

THE IVC DON'T LIE.

PHILIPPE ROLA

JAN 28, 2019

- I run an urban community hospital ICU in Montreal.
- I'm a #FOAMed supporter, @ThinkingCC on twitter and blog at thinkingcriticalcare.com.
- I dislike recipe-based medicine.

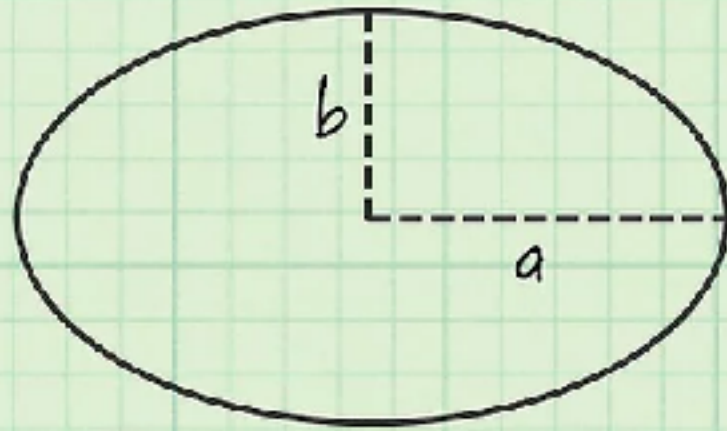


thinking critical care

A BLOG FOR THINKING DOCS: BLENDING GOOD EVIDENCE, PHYSIOLOGY, COMMON SENSE, AND APPLYING IT
AT THE BEDSIDE!

COI - NONE!

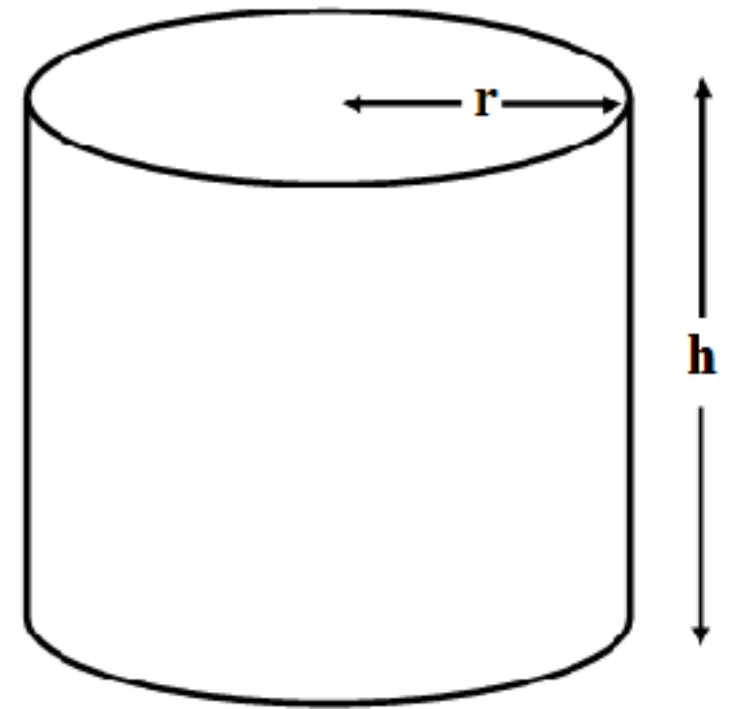
THE IVC



$$\text{Area} = a \times b \times \pi$$

$$A_{\circ} = 3 \times 5 \times 3.14$$
$$= 47.1 \text{ unit}^2$$

$$V = \pi r^2 h$$



Evidence tables: Inferior vena cava collapsibility index (IVC-CI)

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Open Access Original
Article

DOI: 10.7759/cureus.1025

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SA

Correlation of IVC Diameter and Collapsibility Index With Central Venous Pressure in the Assessment of Intravascular Volume in Critically Ill Patients

DP. Evidence tables: Inferior vena cava
OPUS 12 Scientist 2012;6(1):3-5.

P. A. Stawicki, MD, Department of
are, Trauma, and Burn, The Ohio State
e, Columbus, OH 43210 USA. Email:

ORIGINAL ARTICLE

Bali Journal of Anesthesiology (BJOA) 2017, Volume 1, Number 1: 7-9
E-ISSN: 2549-2276

Central venous pressure correlates with
inferior vena cava collapsibility index in
patients treated in intensive care unit



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Inferior vena cava diameter and collapsibility index: A practical non-invasive evaluation of intravascular fluid volume in critically-III patients

