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https://doi.org/10.1053/j.jvca.2021.05.006

A RUSH to SALVATION? Practical and Tested Ultrasound-Guided Evaluations of Critically Ill Patients Already Exist

To the Editors:

We read with great enthusiasm the recently published article, "Simplified Algorithm for Evaluation of Perioperative Hypoxia and Hypotension (SALVATION): A Practical Echo-guided Approach Proposal," by Fatima et al.[1] We applaud the authors' in-depth evaluation of a sequence of ultrasound images to assess for abnormal pathologies as sources of hypoxia and hypotension in the perioperative setting. The algorithm assesses for the presence or absence of critical pathology such as obstruction, extravascular blood, and pneumothorax. Their protocol includes a comprehensive cardiac evaluation in addition to obtaining imaging of the inferior vena cava, the pleura/lung, and the peritoneum. The authors argued that as opposed to other algorithms, theirs more comprehensively incorporates symptomatology and the underlying pathophysiology.

DOI of original article: http://dx.doi.org/10.1053/j.jvca.2021.04.009.

However, the SALVATION algorithm is not new. First introduced in 2006 and published in 2008 by Weingart et al., the "Rapid Ultrasound for Shock and Hypotension (RUSH)" examination uses the same series and sequence of ultrasound windows.[2] The RUSH examination includes an evaluation of the heart, inferior vena cava, peritoneal cavity, aorta, and lungs and is meant to help determine the cause of shock in an undifferentiated patient. The examination is indicated in a symptomatic, critically ill patient (typically manifesting the clinical symptoms and signs of hypoxia, hypotension, or both), with its primary purpose being the rapid identification of life-threatening pathology. Treatment then can be directed as indicated.

Figure 1 demonstrates how the SALVATION examination mirrors the RUSH examination with regard to probe positioning and sequence of evaluation. Weingart et al. originally described the following steps: assessment of the heart to evaluate for pericardial tamponade, right ventricular enlargement, and global LV function; inferior vena cava view allowing for rapid assessment of relative hypovolemia or presence of obstructive pathology; the FAST examination to search for intraabdominal free fluid; axial views of the aorta to help rule out abdominal aortic aneurysms; and finally, a pulmonary ultrasound to rule out tension pneumothorax as a cause of hypotension and/or hypoxia.[2] The examination has evolved to include pelvic and deep-vein thrombosis evaluation if clinical suspicion dictates these.[3]

Since its inception, the RUSH examination has been adopted broadly by the emergency medicine and critical care communities.[4-7] Ample evidence supports the effectiveness of training and skills retention through bedside teaching of learners at varying levels of training.[7-9] Its efficacy in point-of-care use for evaluating undifferentiated shock has been well-studied in the emergency, trauma, and critical care environments.[10-12] Stickles et al., in their systematic review, demonstrated that the RUSH examination performed better when used to rule in causes of shock (as opposed to excluding specific diagnoses) and accurately ruled out obstructive shock.[11]

Although we commend the authors on developing a comprehensive ultrasound protocol, we advise against just reinventing the wheel. The authors listed in their limitations the lack of objective metrics to determine efficacy, achievement of competency, and transferability. We would argue these aspects already have been determined for the RUSH protocol. Creating a new, yet very similar, protocol risks generating confusion and can make adoption more difficult. A more useful discussion, in our opinion, would be to study the role of an established protocol like RUSH in the operating room and perioperative environment. If found to be beneficial, it then can be promoted for adoption by more members of the medical community.

Conflict of Interest

Dr. Weingart and his colleagues are credited with creating the RUSH protocol. There are no other conflicts of interest for the authors.

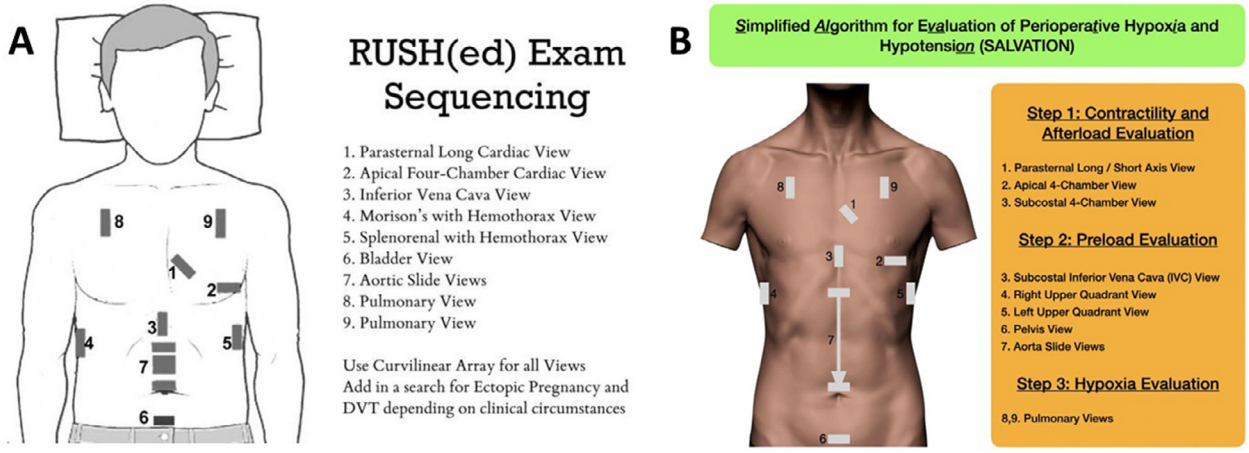

Fig 1. (A) Rapid Ultrasound for Shock and Hypotension (RUSH). (B) Simplified algorithm for evaluation of perioperative hypoxia and hypotension (SALVATION).

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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.[1] in response to the article "Simplified Algorithm for Evaluation of Perioperative Hypoxia and Hypotension (SALVATION): A Practical Echo-guided Approach Proposal."[2] 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[3] 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.[4] 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.[5] 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.