**Response to Reviewers**

**General Formatting:**

1. JoVE is unable to publish manuscripts containing commercial sounding language, including trademark or registered trademark symbols (TM/R) and the mention of company brand names before an instrument or reagent. Please remove all commercial sounding language from your manuscript (text and figures). All commercial products should be referenced in the table of materials/reagents. Here are some examples from your manuscript – Laerdal SimMan,

The commercial language has been removed.

1. If you are re-using figures from a previous publication, you must obtain explicit permission to re-use the figure from the previous publisher (this can be in the form of a letter from an editor or a link to the editorial policies that allows you to re-publish the figure). Please upload the text of the re-print permission (may be copied and pasted from an email/website) as a Word document to the Editorial Manager site in the "Supplemental files (as requested by JoVE)" section. Please also cite the figure appropriately in the figure legend, i.e. "This figure has been modified from [citation]."

We have included approval in the resubmission.

1. Add the following to Table of Materials – embalming solution,

We have added this to the Table of Materials.

* **Protocol:**

1. Line 88 – rinse out jugular veins – how? which needle, syringe do you use? Where is the needle inserted? Please provide all the details.

Details have been provided.

1. Line 90 – are the heads stored in any position / orientation? If yes, please specify.

Details have been provided.

1. Line 91 – embalming solution – how much is typically required per head?

Details have been provided.

1. Line 92 – add a “Caution: embalming solution and formalin are corrosive. Please wear appropriate personal protection”.

The statement has been added.

1. Line 94 – supported -  how? write in imperative tense

We have rewritten it in the imperative tense.

1. Line 100 – what is used to Drill?

Details have been added.

1. Line 104 – remove the bone – how? do you drill, cut? Using what?

Details have been added.

1. Line 108 – specify the size of cannula, clamp

Details have been added.

1. Line 110 – store – at what temperature?

Details have been added.

1. Line 110 – typically how many liters of artificial blood is prepared? Or required per head? Add a note:

Details have been added.

1. Line 110-112 – please provide the recipe for preparation of artificial blood?

Details have been added.

1. Line 115 – do you set the flow rate on the perfusion pump?

Details have been added.

1. Please re-write steps 6 through 9 of your protocol section in imperative tense, as if you are telling someone how to do the technique (i.e. "Do this", "Measure that" etc.). For example, re-write step 6.1 as -  Pair one neurosurgery or ENT resident with one anesthesia resident for each of the simulation scenarios. 6.1.1. Give approximately 10 min to each team of residents to complete each scenario,…….

The sections have been rewritten.

* **Figures:**

1. Please add a scale bar to figure 2

 Scale bar has been added.

* **Highlighting:**

1. After you have made all the recommended changes to your protocol (listed above), please highlight 2.75 pages or less of text (which includes headings and spaces) in yellow, to identify which steps should be visualized / filmed to tell the most cohesive story of your protocol steps. Please see JoVE’s instructions for authors for more clarification. Remember that the non-highlighted protocol steps will remain in the manuscript and therefore will still be available to the reader.

Steps have been highlighted.

1. In case the paper is accepted for publication, which scenario do the authors intend to film for the video? Please pay attention to this when you highlight the protocol text.

Utilize scenario 1 as outlined in Table 1.

Reviewers' comments:

**Reviewer #1:**

*Manuscript Summary:*

* Lucke-Wold et al describe a simulation model for the training of residents on management of intraoperative cavernous carotid artery injury during endoscopic endonasal surgery. The topic is important to address, as such injuries - though uncommon - can have catastrophic consequences. Not only can such injuries result in overwhelming blood loss, placing the patient's life at imminent risk, but they may also be susceptible to pseudoaneurysm formation, vasospasm, thrombosis, embolism and even the formation of caroticocavernous fistulae. There is certainly utility in developing methods for training doctors across disciplines in the management of such injuries, which the authors attempt to do with a cadaveric model. 3 scenarios of varying complexity are described, in which surgical and anesthesia residents must obtain vascular control via muscle patch technique.

