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EPWORTH MEDICAL STUDENT ECHOCARDIOGRAPHY LEARNING COMPENDIUM

Name:……..

Developed by Dr Kyle Brooks, Dr Katrina Timmins and Ms Karen Scholz.

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Online Resources:

https://aseuniversity.org/ase/activities/46

This site is free but you will need to create a login.

This contains high quality videos and online MCQs

http://www.echoclass101.com/?cat=64

- The section on basic anatomy of the heart is a great starting point

http://pie.med.utoronto.ca/TTE/TTE_content/standardViews.html

- This is like having your own echo simulator at home!

https://www.ultrasoundtraining.com.au/foamus/foamus-free-ebooks

- Lots of free e-books on here which are great for those who want to do further learning

http://intensiveblog.com/category/echo-and-ultrasound/

- The level I echo video and ultrasound principles videos are a great resource.

Lesson Plan

Week 1

Title: Parasternal views

Learning objectives:

1) Understand how to position the probe to obtain the first standard views including:

    Parasternal long axis

    RV inflow view

    RV outflow view

    Parasternal short axis views - base, “fish mouth”, mid papillary and apex

2) Understand the Sonoanatomy of

    Left ventricle

    Aortic valve

    Mitral valve

    Tricuspid valve

Format:

Vimedix simulator

Brief demonstration to group then each student obtains the views above

Students not scanning are quizzed on Sonoanatomy

Group Size:

Up to 4

Pre reading:

https://drive.google.com/open?id=17pcyjtCvhyqmA4aPLrldZbg5a79ISxYS

Completed:

Student Supervisor

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Epworth

Lesson Plan

Week 2

Title: Artifacts and their origins & Apical Views

Learning objectives:

1) Understand how to position the probe to obtain the standard apical views including:

   Apical 4 Chamber
   Apical 5 Chamber
   Apical 2 Chamber
   Apical long axis (3 Chamber)

2) Understand the sonoanatomy of

   Left ventricle and right ventricle

   Left and right atria

   Aortic valve

   Mitral valve

   Tricuspid valve

Format:

Vimedix simulator

Brief demonstration to group then each student obtains the views above

Students not scanning are quizzed on sonoanatomy

Group Size:

Up to 4

Pre reading:

https://drive.google.com/open?id=1xZMurH2fApvz5UH_mCFnhZBZPN0EPW3-

https://www.dropbox.com/s/dquem65f62apq0o/Introduction%20to%20TTE%20Susanna%20PRice.pdf?dl=0

Completed:

Student Supervisor

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Lesson Plan

Week 3

Title: Subcostal Views

Learning objectives:

1) Understand how to position the probe to obtain the basic subcostal views
   - Subcostal four chamber
   - Subcostal SAX chamber views of the LV
   - IVC

2) Understand the Sonoanatomy of:

   - The inferior Vena Cava and the right atrium
   - Interatrial septum
   - The hepatic vein
   - The abdominal aorta

Format:

Vimedix simulator

Brief demonstration to group then each student obtains the views above

Students not scanning are quizzed on sonoanatomy

Group Size: Up to 4

Pre reading:

https://vimeo.com/120316428

https://drive.google.com/open?id=1MKhwxS3q5y6Vr_OZypTbwXS_w-U06vol

Completed:

Student Supervisor

Epworth

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Lesson Plan

Week 4/5

Title: Peer Volunteer Scanning

Learning objectives:

1) Learn to obtain all the standard views practiced on the simulator on alive human model
2) Learn work-arounds and alternatives where views are difficult

Format:

Practical session scanning other registrars

Scans are recorded into logbook

Group Size:

Up to 4

Pre reading:

https://www.dropbox.com/s/3e63jn3e5o6eomt/Walley-A%20practical%20approach%20to%20goal-directedechocardiography%20in%20the%20critical%20care%20setting.pdf?dl=0

Completed:

Student Supervisor

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Epworth

Lesson Plan

Week 6

Title: Assessing LV function by eyeball method

Learning objectives:

1) Understand the definition of contractility and its measurement
2) Demonstrate the ability to use VEM to follow the endocardium through the cardiac cycle