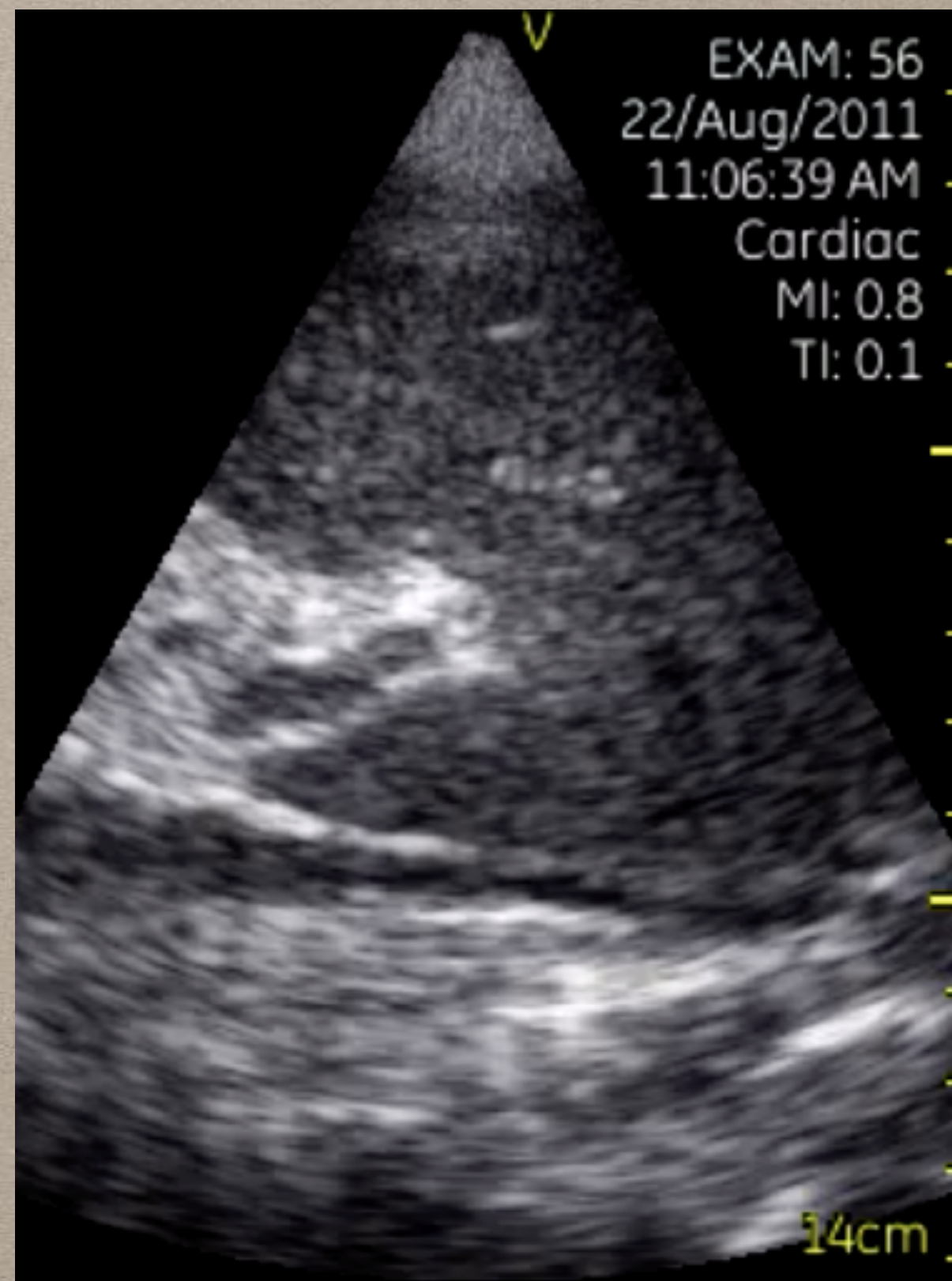
