SAH & RNSH
Critical Care Course Manual 2011:
Arrest
Shock
Breathlessness

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With thanks to:

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Adapted from:

· *Whole Body Ultrasonography in the Critically Ill,* Daniel Lichtenstein, 2010
· *Echo Made Easy,* Sam Kaddoura
· *Emergency Ultrasound Made Easy 2nd ed,* Justin Bowra & Russell McLaughlin, 2011
· *Applied Physics & Technology of Diagnostic Ultrasound,* Roger Gent, 1997
· *Basic Echocardiography for Acute Management Course Manual,* Cliff Reid
· *Critical Care US Manual,* Justin Bowra

Contents

Course timetable

7.45	Registration
8am	1. Welcome & intro: what is critical care US?
8.30am	2. Image optimization for critical care US
9am	3. Scanning the lung: method / findings [sliding, A, B, C, effusion] / patterns of disease
9.45am	4. Scanning the IVC: volume status
10am	5. Scanning for DVT: the rule-in scan
10.30	**Break**
10.45am	6. Getting started in focused transthoracic echo: the questions and the windows
11am	7. Introduction to cardiac chambers & volume assessment
11.30	8. Pericardial effusion and tamponade, Pericardiocentesis
12.00pm	**9. PRAC 1** [120 min]: image acquisition on healthy volunteers (all faculty: 5 stations with US machines & healthy volunteers): Lung / DVT / PLAX & PSAX / subcostal heart & IVC / A4C & A2C
2pm	**Lunch**
2.30pm	10. The arrested patient: algorithm plus examples
3pm	11. The shocked patient: algorithm plus examples
3.30pm	12. The breathless patient: modified BLUE protocol plus examples
4pm	**Break**
4.15pm	13. Frequently Asked Questions
4.30	14. Pitfalls & pratfalls: F***ing up with focused US
5pm	**15. PRAC 2** [30 min]: image interpretation: stills & cineloops of pathology (all faculty, 5 stations with laptops)
5.30pm	16. Post test MCQ & feedback
6pm	Close

Introduction

Since its introduction to ED practice in the 1980s, focused ultrasound (US) has achieved widespread acceptance in the critical care environment. It has revolutionized the bedside management of a number of conditions, particularly with regard to the assessment of shock, breathlessness & fluid status.

This manual & the accompanying one day course provide an introduction to the field. They are designed for the critical care sonographer who has already achieved proficiency in basic focused US (eg FAST, AAA and basic procedures).

This course offers a mixture of lectures and practical skills sessions. The key educational objectives are:

Knowledge

To introduce participants to basic critical care US:

- o Image acquisition & interpretation in:
  - ▪ Basic echocardiography
  - ▪ IVC & volume status assessment
  - ▪ Lung US
  - ▪ DVT US
- o Synthesis of findings in the critically ill patient
- o Pitfalls & limitations of basic critical care US

Skills

To provide an opportunity to demonstrate the following US skills in the critically ill patient:
- o Image acquisition
- o Image identification
- o Synthesis of findings

What is critical care US?

- A rapid, patient-focused bedside US scan
- Two steps:
1. Rapid scan lungs / IVC / heart (curved probe) / other areas as appropriate
2. Then, after initial resuscitation, a more rigorous look at specific areas as indicated:

- Heart / Lungs / Abdomen / Leg veins

<u>Why can't I just do a TTE?</u>
Comparison of formal transthoracic echocardiography (TTE) and critical care US screen:

TTE	Critical care screen
1. Just looks at heart	1. Heart / lung / IVC
2. Cardiac probe / preset	2. Curved probe / abdo preset
3. Difficult windows	3. Simple windows
4. Slow learning curve	4. Rapid learning curve
5. Takes several minutes	5. Takes 3 minutes
6. No cardiac windows = no information	6. Works even if you can't see the heart / IVC
7. Adapted from formal TTE	7. Purpose-built & validated for critical care

Limitations of critical care US screen:

- Not a substitute for formal TTE:
    - Doesn't use M-mode or Doppler
    - Doesn't look for LV systolic function, valve disease or subtle disease
    - It includes other windows & other organs to synthesize the answer
- Algorithm: only validated in **critically unwell** patients, Not in those with minor degrees of illness (eg mild CCF)
- Patient: suboptimal position & still being resuscitated!
- Time (none!)
- ***Sonographer***
    - Image acquisition
    - Image interpretation

Therefore we need to follow certain rules… see next page.

The seven golden rules of critical care US

1. 'Resus-only': Patient must be critically unwell: shocked / breathless / peri-arrest. That's because the US signs of some of these diseases are only reliably present if <u>severe</u> eg <u>massive</u> PE, <u>severe</u> pneumonia. If formal studies are needed after resus, get them.

2. Clinical context is paramount. Make a differential diagnosis list before you switch on the machine. All data must be considered (eg FBC with Hb = 4).

3. Only ask questions that you can answer. Leave the fancy stuff (eg valve disease) to others.

4. Repeat scans are crucial during resuscitation & each time clinical picture changes.

5. 90% = 100%: Every test has its limitations. In a periarrest patient, no study will be 100% accurate. If this bothers you, don't practise critical care.

RNSH respiratory physician: 'Would you really thrombolyse a critically ill patient with suspected PE on the basis of bedside US?'

ED physician answer: 'I spent years doing just that without the benefit of US. Anything that improves my accuracy suits me fine.'

6. When in doubt, be a doctor. You were a clinician before you were a sonographer. If the clinical picture & scan findings don't agree, believe the clinical picture.

'What would I diagnose if I didn't have an US machine?'

7. A fool with a stethoscope will be a fool with an ultrasound.