Authors' Response to Letter to the Editor by Allen *et al* regarding Joint statement from the American College of Surgeons Committee on Trauma (ACS COT) and the American College of Emergency Physicians (ACEP) regarding the clinical use of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) by Brenner *et al*

We appreciate the thoughts and comments provided by Allen *et al* in their correspondence to the editor. The care of the trauma patient requires an interdisciplinary approach. The American College of Surgeons Committee on Trauma (ACS COT), along with its partner organizations, such as American College of Emergency Physicians (ACEP), has diligently tried to make trauma center criteria centered on the patient and the multidisciplinary team concept. Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) has emerged as a potential technique for controlling previously lethal truncal hemorrhage in trauma patients, but its optimal role in the management of hemorrhagic shock has yet to be established. The purpose of the ACS and ACEP joint statement is to keep the focus on patient safety in the use of this device. We believe there is insufficient evidence to support the widespread adoption of REBOA[1] in both civilian trauma centers and non-trauma centers where there is *not immediate access to definitive hemorrhage control*. This stance is due to concerns of the negative consequences of (1) prolonged ischemia and (2) delay of hemorrhage control as documented in published studies.[2] In addition, the Joint Trauma Systems Clinical Practice Guideline notes, '… there is currently a paucity of evidence to guide the specific length of time that the aorta may be safely occluded, limiting its application to locations where a surgical team is immediately available'.[3] The complications of REBOA documented in the joint ACS COT and ACEP statement are real, and in and of themselves can be life threatening.

Regarding the authors' statement that REBOA 'may have a role in life-saving hemorrhage control at non-level 1 trauma centers that are part of a robust trauma system and can move patients to the operating or interventional suite within a reasonable period of time'. There is a lack of current data to define 'reasonable period of time' in which prolonged ischemia results in amputation and subsequent decompensation and mortality, which are reported complications of this device even within trauma centers. There are no data supporting safe interfacility ground or air transports of patients with REBOA at this time. Additionally, even in busy trauma centers, REBOA is rarely placed (1 January 2016 to 31 March 2017 the Trauma Quality Improvement Program/National Trauma Data Bank data on REBOA showed 65 centers entered REBOA patients with a median number of REBOA placements per center during this time period being 1). Given the infrequency of placement, skills maintenance is a significant issue. From a patient safety perspective, there is simply not enough known at this time to support the expansion of and widespread use of REBOA. As noted in our joint statement, we support continued research before widespread deployment in the civilian sector.

The authors noted that educational programs have emerged for REBOA placement and are designed exclusively for surgeons. In fact, these courses are designed to ensure *anyone* placing REBOA is appropriately trained. We are aware of some courses being taught in 1–2 hours, which is not sufficient to gain experience necessary for placement in practice. We support implementation of integrated competency-based REBOA programs that include rigorous educational standards, carefully studied for effectiveness and support real-time process improvement.

The authors note that they strongly believe that with appropriate training emergency physicians can develop skills necessary to appropriately place a REBOA catheter. We do not dispute that anyone can be taught to place the catheter with proper training, but this is not just another 'tool in the toolbox'. Rather, more appropriate questions are, even if taught to place it, under what clinical, ethical, and system-based circumstances should it be placed, if at all? Thus, we worked to come to consensus with a statement that focuses on patient safety. Most of the current clinical literature on REBOA has been equivocal, with some studies demonstrating survival benefit, while others showing it may actually worsen mortality. To date, there has only been one prospective clinical study, which showed no difference in survival compared with open aortic occlusion.[4]

The authors note that the ACS COT and ACEP joint statement sends a 'confusing and contradictory message' regarding military training providing a pathway for civilian emergency physicians to place REBOA. Both organizations greatly value and respect military service and experience. Our joint statement references the military pathway to acknowledge the experience emergency physicians obtained with REBOA during deployment and to provide a clear pathway for their continued REBOA use within an organized civilian trauma system.

We made these recommendations with consensus among the leadership of both organizations based on current available best evidence. We recognize these recommendations are both inconvenient and demanding for surgeons and require some professional self-restraint by emergency physicians. However, we believe that during this critical period of introduction of the device into civilian practice our statement fosters judicious use of REBOA in a manner that is safest for patients. In closing, we support an inclusive team approach, including both emergency physicians and surgeons, who have sufficient training in REBOA placement for patients cared for in well-developed, coordinated trauma systems. We strongly support ongoing research and performance improvement efforts to expand the evidence and further clarification of the indications, contraindications, and optimal use of REBOA in patients with non-compressible torso hemorrhage. We urge caution in widespread use until such time as this information is forthcoming.

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Contributors All of the authors contributed to this letter. This letter was drafted by DGP and CSK. All other authors reviewed and provided revision and input.

Funding This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Disclaimer The statements and views expressed are those of the authors and do not reflect the official policy or position of the United States Army or the Department of Defense.

Competing interests MB reports grants from Department of Defense, during the conduct of the study; and stock options from Prytime Medical Inc. outside the submitted work.

Provenance and peer review Commissioned; internally peer reviewed.

OPEN ACCESS

To cite Perina DG, Kang CS, Bulger EM, *et al*. *Trauma Surg Acute Care Open* 2018;**3**.

Received 17 February 2018
Accepted 19 February 2018

► http://dx.doi.org/10.1136/tsaco-2018-000168

Trauma Surg Acute Care Open 2018;**3**. doi:10.1136/tsaco-2018-000172

REFERENCES

1 Brenner M, Bulger EM, Perina DG, Henry S, Kang CS, Rotondo MF, Chang MC, Weireter LJ, Coburn M, Winchell RJ, *et al*. Joint statement from the American College of Surgeons Committee on Trauma (ACS COT) and the American College of Emergency Physicians (ACEP) regarding the clinical use of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA). *Trauma Surgery & Acute Care Open* 2018;3:e000154–3.
2 Inoue J, Shiraishi A, Yoshiyuki A, Haruta K, Matsui H, Otomo Y. Resuscitative endovascular balloon occlusion of the aorta might be dangerous in patients with severe torso trauma: A propensity score analysis. *J Trauma Acute Care Surg* 2016;80:559–67.
3 Pasley J, Cannon J, Glaser J. Joint Trauma System Clinical Practice Guideline (JTS CPG). http://www.usaisr.amedd.army.mil/cpgs/REBOA_%2006Jul2017CORRECTED.pdf (accessed 29 Jan 2018).
4 Norii T, Crandall C, Terasaka Y. Survival of severe blunt trauma patients treated with resuscitative endovascular balloon occlusion of the aorta compared with propensity score-adjusted untreated patients. *J Trauma Acute Care Surg* 2015;78:721–8.