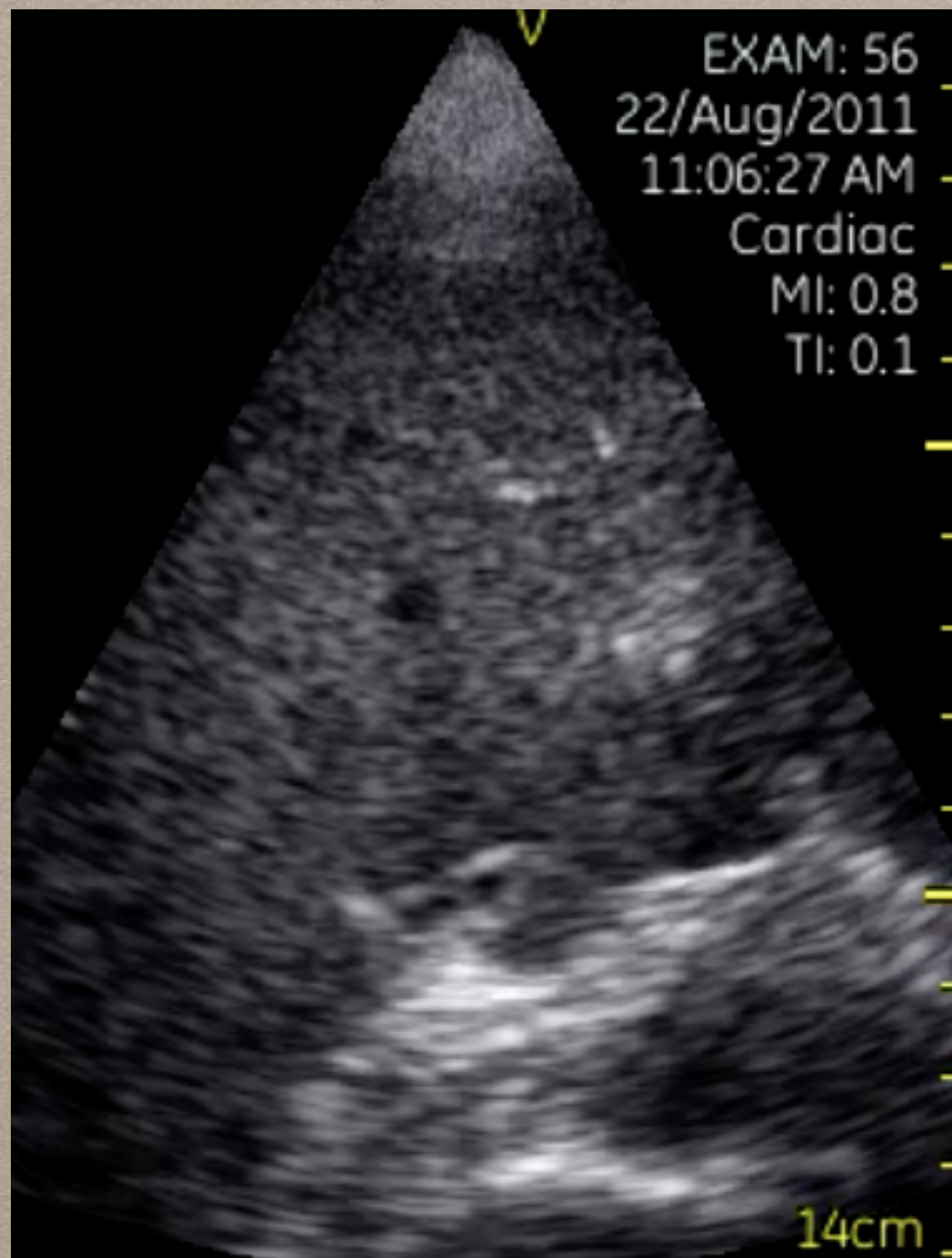
ABSTRACT

