Point of Care Ultrasound (2): Heart, Lung and Vascular Online Course

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Learning Outcomes

At the completion of the course the participants should be able to:

1. Discriminate the ultrasound technique for imaging of the Inferior vena cava as part of the RUSH protocol
2. Prioritise the ultrasound technique, anatomy and pathological findings for three echocardiographic windows used in the RUSH protocol
3. Differentiate the types of doppler used with ultrasound imaging and the indications for colour doppler in POCUS
4. Structure the ultrasound procedure, ultrasound anatomy and pathological findings in lung ultrasound
5. Contrast how ultrasound may be used to guide insertion of a central of a venous cannula

Summary of the e-Learning Program

The e-learning is interactive and requires the clinician to consider a series of blood gases and identify key abnormalities. The mastery quiz incorporates both formative and summative assessment components. There are 5 topics with a total course time of 8 hours.

The five topics are:

1. RUSH Protocol : Ultrasound of the Inferior Vena Cava (IVC)
2. Basic Echocardiography: PLAX Apical and Subcostal Views
3. Introduction to Doppler Ultrasound
4. Advanced Lung Ultrasound
5. Ultrasound Guided Advanced Vascular Access

Outline of the Program

1. RUSH – Rapid Ultrasound in Shock

Module summary: The Rapid Ultrasound in Shock protocol is a recently developed structured ultrasound approach for assessing patients with circulatory shock. In this topic we introduce the RUSH protocol and then focus on the ultrasound procedure for imaging the inferior vena cava, exploring the related ultrasound anatomy and the clinical application of this examination to beside clinical care in the acutely ill patient.

Interaction/Assessment:

- Iteractive Tutorial – Introduction to the RUSH Protocol
- Video eTutorial: Inferior Vena Cava
- Interactive Tutorial: Ultrasound of the Inferior Vena Cava
- Topic Quiz – Module 1

2. Basic Echocardiography

Module summary: Echocardiography is a specialised (and complex) area of ultrasound practice. It is an extremely useful method for the bedside assessment of the patient in shock allowing the clinician to assess left ventricular contractility, cardiac tamponade and to identify possible massive pulmonary embolism.

Cardiac Window – Parasternal View

In this first section we will explore one of the commonly used cardiac windows, the parasternal long axis view, and identify the related anatomy and ultrasound findings associated with decreased LV contractility.

Interaction/Assessment:

- Interactive Tutorial : The Parasternal Window : Left Ventricle
- Topic Quiz – Module 2 (a)

Cardiac Window – Subcostal (Subxiphoid) View

In this second echocardiography topic we focus on assessing the heart for pericardial effusion and the ultrasound features indicating pericardial tamponade. For this purpose we will revisit the subcostal cardiac window that was discussed with the FAST examination as this is a particularly useful method for examining the pericardial sac for pericardial fluid / blood and for identifying pericardial tamponade. The subcostal view may also be used (as a backup) should the parasternal long axis view be difficult to obtain.

Interaction/Assessment:

- Interactive Tutorial : The Subcostal Window : Pericardium
- Topic Quiz – Module 2 (b)

Cardiac Window – Apical View

In this final echocardiography topic we consider the apical view. The apical view is the possibly most technically difficult of the three cardiac views and is generally performed by clinician experienced with echocardiography. It is however a useful window for assessing the function of the right ventricle especially in the patient with unexplained shock. In these patients it is important to consider the possibility of impaired right ventricular function as a cause for the shock due to massive pulmonary embolism or right myocardial infarction. In these situations ultrasound may be used to guide therapy such as the administration of thrombolysis in the case of massive pulmonary embolism and the use of fluid and inotropes in right ventricular infarction.

Interaction/Assessment:

- Interactive Tutorial : The Apical Window : Right Ventricle
- Topic Quiz – Module 2 (c)

3. Introduction to Doppler Ultrasound

Module summary: In this topic we explore the physics behind and role of Doppler with Bedside Emergency Ultrasound. Colour Doppler is useful for examining blood flow in arteries and veins in a range of of organs and clinical circumstances. More specialised forms of Doppler such as Pulsed Wave and Continuous Wave Doppler may be used to plot velocities in a blood vessel or within the heart (for example to assess for valve stenosis).

Interaction/Assessment:

- Interactive Tutorial : Introduction to Doppler
- Topic Quiz – Module 3

4. Point of Care : Lung Ultrasound

Module summary: It is only recently that Ultrasound has been recognised as a tool for the assessment of lung pathology. In Trauma, lung ultrasound is a component of the eFAST protocol and in the patient with unexplained shock it forms an essential part of the RUSH protocol. In addition the technique can be used in patients presenting with unexplained dyspnoea, suspected pneumonia or other recurring infections, cardiogenic pulmonary edema, acute respiratory distress syndrome (ARDS) COPD/asthma and pneumothorax.

Interaction/Assessment:

- Video eTutorial: Ultrasound of the Lung
- Interactive Tutorial: Lung Ultrasound
- Topic Quiz – Module 4

5. Vascular Access Ultrasound

Module summary: One of the great headaches for clinicians working in acute care is intravenous access. For maybe 2/3 of patients this usually does not present a problem but for the other one third the issue of obtaining IV access can lead to significant delays in treatment, ties up the clinician's time for extended periods and may result in back and neck pain for the clinician. Ultrasound may be used to successfully cannulate and reduce the number of attempts to cannulate especially in difficult to cannulate patients such as those with a history of IV drug use, obesity or chronic medical illness.

Ultrasound is now used routinely to assist with central venous catheterisation. When used correctly ultrasound enables the operator to visually guide the placement of the catheter into the vein reducing the risks of injury to nearby structures and complications associated with incorrect placement of the catheter.

Interaction/Assessment:

- Interactive Tutorial – Vascular Access Ultrasound
- Topic Quiz – Module 5

6. Final Post Course Assessment - 20 mins

Final Course Quiz – POCUS (2): Lung, Cardiac, Vascular