EPWORTH RICHMOND CRITICAL CARE ECHOCARDIOGRAPHY AND ULTRASONOGRAPHY EDUCATION PROGRAM 2016

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| **DATE**  | **TOPIC** | **COURSE OBJECTIVES** |
| Introduction to TTE and basic views |
| Wk 1  | Course overview, machine care, vascular access | * Introduction to equipment CX50, machine care, vascular access.
* Introduction to US physics
* Introduction to standard 2D TTE views (PLAX, RV inflow, PSAX x 3, A4C, SC)
* Introduction to common artifacts (Propagation, Attenuation, Reflection, Scattering)

Focus on Image acquisition skills in 2D at this stage.Sono-anatomy.Basic knobology skills**Assessmen**t- hands on 2D image acquisition for basic views and MCQs on Survey monkeyReading: 1. *Echocardiography I- Where to start* (Price: Introduction to TTE)
2. *US Physics* – (Sofferman: Physics and Principles of US pg 9-13)
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| Wk 2  | Basic views overview (US waves I) |
| Wk 3 | Parasternal views (US Waves II) |
| Wk 4  | Apical views 2D (Propagation and attenuation) |
| Wk 5  | Subcostal views 2D (Reflection and scattering)  |
| Wk 6 | Review of 2D views + **ASSESSMENT**  |
| Doppler Principles and Measurements |
| Wk 7  | Doppler physics and parasternal views | * Introduction to Doppler principles and application.
* Aliasing
* Brief intro to spectral Doppler.
* Explain principles of colour Doppler and utility.

Continue to support image acquisition skills.Promote use of Doppler if 2D acquisition skills good.Enhance knobology skills if advance level.Reading: 1. *Echocardiography I- Where to start* (Price: Introduction to TTE)
2. *US Physics* – (Sofferman: Physics and Principles of US – Artifacts pg 14 Doppler pg 16-18)
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| Wk 8 | Doppler Apical (Spectral doppler artefacts) |
| Wk 9 | Doppler subcostal (Colour Doppler artefacts) |
| Wk 10 | Review of Doppler Principles + ASSESSMENT | Assess basic understanding of Doppler principles by MCQ on survey monkey and practical use of CFD and spectral. |
| Wk 11 | Interesting cardiology cases | Presented by cardiology department |
| Wk 12  | Abdominal Ultrasound | * Introduction to abdominal scanning, the use of curvilinear probe, identification of basic abdominal structures and FAST principles. (15 mins)
* Hands on session (45 mins)
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| 2D and Doppler Measurements |
| Wk 11 | Measurement parasternal (Attenuation and depth artefacts) | * Measurement principles – linear 2D, M-mode, Doppler (CW vs PW)
* Continuity and Bernoulli principles
* LVIDd, LVOTd, TRVmax, LVOT VTI, TRVmax, TAPSE, IVC diameter and clinical applications
* Sources of error

Improving on 2D image acquisition.Technical perfection of measurements. |
| Wk 12 | Measurement Apical  |
| Wk 13 | Measurement Subcostal (Beam path artefacts) |
| Wk 14 | Review of Measurements (Live scanning) | \*If 2D imaging skills not adequate, continue to support before moving on.Advance measurements: None |
| Wk 15 | Review of Measurements (Live scanning) |
| Wk 16 | Measurement Assessments (Loops, MCQ) |
| Chambers and Valves |
| Wk 17  | RV Assessment  | * Basic RV assessment: size, RVSP, TAPSE, septal motion, linear dimension as per ASE paper. Use flashcards on echopraxis if needed.
* Clinical application and conditions involving RV assessment, effect of PEEP, ventricular interdependence
* Cases and loops

Advance: PVAT, FAC, RVs’Reading:1. *Echocardiography III – RV failure in ICU, JASE 2013 Pulmonary arterial hypertension*
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| Wk 18 |
| Wk 19 |
| Wk 20 | LV Assessment | Basic LV assessment with eyeball, FS, CO.Advance: EF (theory) |
| Wk 21 | Valve Assessment ( stenosis, regurgitation) | * Continuity Principle
* Colour flow Doppler
* Aliaising
* Pitfalls

Advance: PISA, vena contracta |
| Wk 22 | Volume assessment  | * Definition of volume responsiveness, static, dynamic measures, utility of echo, pitfalls, case example loops
* Distinguishing utility of IVC variation in SV vs MV patients.
* The use of PLR and VTI measurements.
* Quick introduction to lung US as part of volume assessment.

Reading: Diagnostic accuracy of passive leg raisingfor prediction of fluid responsiveness in adults: systematic review and meta-analysis of clinical studies. Intensive Care Med (2010)*ASE Review Papers* (Guidelines for the Use of Echocardiography as a Monitor for Therapeutic Intervention in Adults)*Vol responsiveness and PLR* (Appreciating the Strengths and Weaknesses of Transthoracic Echocardiography in Hemodynamic Assessments. Cardiology Research and Practice Volume 2012) |
| Wk 23 | Lung Ultrasound | Li TanPre-reading with video on lung US including lung signs, probe selection, artifacts <https://www.youtube.com/watch?v=uv6zI4QHYss> Interpretation of Lung US<https://www.youtube.com/watch?v=q3uJDY3izn4>​ Intro to lung US* Hands on session by patient. Discuss limitations and utility of lung US.

Reading: 1. International evidence-based recommendations for point-of-care lung ultrasound. Intensive Care Med (2012) 38:577–591
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| Echo in Shock States |
| Wk 24 | Vascular Ultrasound/DVT | * Pre-reading video on how to perform lower limb DVT scan <https://www.youtube.com/watch?v=Q0QnwbvSgtY>
* Whole session should be hands on, bedside scanning with emphasis on identifying LL venous tributaries (above knee), compression technique and the use of CFD.
* If time permits, UL venous anatomy demonstration with US
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| Wk 25 | *Registrars Case Presentation* | * SAM and dynamic LVOT obstruction
* RWMA
* chiari network and anatomic variants in RA
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| Wk26 | *Registrars Case Presentation* |  |
| Wk 27 | *Examination* | Kyle Brooks |
| Wk 28 | Echo in the evaluation of shock, Pericardium Assessment, Tamponade physiology | Li Tan* Discuss relevant intraop findings to patient care eg LV function with severe MR, LV size with severe AS etc
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| Wk28  | Introduction to trans-oesophageal echo post cardiac surgery |
| Wk 29  | Registrar Case Presentation | Registrar Logbook presentations |
| Wk 30  | Introduction to diastology | * Diastolic physiology and implications for ICU patient
* Basic measurement concepts E/A, e/e’, LA size
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| Wk 31  | Diastology 2  |
| Wk 32  | The use of echo in CPR | Kyle Brooks |
| Wk 33  | *Registrars Case Presentation* | Li Tan* RV dysfunction, septal flattening
* Severe TR, hepatic vein flow reversal – clinical implications
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| Wk 34  | *Registrars Case Presentation* | Kyle Brooks |
| Wk 35  | *Registrars Case Presentation* | Tom Rozen |
| Wk 36  | *Registrars Case Presentation* | Li Tan |
| Wk 37 | *Registrars Case Presentation* | Kyle Brooks |
| Wk 38  | *Registrars Case Presentation* | Tom Rozen |

Online MCQs

* Critical care echocardiography skills survey
* Machine Care and vascular access
* Critical Care Echo Views I
* Critical Care Echo Views
* Parasternal Long
* Apical
* US Physics I
* Assessment I
* Assessment II (Measurements)