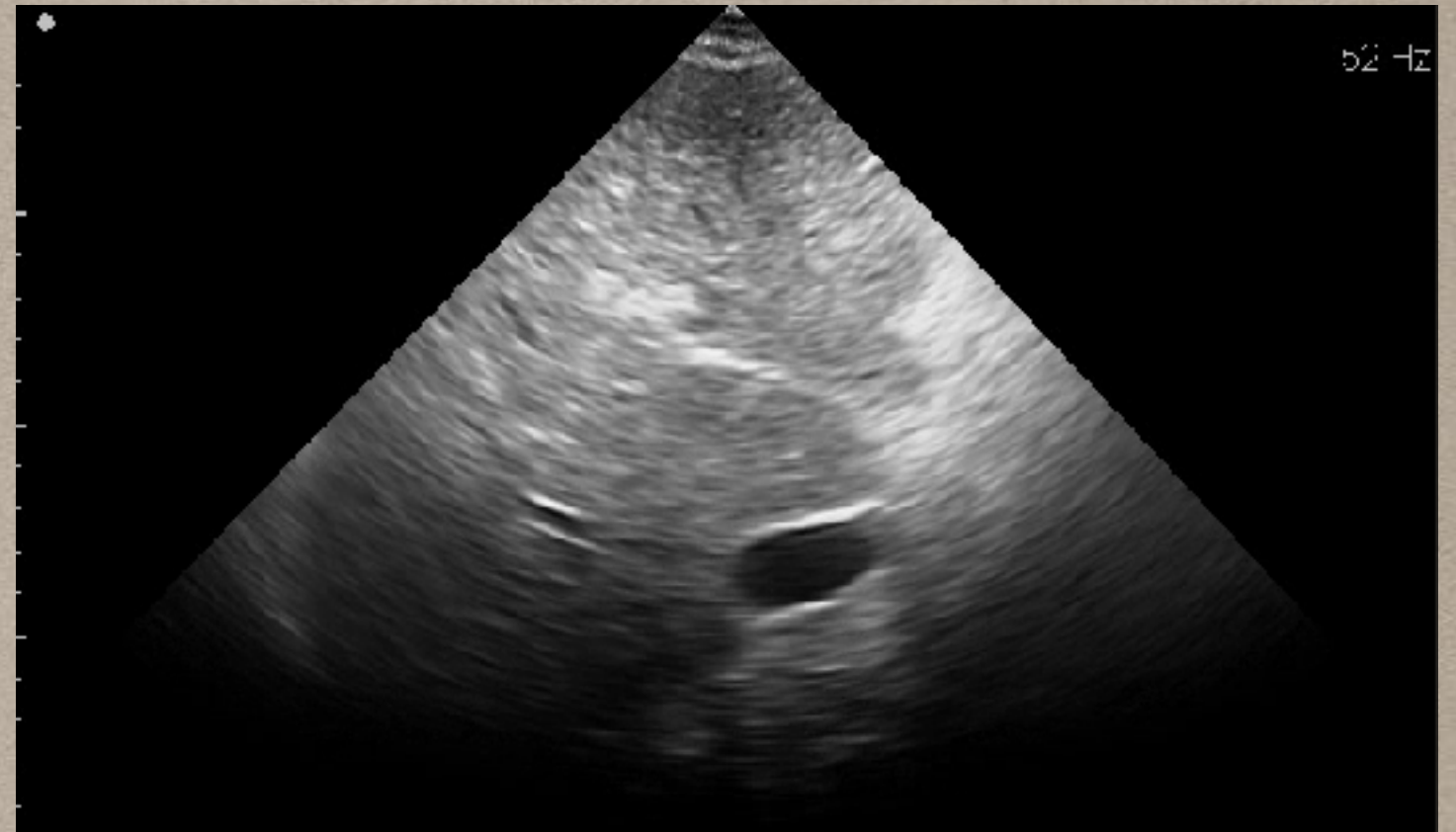
Background: Intravascular vo
in monitoring the patients tr