Format:

Live scanning of real patients in small groups on the ward

Group Size:

Up to 4 per instructor

Pre reading:

https://drive.google.com/open?id=1zaQMbXbATh4M801v9wKZCM8faBZ9kHk7

https://drive.google.com/open?id=1h6qP533D2VjgZWilCNon7he9F3v30LBQ

https://drive.google.com/open?id=1btEf6APm96hhCJgEuwa5aY592EVfF4x1

https://drive.google.com/open?id=13Qlodc2tm6OveiWk_Zk9NMge2_5GNP5G

https://drive.google.com/open?id=18qC1IM3DmFo0F3CzOC7ktEHcOmrqzQsK

https://drive.google.com/open?id=1X87Nv1LTDAJ0cMpo3dcRYCFYI6kpZqiT

Completed:

Student Supervisor

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Lesson Plan

Week 7

Title: Introduction to Doppler

Learning objectives:

1) Understand the Doppler principle
2) Demonstrate the use of colour Doppler in the Parasternal views

Format:

Live scanning on patients in ICU or CCU

Group Size:

Up to 2

Pre reading:

https://drive.google.com/open?id=0B93QsjVQISuJWWlEaWVCY2VHX1E

Completed:

Student

Supervisor

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Lesson Plan

Week 8

Tile: Apical Doppler

Learning objectives:

1) Demonstrate the use of colour and spectral Doppler in the Apical views with the CX-50

Format:

Live scanning on patients in ICU or CCU

Group Size:

Up to 2

Pre reading:

https://drive.google.com/open?id=1PovConZAxxFaeQKhK0GRr84i2qL0F831

Completed:

Student Supervisor

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Lesson Plan

Week 9

Tile: Subcostal Doppler

Learning objectives:

1) Demonstrate the use of colour and spectral Doppler in the subcostal views with the CX-50
2) Understand the value of screening valves for pathology in ICU

Format:

Live scanning on patients in ICU or CCU

Group Size:

Up to 2

Pre reading:

https://drive.google.com/open?id=1GS8v7scH7z0BH91HNcRleiGtSzjgdSBj

Completed:

Student

Supervisor

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Lesson Plan

Week 10

Tile: Complete Doppler examination

Learning objectives:

1) Demonstrate a Level 1 echo with the CX-50
2) Understand the basics of the Doppler principles involved

Format:

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

https://youtu.be/hqZ_Zx59Uvo

https://drive.google.com/open?id=1cl0JB-w66PvSX96SEIBKSG8fkdRfsVPh

Completed:

Student Supervisor

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Lesson Plan

Week 11

Tile: 2D Measurements

Learning objectives:

1) Learn how to perform basic 2D and M-mode measurements in the parasternal, apical and subcostal windows:

   Parasternal LAX: LVOT diameter, LVIDd
   Apical 4 Chamber: TAPSE (M-mode)
   Subcostal SAX: IVC diameter and collapsibility (2D and/or M-mode).

2) Demonstrate 2D/m-mode measurements in a bedside echo assessment

Format:

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

Completed:

Student Supervisor

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Lesson Plan

Week 12

Tile: Aortic valve

Learning objectives:

1) Understand aortic valve structure and pathologies, including:
   - Congenital and acquired stenosis (bicuspid AoV, age related degeneration)
   - Aortic regurgitation

2) Learn how to assess the aortic valve using 2D and Doppler techniques:
   - Maximal aortic cusp separation (MACS) using M-mode
   - Colour and spectral Doppler

Format:

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

https://drive.google.com/open?id=1T1wFPAGDVqt7RRtH4aGgsgxZDbsBPXh_

Completed:

Student Supervisor

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Lesson Plan

Week 13

Tile: Mitral Valve

Learning objectives:

1) Understand mitral valve structure and pathologies including acquired stenosis and regurgitation.
   - Stenosis: Mitral annular calcification, Rheumatic mitral disease
   - Mitral Regurgitation: functional, prolapse, flail, “SAM”, endocarditis

2) Learn how to assess the mitral valve using 2D/M-mode and Doppler techniques

Format:

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

https://drive.google.com/open?id=15wk7azjJFb98XIFrJMT9ZSBbmZrkQ22E

Completed:

Student Supervisor

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Lesson Plan

Week 14

Tile: Tricuspid Valve and Pulmonary pressures

Learning objectives:

1) Understand tricuspid valve structure and pathologies including:
   - Functional tricuspid regurgitation
   - Ebstein's anomaly
   - Rheumatic tricuspid disease (in association with mitral valve involvement)
   - Carcinoid heart disease

2) Learn how to assess the tricuspid valve using 2D and Doppler techniques

3) Learn how to measure RV and PA systolic pressure from the TR spectral Doppler signal

Format:

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

https://vimeo.com/119991183

Completed:

Student Supervisor

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Lesson Plan

Week 15

Tile: Pulmonary Valve and Pulmonary pressures

Learning objectives:

1) Understand pulmonary valve structure and pathology:
   - Congenital pulmonary stenosis
   - Pulmonary homograft/allograft
   - Pulmonary regurgitation

2) Learn how to assess the pulmonary valve using 2D and Doppler techniques
3) Learn how to measure PA Acceleration Time (PAAT), mean PA pressure (mPAP) and PAEDP from the PR spectral Doppler signal

Format:

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

https://vimeo.com/119991183

Completed:

Student

Supervisor

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Lesson Plan

Week 16

Tile: Pericardial Effusion and Tamponade

Learning objectives:

1) Identify and differentiate a pericardial effusion from a pleural effusion and ascites using all imaging windows
2) Establish the qualitative size and distribution of a pericardial effusion
3) Use 2D and spectral Doppler to confirm the clinical diagnosis of tamponade

Format:

Vimedix simulator

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

Completed:

Student

Supervisor

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Lesson Plan

Week 17

Title: Hypovolaemia

Learning objectives:

1) Learn to assess a patient's volume state using 2D/M-mode (LVIDd, IVC size and collapsibility)
2) Understand the limitations of the IVC assessment in mechanical ventilation.

Format:

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

https://intensiveblog.com/level-1-echo/

Completed:

Student

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Supervisor

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Lesson Plan

Week 18

Title: Pulmonary Embolus and Right Heart Failure

Learning objectives:

1) Identify the echocardiographic signs of pulmonary embolus from all available views including:
    3) RV dilatation
    4) McConnell's sign
    5) Saddle embolus
2) Differentiate normal RV size and systolic function from abnormal (RV linear measurements, visual estimate)
3) Revise the measurement techniques to estimate pulmonary pressures.

Format:

Vimedix simulator

Live scanning on patients in ICU and CCU

Group Size:

Up to 2

Pre reading:

Completed:

Student Supervisor

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Appendix 2 Teaching Timetable .

Medical Student Echo Teaching Timetable.

Week Commencing	Learning Activities	Learning Objectives
3rd April	Introduction Lecture -Monday 3rd April	-Understand the outline, requirements and objectives of the Epworth Medical Student Echo Course -Introduction to the Vimedix Echo Simulator
10 April	**Online lectures** Introduction to soundwaves Parasternal views **Hands on practice** Vimedix with Dr Kyle Brooks	-Understand the basic concepts of ultrasound and its interaction with human tissue as well as image formation. -Learn the cardiac anatomy seen in parasternal long and short axes. -Practice image acquisition.
24 April	**Online lectures** Introduction to artefacts Apical views **Hands on practice** Vimedix with Dr Kyle Brooks	-Understand the basic concepts of artefacts and their origins. -Learn the cardiac anatomy seen in Apical views. -Practice image acquisition.
01 May	**Online lectures** CX-50 Knobology and machine Care Subcostal views **Hands on practice** Vimedix	-Learn the cardiac anatomy seen in Subcostal views. -Learn how to operate the Phillips CX-50 portable echo unit in a safe and effective manner. -Practice image acquisition
8 May	Attendance in Echo Lab **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Begin to practice image acquisition on live patients. -Observe expert echocardiographers performing image acquisition on real patients
15 May	Attendance in Echo Lab **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Further practice image acquisition on live patients. -Observe expert echocardiographers Performing image acquisition on real patients
22 May	**Online lectures** Doppler physics and parasternal views	-Learn to use colour and spectral doppler in the parasternal views.

