



Fig 1. (A) Rapid Ultrasound for Shock and Hypotension (RUSH). (B) Simplified algorithm for evaluation of perioperative hypoxia and hypotension (SALVATION).

## References

- 1 Fatima H, Amador Y, Walsh DP, et al. Simplified Algorithm for Evaluation of Perioperative Hypoxia and Hypotension (SALVATION): A practical echo-guided approach proposal. *J Cardiothorac Vasc Anesth* 2021;35:2273–82.
- 2 Weingart S, Duque D, Nelseon B. 2008. Rapid Ultrasound for Shock and Hypotension. EMCrit.org Project. Available at: <https://emcrit.org/rush-exam/original-rush-article/>. Accessed August 3, 2021.
- 3 Weingart S. 2012. Rapid Ultrasound for Shock and Hypotension – the RUSH Exam. EMCrit.org Project. Available at: <https://emcrit.org/rush-exam/>. Accessed August 3, 2021.
- 4 Buhmaid R. PoCUS - RUSH Protocol. International Emergency Medicine Education Project. Available at: <https://iem-student.org/rush/>. Accessed August 3, 2021.
- 5 Perera P, Mailhot T, Riley D, et al. The RUSH exam: Rapid Ultrasound in SHOCK in the evaluation of the critically ill. *Emerg Med Clin North Am* 2010;28:29–56.
- 6 Gonzalez JM, Ortega J, Crenshaw N, et al. Rapid ultrasound for shock and hypotension: A clinical update for the advanced practice provider: Part 2. *Adv Emerg Nurs J* 2020;42:284–92.
- 7 Seif D, Perera P, Mailhot T, et al. Bedside ultrasound in resuscitation and the rapid ultrasound in shock protocol. *Crit Care Res Pract* 2012;2012:503254.
- 8 Hrymak C, Weldon E, Pham C. LO092: The educational impact of a formalized RUSH (Rapid Ultrasound in Shock) protocol in emergency medicine residency ultrasound training. *CJEM* 2016;18:S61–2.
- 9 Cevik AA, Cakal ED, Abu-Zidan F. Point-of-care ultrasound training during an emergency medicine clerkship: A prospective study. *Cureus* 2019;11:e6118.
- 10 Keikha M, Salehi-Marzijarani M, Soldoozi Nejat R, et al. Diagnostic accuracy of Rapid Ultrasound in Shock (RUSH) exam; a systematic review and meta-analysis. *Bull Emerg Trauma* 2018;6:271–8.
- 11 Stickles SP, Carpenter CR, Gekle R, et al. The diagnostic accuracy of a point-of-care ultrasound protocol for shock etiology: A systematic review and meta-analysis. *CJEM* 2019;21:406–17.
- 12 Elbaih AH, Housseini AM, Khalifa MEM. Accuracy and outcome of rapid ultrasound in shock and hypotension (RUSH) in Egyptian polytrauma patients. *Chin J Traumatol* 2018;21:156–62.

Shyam Murali, MD\*  
Scott Weingart, MD<sup>†</sup>  
Zaffer Qasim, MBBS<sup>‡</sup>

\*Department of Traumatology, Surgical Critical Care, and Emergency Surgery, University of Pennsylvania, Philadelphia, PA

<sup>†</sup>Division of Emergency Critical Care, Department of Emergency Medicine, Stony Brook University Medical Center, Stony Brook, NY

<sup>‡</sup>Department of Emergency Medicine, University of Pennsylvania, Philadelphia, PA

<https://doi.org/10.1053/j.jvca.2021.08.038>

## Salvation Through Evolution

To the Editor:

We read with interest the communication by Weingart et al.<sup>1</sup> in response to the article “Simplified Algorithm for Evaluation of Perioperative Hypoxia and Hypotension (SALVATION): A Practical Echo-guided Approach Proposal.”<sup>2</sup> We are thankful to the authors for their review, insightful remarks, and thorough attention to our article. Emergency medicine physicians were the earliest adopters of point-of-care ultrasound (POCUS), paving the way for diversification and adoption of this technology across multiple specialties. We also acknowledge that Weingart et al. are the pioneers in developing and establishing the Rapid Ultrasound for Shock and Hypotension (RUSH) examination protocol<sup>3</sup> and applaud their efforts in this regard. Their simplified algorithm has been the source of guidance and education for numerous derivative protocols, SALVATION being one of them.