Article in [Journal of the Medical Association of Thailand = Chotmai het thangphaet](#) 96 Suppl 3(Suppl 3):S14-22 · March 2013 with 272 Reads
Source: [PubMed](#)

SO HOW SHOULD WE DO IT?

- **Short axis view from RA to sub-hepatic IVC.**
- **Long axis across same span.**
- **Eyeball the IVC for size and variation.**
- **Classify broadly (empty-mid-full...maybe really full)**





52 Hz

Full IVC in SAX with "Staghorn" appearance



Philippe Rola @ThinkingCC · Dec 23

#POCUS poll 1 of 2, please answer both and RT! Is the ivc below:

71% Full-ish

7% Normal-ish

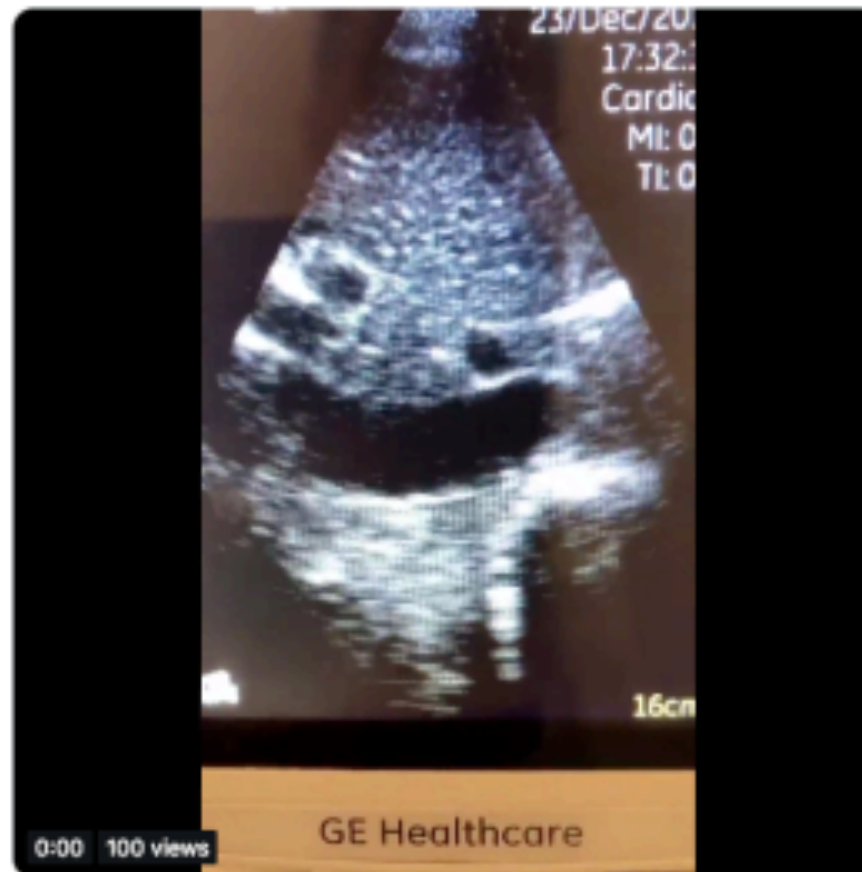
2% Empty-ish

20% Can't tell

55 votes · 1 day left



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Re:above

24% Full-ish

18% Normal-ish

21% Empty-ish

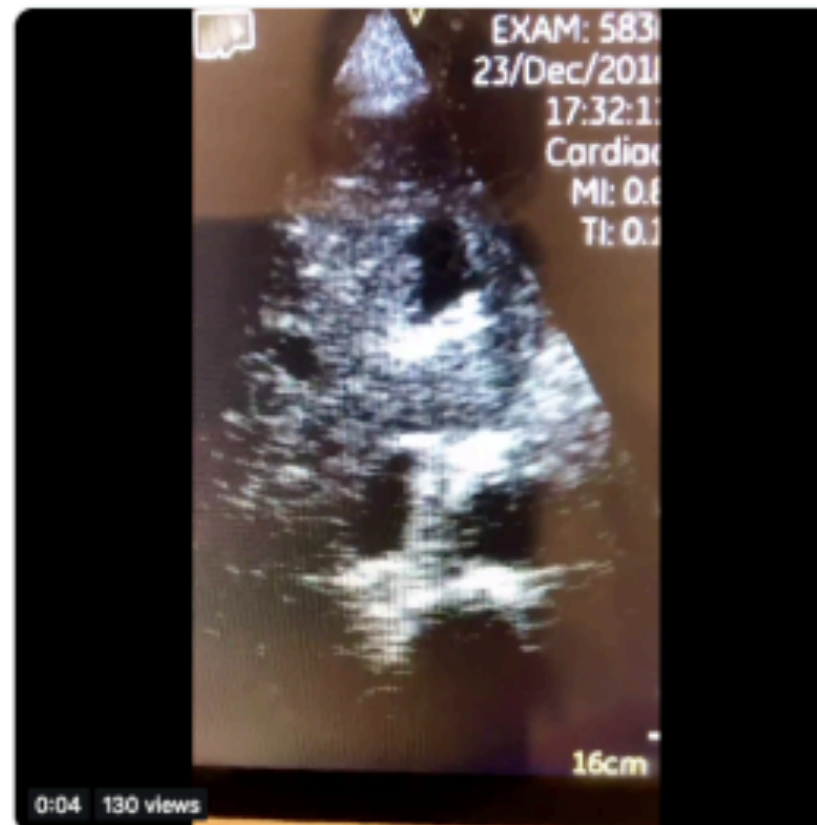
37% Can't tell

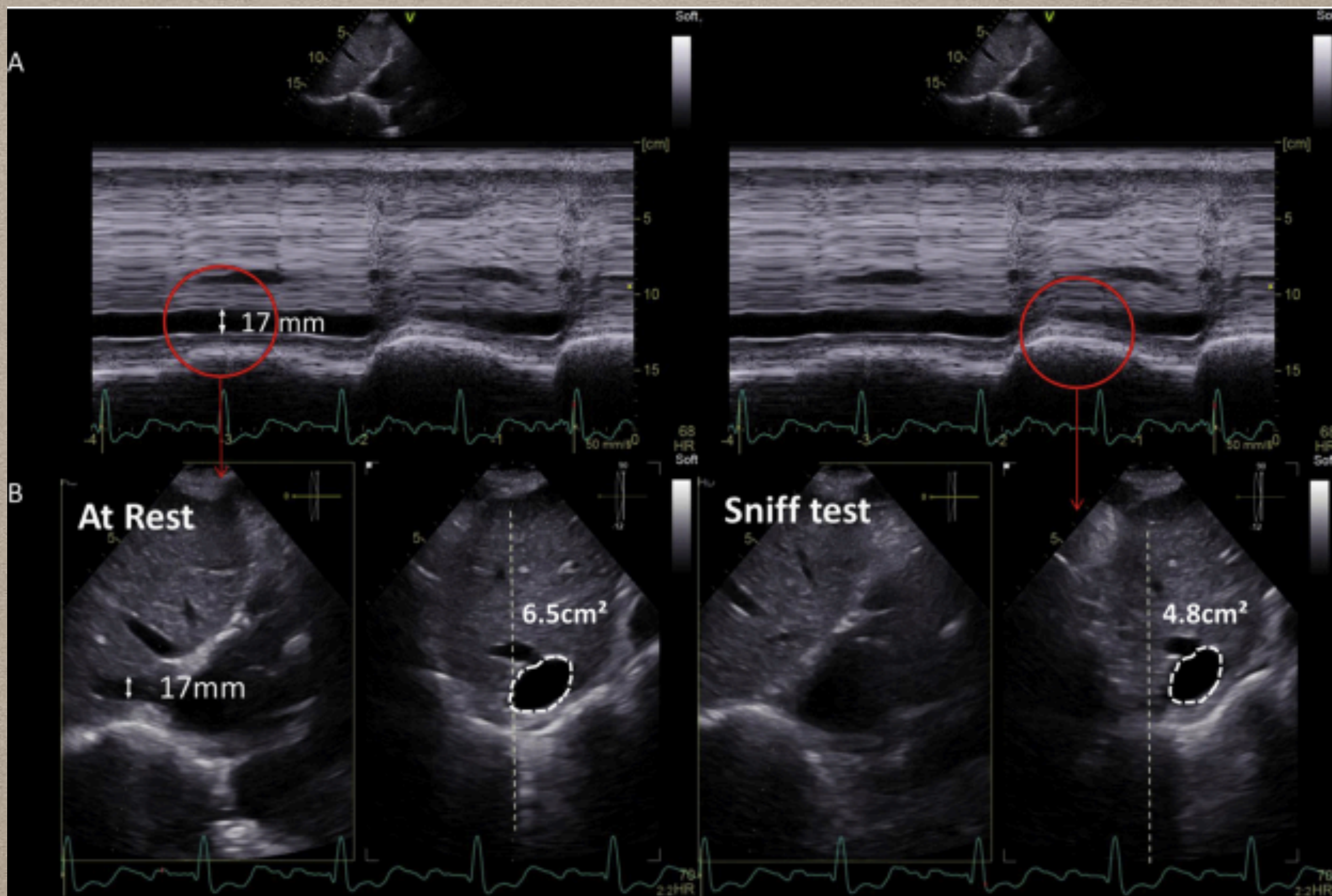
34 votes • Final results



Philippe Rola @ThinkingCC · Dec 23

And now the next?







Three-Dimensional Inferior Vena Cava for Assessing Central Venous Pressure in Patients with Cardiogenic Shock



Raphaëlle Huguet, MD, Damien Fard, MD, Thomas d'Humieres, MD, Ophelie Brault-Meslin, MD, Laureline Faivre, MD, Louis Nahory, MD, Jean-Luc Dubois-Randé, MD, PhD, Julien Ternacle, MD, Leopold Oliver, MD, and Pascal Lim, MD, PhD, *Creteil, France*