Thanks for the comments and highlighting the significance of the model for training learners.

* Strengths of the manuscript include the development of the model and the opportunity it provides to practice crisis management. The stepwise escalation in complexity of cases also provides a logical sequence in which to gain familiarity with the crisis and tailor the simulation to skill level. The setup of the model is well-detailed and should be reproducible from the description provided. And while many animal models are available for practicing management of this event, this is to our knowledge the first described employing human cadavers. The opportunity for immediate feedback is also a positive attribute.

We appreciate the comments, especially for recognizing the novelty of the model. Thank you for taking the time to review our manuscript.

* One glaring weakness of the manuscript is the relative paucity of photographic or video demonstration of the model (they do mention a video, but none seems to be provided). The use of an 11-blade to induce the injury, while easily reproducible, is likely somewhat different in mechanism than how these injuries occur. A punch or stellate injury may be more common than a linear injury. More detail should be provided in section 6 as to how vascular control is obtained (e.g. positioning and orientation of suction and scope, application of muscle patch, etc) Valentine and Wormald have already described a similar model for controlling the surgical field during such an injury, and though theirs was an animal model, many of the same fundamental principles are employed.

JoVE will be helping film the video for the model in the coming months to show step by step how it is performed. The video will accompany the paper when it is published. We appreciate the comment about how the injury occurs in the operative arena and have added detail about the management of vascular control. In particular, we added details regarding the technique that Valentine and Wormald utilize in the introduction and describe our technique in further detail in the protocol section. The key difference is that we propose using a cottonoid to control the bleeding prior to the muscle patch. This two-step process allows learners to practice endoscopic techniques of transference in a high stakes scenario. Furthermore, we have added different options for how to cause the injury based on your suggestions.

* A major vascular injury is one of the most challenging scenarios a surgeon can face. The high-pressure and high-flow environment can prove difficult even in the most experienced hands, so any opportunity to practice the skills necessary to manage the situation in a controlled environment is of value.

Again, thank you for the comment. We appreciate that you recognize the value of the model.

*Major Concerns:*

* N/A

*Minor Concerns:*

* N/A

*Additional Comments to Authors:*

* N/A

**Reviewer #2:**

*Manuscript Summary:*

* The authors provide a relatively simple but realistic and reproducible technique for simulating carotid artery injury during endonasal neurosurgical procedures. This is the most life threatening complication of these procedures and may occur unexpectedly. Management requires effective multidisciplinary management by the surgeons and anesthesiologists in a rapid and coordinated fashion. Surgical simulation using a realistic model is very important and this model is easily constructed and reproducible.

Thank you for providing an overview of the importance of the model.

*Major Concerns:*

* N/A

*Minor Concerns:*

* The authors should provide more detailed scripted clinical scenarios for the simulators to follow to ensure the model is well executed across multiple sites.

Thank you for this comment. In the video JoVE is helping us film, we are going to go into more detail for scenario 1. Please see below why we intentionally left the descriptions a bit vague in the text. We hope you agree this is a reasonable strategy to hopefully have the model be applicable to the widest audience.

We provided a description of three relevant scenarios relevant to our geographic region in table 1. We didn’t want to specifically limit the reader to using those scenarios alone because different regions of the country have a different prevalence and incidence of various diseases and comorbidities. We want the model to be adaptable so that the faculty member leading the session can change the scenarios in order to be most relevant to the learner’s training environment. There is intrinsic flexibility in the model to allow the faculty member to adapt it to his or her needs or what he or she deems most relevant to the geographic region.

*Additional Comments to Authors:*

* Very nicely constructed model to simulate a potentially life threatening event during endonasal surgery. The authors recognize that multidisciplinary coordinated efforts are necessary to successfully control carotid artery bleeding while resuscitating the patient hemodynamically and this model provides a useful, reliable, and reproducible simulation technique

We appreciate the comment. Thank you for taking time to review the article.