Technologic innovations have blurred specialty lines. For example, transesophageal echocardiography (TEE) was developed and introduced in the clinical arena by cardiologists; its intraoperative applications were adopted and since have been furthered by anesthesiologists.<sup>4</sup> Whereas it is based on the same physical principles, exclusive training and image acquisition protocols were developed de novo for perioperative TEE imaging for anesthesiologists.<sup>5</sup> Despite the similarities, the clinical context of perioperative TEE imaging is different from the premise of an outpatient TEE examination, and competence in perioperative TEE imaging is recognized as an

DOI of original article: <http://dx.doi.org/10.1053/j.jvca.2021.08.038>.



exclusive skill set.<sup>6</sup> Adoption of regional anesthesia for pain management by the emergency room (ER) physicians is another such example. Whereas these techniques traditionally were considered exclusive to anesthesiologists, they are practiced widely by ER physicians. There are existing and entrenched protocols of education and training in anesthesia in regional techniques.<sup>7</sup> However, at a societal level, ER physicians are also in the process of developing training and educational curricula specifically for fully trained and in-training ER physicians.<sup>8-10</sup>

These are all welcome developments and demonstrate that these techniques have a broad-based application in clinical protocols, and curricula are evolving to address the diverse educational and training backgrounds of practicing physicians. With limited crossover of literature awareness across specialty lines, it also is useful to reintroduce vital information/techniques with a specialty-specific clinical context. As pointed out by the authors, we acknowledge the value of the established RUSH protocol in the ER and critical care setting. Recognizing that POCUS is a relatively nascent technique in anesthesiology, we have attempted to contextualize the use of POCUS in the perioperative setting, with emphasis on the pathophysiology. The efficacy of SALVATION protocol in the perioperative arena remains to be established in future studies. Since training and educational backgrounds can vary, the context of information is of vital importance in establishing relevance and educational value. We believe that this is evolution and not reinvention. The pioneering work done by the authors to develop the RUSH protocol now is evolving to address a broad-based audience across disciplines and calls for joint multidisciplinary training guidelines.

### Declaration of Competing Interest

Authors report no conflict of interest.

### References

- 1 Murali S, Weingart S, Qasim Z. A rush to salvation? Practical and tested ultrasound-guided evaluations of critically ill patients already exist. *J Cardiothorac Vasc Anesth* 2021;35:3848–9.
- 2 Fatima H, Amador Y, Walsh DP, et al. Simplified algorithm for evaluation of perioperative hypoxia and hypotension (SALVATION): A practical echo-guided approach proposal. *J Cardiothorac Vasc Anesth* 2021;35:2273–82.
- 3 Weingart S, Duque D, Nelseon B. Rapid ultrasound for shock and hypotension. *EMCrit.org* Project; 2008. Available at: <https://emcrit.org/rush-exam/original-rush-article/AccessedAugust 23, 2021>.
- 4 Mahmood F, Sherman SK. Perioperative transesophageal echocardiography: current status and future directions. *Heart* 2016;102:1159–67.
- 5 Shanewise JS, Cheung AT, Aronson S, et al. ASE/SCA guidelines for performing a comprehensive intraoperative multiplane transesophageal echocardiography examination: Recommendations of the American Society of Echocardiography Council for Intraoperative Echocardiography and the Society of Cardiovascular Anesthesiologists Task Force for Certification in Perioperative Transesophageal Echocardiography. *J Am Soc Echocardiogr* 1999;12:884–900.
- 6 Mahmood F, Matyal R, Skubas N, et al. Perioperative ultrasound training in anesthesiology: A call to action. *Anesth Analg* 2016;122:1794–804.
- 7 Sites BD, Chan VW, Neal JM, et al. The American Society of Regional Anesthesia and Pain Medicine and the European Society of Regional Anaesthesia and Pain Therapy Joint Committee recommendations for education and training in ultrasound-guided regional anesthesia. *Reg Anesth Pain Med* 2009;34:40–6.
- 8 Wiercigroch D, Ben-Yakov M, Porplycia D, et al. Regional anesthesia in Canadian emergency departments: Emergency physician practices, perspectives, and barriers to use. *CJEM* 2020;22:499–503.
- 9 Herring AA. Bringing ultrasound-guided regional anesthesia to emergency medicine. *AEM Educ Train* 2017;1:165.
- 10 Tucker RV, Peterson WJ, Mink JT, et al. Defining an ultrasound-guided regional anesthesia curriculum for emergency medicine. *AEM Educ Train* 2021;5:e10557.

Robina Matyal, MD\*

Huma Fatima, MD

Feroze Mahmood, MD

*Department of Anesthesia, Critical Care and Pain Medicine, Beth Israel Deaconess Medical Centre, Harvard Medical School, Boston, MA*

<https://doi.org/10.1053/j.jvca.2021.08.042>