Background: The inferior vena cava (IVC) has a complex three-dimensional (3D) shape, but measurements used to estimate central venous pressure (CVP) remain based on two-dimensional (2D) echocardiographic imaging. The aim of this study was to investigate the accuracy of IVC size and collapsibility index obtained by 3D echocardiography for assessing CVP in patients with cardiogenic shock.

Methods: Eighty consecutive echocardiographic examinations performed in 33 patients (mean age, 72 ± 15 years; mean left ventricular ejection fraction, $19 \pm 10\%$) admitted for cardiogenic shock were prospectively included. Two-dimensional and 3D images of the IVC were acquired simultaneously with invasive measurement of CVP, both at rest and during a sniff test. IVC diameters, 3D IVC area, and IVC collapsibility index (IVCCI) were assessed. The eccentricity index was computed from 3D data as the ratio of maximum to minimum IVC diameter. A cutoff value of 10 mm Hg for CVP defined patients with euolemic hemodynamic status.

Results: At rest, IVC diameter averaged 23 ± 7 mm by 2D imaging and $25 \pm 8 \times 19 \pm 7$ mm by 3D imaging. The IVC had an eccentric shape (eccentricity index = 1.3) that increased when CVP was ≤ 10 mm Hg and during the sniff test ($P < .001$). IVC measurements by 2D and 3D imaging were correlated with CVP. The best correlation was obtained with IVCCI derived from 2D diameters ($R = -0.69$) and 3D area of 50% for IVCCI, 11 examinations were misclassified by 2D imaging and intraobserver reproducibility for IVC area was $7 \pm 6\%$ and $5 \pm 3\%$, respectively.