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	Hands on practice Karen Scholz Monday and Wednesday by appointment.	-Begin to understand the physics of the various doppler modes. -Learn the skills necessary to assess valves
19 May	**Online lectures** Doppler physics and Apical views (Spectral Doppler artefacts) **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to use colour and spectral doppler in the Apical views. -Further understand the physics of the various doppler modes. -Learn the skills necessary to assess valves
05 Jun	**Online lectures** Doppler subcostal (Colour Doppler artefacts) **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to use colour and spectral doppler in the Apical views. -Further understand the physics of the various doppler modes. -Learn the skills necessary to assess valves
03 July	Begin independent practice **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn the skills necessary to perform a complete bedside echo assessment at a medical student level. -Begin recording the 30 scan logbook.
10 July	**Online lectures** Assessment of LV function **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to assess LV function by eyeball method using an online video library. Continue recording the 30 scan logbook.
17 July	**Online lectures** Aortic Valve pathology **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to assess the aortic valve using 2D and doppler techniques. -Continue recording the 30 scan logbook.
24 July	**Online lectures** Mitral Valve pathology **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to assess the mitral valve using 2D and doppler techniques. -Continue recording the 30 scan logbook
31 July	**Online lectures** Tricuspid valve pathology and pulmonary pressures **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to assess the tricuspid valve using 2D and doppler techniques. -Continue recording the 30 scan logbook
07 August	**Online lectures** pulmonary valve pathology and pulmonary pressures **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to assess the pulmonary valve using 2D and doppler techniques. -Continue recording the 30 scan logbook
14 August	**Online lectures** Pericardial effusion and tamponade **Hands on practice**	-Learn to assess the pericardium and differentiate pleural and pericardial effusions. -Continue recording the 30 scan logbook

	Karen Scholz Monday and Wednesday by appointment.	
21 August	**Online lectures** Hypovolaemia **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to assess the patients volume state. -Continue recording the 30 scan logbook
28 August	**Online lectures** PE and Right Heart Failure **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to assess for echo signs of pulmonary embolus. -Continue recording the 30 scan logbook
04 September	**Online lectures** Advanced artefact interpretation **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to interpret complex artefacts and begin to understand the limitations of bedside echocardiography. -Continue recording the 30 scan logbook
11 September	**Online lectures** Limitations of bedside echo **Hands on practice** Karen Scholz Monday and Wednesday by appointment.	-Learn to interpret complex artefacts and begin to understand the limitations of bedside echocardiography. -Continue recording the 30 scan logbook.

Appendix 3. Links to online videos

Online e-books:

https://www.ultrasoundtraining.com.au/foamus/foamus-free-ebooks

Overview of basic views:

https://drive.google.com/open?id=0B93QsjVQISuJMjZiNUY5QmpvSlk

Parasternal Views:

https://drive.google.com/open?id=17pcyjtCvhyqmA4aPLrldZbg5a79ISxYS

Apical Views:

https://drive.google.com/open?id=1xZMurH2fApvz5UH_mCFnhZBZPN0EPW3-

Subcostal Views:

https://vimeo.com/120316428
https://drive.google.com/open?id=1MKhwxS3q5y6Vr_OZypTbwXS_w-U06voI

LV function Assessment:

https://drive.google.com/open?id=1G2Wd_7TBtSYFm3zkDmJExRMoMYhT4lYS

https://drive.google.com/open?id=1jnzZthGWi_y26t6xysizSXFyEFZM2Jfp

https://drive.google.com/open?id=1bF1RqVaN6NeMWZMNEXJ8kcOgNXbJDVs8

https://drive.google.com/open?id=1ulJetplr-T6z0tq1ETEYOEnTBJFtaODy

https://drive.google.com/open?id=1oNOQHNYojNOeRV_LqCY_gnKkO9jtNc4u

https://drive.google.com/open?id=1X87Nv1LTDAJ0cMpo3dcRYCFYI6kpZqiT

Introduction to Doppler:

https://drive.google.com/open?id=0B93QsjVQISuJWWlEaWVCY2VHX1E

Apical Doppler:

https://drive.google.com/open?id=1PovConZAxxFaeQKhK0GRr84i2qL0F831

Subcostal Doppler:

Developed by Dr Kyle Brooks, Dr Katrina Timmins and Ms Karen Scholz.

https://drive.google.com/open?id=1GS8v7scH7z0BH91HNcRleiGtSzjgdSBj

Overview of valvular assessment:

https://youtu.be/hqZ_Zx59Uvo
https://drive.google.com/open?id=1cI0JB-w66PvSX96SEIBKSG8fkdRfsVPh

https://drive.google.com/open?id=1GS8v7scH7z0BH91HNcRleiGtSzjgdSBj

Assessment of the Aortic Valve:

https://drive.google.com/open?id=1T1wFPAGDVqt7RRtH4aGgsgxZDbsBPXh_

Assessment of the Mitral Valve:

https://drive.google.com/open?id=15wk7azjJFb98XIFrJMT9ZSBbmZrkQ22E

Assessment of the Tricuspid valve:

https://vimeo.com/119991183

Review:

https://intensiveblog.com/level-1-echo/

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Medical Student Echo Report Proforma

Study Number: ……..
Patient Identifier: ……
Student Identifier: ……..
LV function: Normal Or Impaired Mild Moderate Severe
Pericardial Effusion: Absent Or Present - Record depth in diastole ……..
RV:LV size ration: Normal (LV>RV in A4c view) or Abnormal (RV>LV in A4C view)
Valves:

Mitral	Normal or only mildly impaired.		
	Or		
	> Mild Regurgitation	Jet area % of LA ……..%	Vena Contracta Width …….
	> Mild Stenosis	Mean Gradient ……mmHg	Pressure ½ time……..mSec
	Valve replacement in situ		
Aortic	Normal or only mildly impaired.		
	Or		
	> Mild Regurgitation	Jet height % of LVOT…….%	Vena Contracta ……..mm
	> Mild Stenosis	Peak Velocity ……m/sec	
	Valve replacement in situ		
Tricuspid	Normal or only mildly impaired.		
	Or		
	> Mild Regurgitation	Jet area ……..cm	Vena contracta Width …….mm
	> Mild Stenosis	Mean Gradient ……mmHg	Pressure ½ time……..mSec
	Valve replacement in situ		
	TR Vmax ……		
Pulmonary	Normal or only mildly impaired.		
	Or		
	> Mild Regurgitation		
	> Mild Stenosis		
	Valve replacement in situ		

Grading Guide:

Mitral			
	> Mild Regurgitation	Jet area % of LA 20%	Vena contracta Width > 3mm
	> Mild Stenosis	Mean Gradient > 5mmHg	Pressure ½ time >140mSec
Aortic	> Mild Regurgitation	Jet height % of LVOT >25%	Vena Contracta >3mm
	> Mild Stenosis	Peak Velocity >3m/sec	
	Valve replacement in situ		
Pulmonary	> Mild Regurgitation	Obvious Colour flow doppler regurgitation	
	> Mild Stenosis	Clear aliasing through valve	
Tricuspid	> Mild Regurgitation	Jet area >5cm	Vena contracta Width >7mm
	> Mild Stenosis	Impaired valve opening with clear aliasing	

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Mixed Methods Survey

Student Number …….

Circle the response that most accurately reflects your response to the following questions:

1. Trans-thoracic echocardiography education has enhanced my understanding of cardiac anatomy and function.

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

2. I plan to use TTE in my future clinical practice.

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

3. I will benefit from continued ultrasound education throughout my 4 years of medical school.

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

4. All medical schools should provide students with education on TTE.

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

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5. My experience with the TTE education was positive

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

Open ended responses in survery:

6. The Best thing about the FCU education was:

7. The aspect of TTE that could be improved the most was:

8. If I was responsible for designing the TTE training for MD students I would make the following changes for next year: