional 2 cases are explained in the document). Four of 15 faculty voluntarily completed the training on the intervention unit. We believe we were looking at the impact on resident (and to a lesser extent faculty) behavior within the specific hospital.** **We would like to thank the editors and reviewers for helping us to improve the quality and the clarity of the manuscript and for the opportunity to revise and resubmit.**