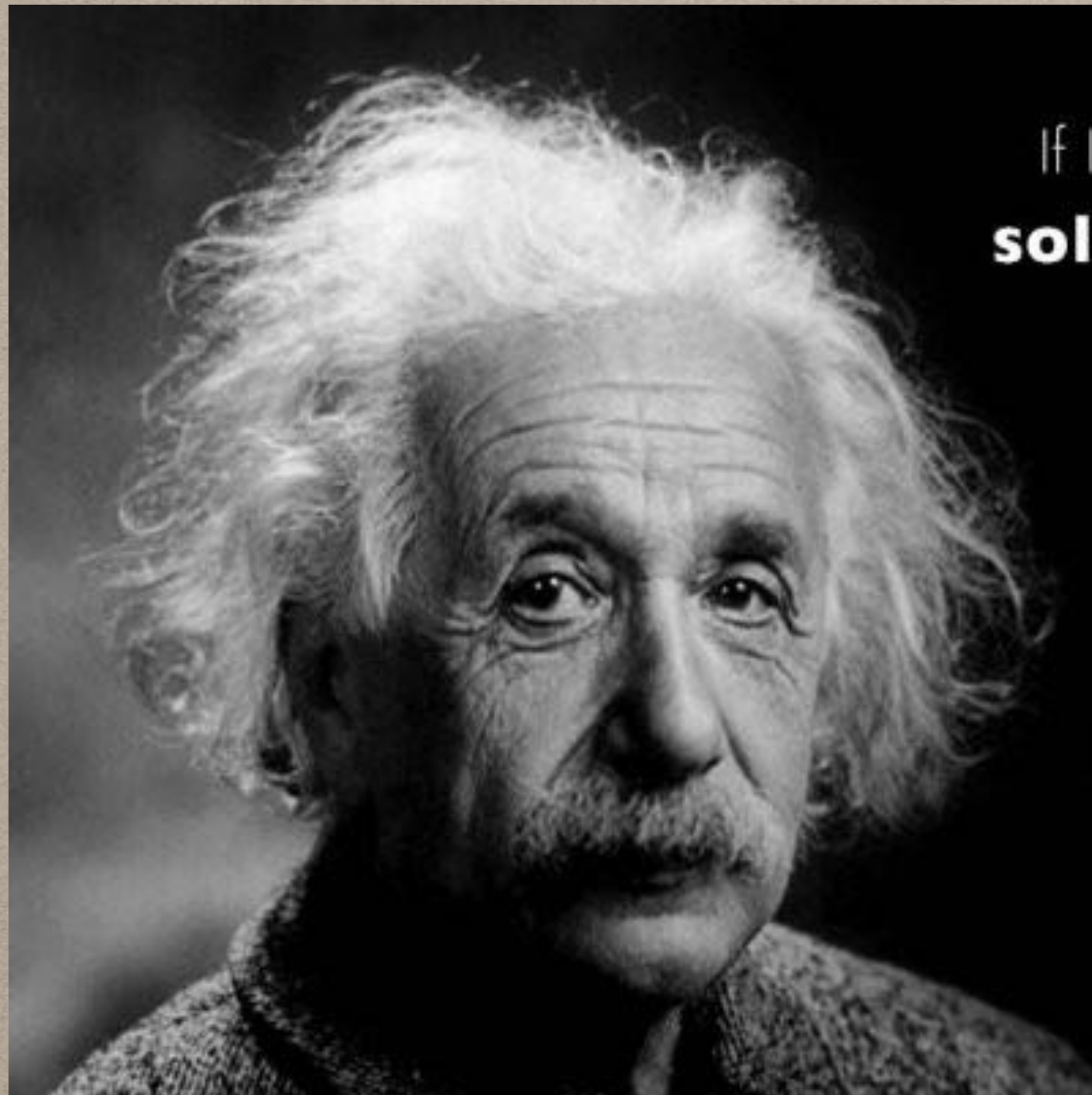
Conclusions: In patients with cardiogenic shock, IVCCI from area by 3D echocardiography is accurate to evaluate CVP. (J Am Soc Echocardiogr 2018;31:1034-43.)

Clinical Implications

Compared with standard 2D echocardiography, 3D IVC imaging provided a better assessment of IVC shape and seemed to be more accurate to estimate CVP. In our population, IVCCI derived from 3D area was best correlated with invasive CVP, and the cutoff of 50% seems to be particularly accurate to identify low and high CVP values. In the setting of cardiogenic shock, the correlation between changes in IVCCI and in CVP may be particularly interesting for adapting fluid and diuretic doses. Furthermore, reproducibility of 3D IVC area measurement was acceptable for clinical use.

ONE VIEW IS NO VIEW!

- **The IVC is my friend**
- **I don't care about volume responsiveness (...or at least not much.)**



If I had an hour to
solve a problem and my
life depended on it,
I would use the
first 55 minutes
determining the
proper questions to ask.

Albert Einstein

ASK THE RIGHT QUESTIONS

or look like a muppet



SO WHAT ARE THE RIGHT QUESTIONS?

- **Do I have a massive PE? (not unless I'm full+)**
- **Do I have tamponade? (not unless I'm full+)**
- **Do I have a tension pneumothorax? (not if I'm not full+)**
- **Should I stop giving fluids? (if I'm full, most probably, because I'm probably not volume tolerant)**
- **Do I need to check for venous hypertension? (if I'm full, yes!)**
- **Am I volume depleted? (if I'm really small, maybe, but you have to correlate w/cardiac POCUS to r/o hyperdynamic state and physical exam to r/o significant vasodilation)**
- **Am I volume responsive? (if I'm small or mid-sized with respiratory variation, probably)**

THE PROBLEM WITH THE QUEST FOR FLUID RESPONSIVENESS...



