CORRESPONDENCE

Is ultrasound assessment of the inferior vena cava for fluid responsiveness unlikely to be helpful, or is it just too early to say?

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To the Editor,

The review by Dr. Millington¹ entitled “Ultrasound assessment of the inferior vena cava for fluid responsiveness: easy, fun, but unlikely to be helpful” published in the *Journal* concluded that “[inferior vena cava] IVC analysis will not be helpful for a large majority of patients and should therefore be abandoned in most situations”. There are two reasons supporting the conclusion of this article. One is that many factors cause unreliable measurements of the IVC; the other is the overall poor evidence-base. Nevertheless, we argue that it is too early to abandon IVC assessment and offer the following points as counter argument.

We believe the technical limitations mentioned by Dr. Millington are likely being addressed in most clinical situations. When we do an ultrasound assessment of the IVC, we usually consider three steps to optimize it.

First, we ensure that the image acquired is good quality and has a standardized view. For example, Dr. Millington referred to errors in differentiating the IVC from the aorta. We avoid this by identifying both the confluence of the hepatic vein into the IVC and the IVC into the right atrium.² In addition, the wall thickness and pulsation of the aorta, along with Doppler assessment of pulsatile flow also help us to avoid confusing the aorta with the IVC. The anterior and posterior walls of the IVC should be clearly

identified with the imaging plane passing through the IVC's largest diameter.

Second, measurements must be made precisely. We are careful to avoid problems caused by the vessel flare near the cavo-atrial junction³ by choosing an IVC measurement point 1–3 cm (not 1–2 cm) from the right atrium. If M-mode is used, the M-mode line must be perfectly perpendicular to the long axis of the vessel.

Third, a standardized approach is used to assess the validity of all IVC exams.² We recognize the criteria for IVC variability to assess fluid responsiveness (FR) are different for patients breathing spontaneously and those on positive pressure ventilation. In addition, we incorporate right heart function, tricuspid regurgitation, the IVC short-axis shape, and intra-abdominal pressures into our decision-making. Since these factors were poorly described in the sources cited^{4,5} by Dr. Millington, it calls into question the validity of those authors' conclusions.

We are aware that ultrasound assessment of the IVC can be operator-dependent. While we do see performance improvements with increased echocardiography expertise, we recognize that there is inconsistent performance across different IVC measurements in early learners (Figure). The IVC assessment is a non-invasive imaging technique that can potentially inform physicians about intravascular volume status and FR by directly visualizing the underlying physiology. Nevertheless, IVC assessment still needs careful attention in practice and further research focusing on standardized exams, optimal IVC and FR criteria, formalized training programs, and definition of competency. Until then, we argue that it's too early to abandon the IVC.

This letter is accompanied by a reply. Please see Can J Anesth 2020; 67: this issue.

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Figure Performance of ultrasound (US) operators with different levels of experience on the various measurements of the IVC. The data in this figure were obtained from 19 patients in a general critical care unit of an academic teaching hospital. Twelve intensivists with different levels of training in critical-care US performed four different IVC measurements, including IVC diameter through subcostal and liver view, IVC area in subcostal short-axis view, and IVC distensibility using M-mode US. The Pearson correlation (r value) among operators with different levels measuring four parameters of IVC is shown using different orange shading. The blocks with a dark orange background indicate a strongly coefficient correlation ($r = 0.8-1$) and blocks with a light orange background indicate a moderately coefficient correlation ($r = 0.6-0.8$). The various experience of the operators is displayed with different green shading: advanced-experts in dark green with a number of 1 to 2, primary-experts in middle green with a number of 3 to 6, and novices in light green with a number of 7 to 12. The four measurements of IVC are in different areas. Data in the left lower and right upper triangle area in the upper part are the measurements of IVC diameter through the subcostal IVC long-axis view and the IVC diameter through the liver. Data in the left lower and right upper triangle area in the lower part are the IVC areas through the subcostal IVC short-axis view and distensibility of the IVC, respectively

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