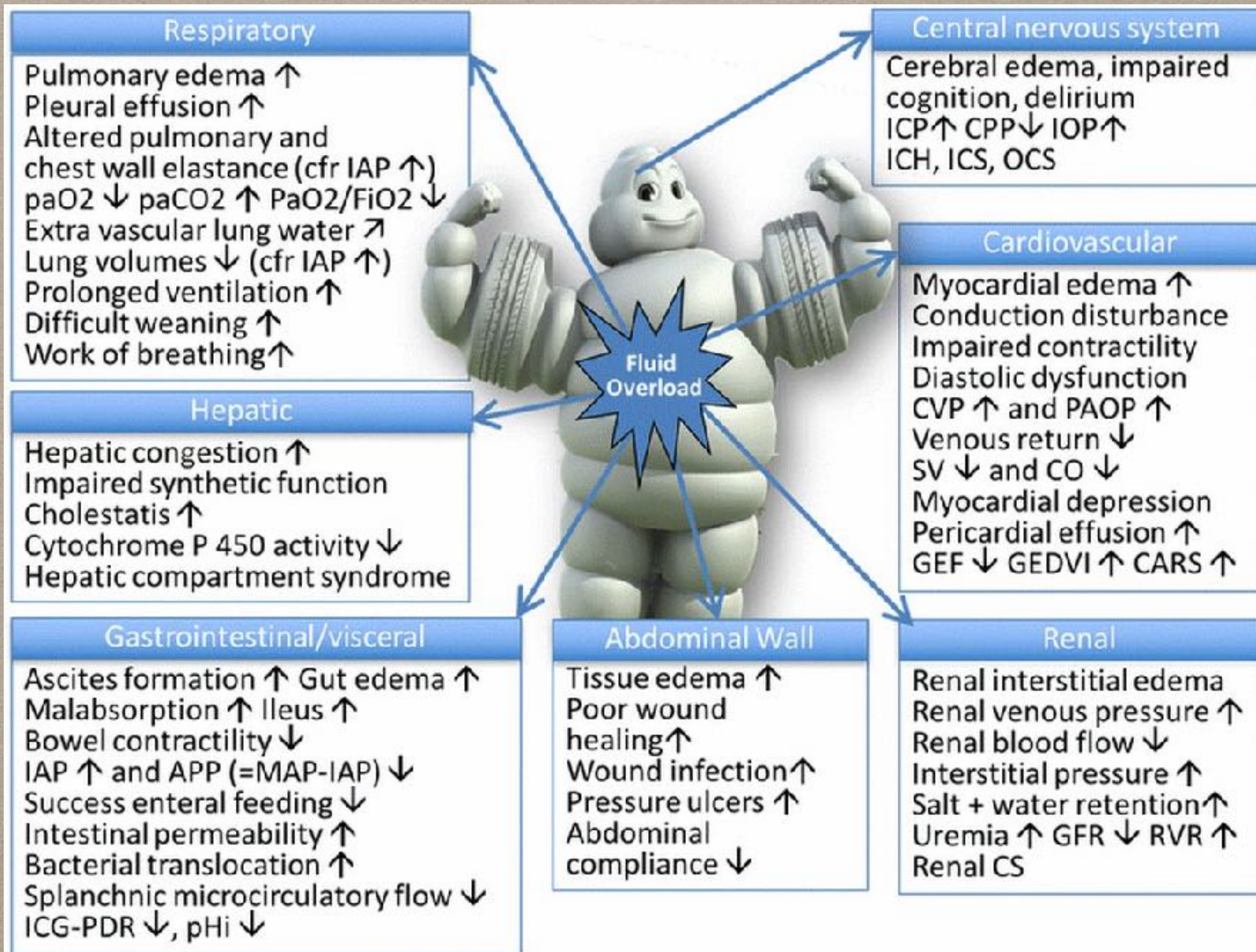
FLUID RESPONSIVENESS

YOU HAVE BEEN



TERMINATED

memecrunch.com



2 COGNITIVE PARADIGMS:

**FLUIDS ARE BETTER THAN
PRESSORS.**

**ALL SHOCK BENEFITS FROM
MAXIMIZING CARDIAC OUTPUT.**

TAKE-HOME MESSAGES:

THE IVC IS YOUR FRIEND TOO.

**JUST ASK IT THE RIGHT
QUESTIONS.**

LESS IS OFTEN MORE.

QUESTIONS?

philipperola@gmail.com

Thank you!