Naval Medical Center San Diego Pulmonary and Critical Care Medicine Ultrasound Curriculum

This curriculum is designed in accordance with the 2009 CHEST Statement of Competence in Critical Care Ultrasonography, the American Society of Echocardiography (ASE) guidelines for focused cardiac ultrasound in the emergent setting, and other nationally accepted best practices in critical care ultrasound training. The structure of this curriculum intentionally aligns with published standards to ensure that fellows are trained, assessed, and certified in a systematic and evidence-based manner. The goal is to graduate fellows who are competent in both the acquisition and clinical application of bedside ultrasound in critical care.

Overview

Duration: 3 years (9 ICU blocks total)
Modules: ~3 SonoSim modules per ICU block
Images: Progressive portfolio submission
Assessment: Faculty review, quarterly image feedback

Year 1: Foundations of Critical Care Ultrasound

Theme: Learn image acquisition, knobology, basic cardiac, lung, and vascular access

Goals

- Identify basic anatomy and pathology
- Understand and practice Ultrasound Guided Procedure
- Independently perform core ultrasound exams
- Begin portfolio with foundational views

ICU Block 1

- Fundamentals of Ultrasound
- Heart – Anatomy and Physiology
- Introduction to Ultrasound Guided Procedures
- Ultrasound Guided Internal Jugular Vein Cannulation

ICU Block 2

- Cardiology – Core Clinical
- Focused Cardiac Ultrasound (FoCUS) - Part I

- Focused Cardiac Ultrasound (FoCUS) - Part II
- Ultrasound Guided Femoral Line Placement

ICU Block 3

- Lungs – Anatomy and Physiology
- Pulmonary – Core Clinical
- DVT – Lower Extremity – Core Clinical
- Ultrasound Guided Thoracentesis

Hands-on Objectives

- Basic image acquisition – Critical Care Echocardiography, Lung ultrasound, Lower Leg Venous Anatomy
- Proper needle tracking for US guided procedures

Portfolio Milestones (~50 images)

Cardiac – Parasternal Long Axis, Parasternal Short Axis, Apical, Subcostal, IVC
Lung - Lung sliding, pleural effusion, B-lines, A-lines, thickened pleura
DVT – Proper Anatomy with Compression

Year 2: Integrated ICU Ultrasound Practice

Theme: Apply ultrasound in clinical scenarios (shock, dyspnea, fluid management)

Goals

- Cardiac/Pulmonary Views with Pathology and Interpretation
- Incorporate Whole Body Ultrasound (WBU) into clinical diagnosis/management
- Expand procedural scope

ICU Block 4

- Renal – Anatomy and Physiology
- Renal – Core Clinical
- Rapid Ultrasound in Shock (RUSH) – Core Clinical
- Ultrasound Guided Paracentesis

ICU Block 5

- Airway – Core Clinical
- Upper Airway – Anatomy and Physiology
- Gastric Ultrasound – Advanced Clinical
- Ultrasound Guided Subclavian Vein Cannulation

ICU Block 6

- Aorta/IVC – Anatomy and Physiology
- Aorta/IVC – Core Clinical

- eFAST Protocol and FAST Protocol
- Ultrasound Guided Pericardiocentesis

Hands-on Objectives

- Assess LV/RV function, tamponade/pericardial effusion
- Perform volume assessment using IVC, kidneys, lung, and cardiac views
- Execute image-guided procedures

Portfolio Milestones (~100 images)

Cardiac – Parasternal Long Axis, Parasternal Short Axis, Apical, Subcostal, IVC
Lung - Lung sliding, pleural effusion, B-lines, A-lines, thickened pleura
DVT – Proper Anatomy with Compression
Aorta – Ascending/Descending/Abdominal
Bladder – Longitudinal, Transverse
Renal – Longitudinal, Transverse
Vascular Access – Internal Jugular, Femoral

Year 3: Mastery and Advanced Application

Theme: Complex interpretation, Mentorship/Teaching, Advanced Critical Care Echocardiography

Goals

- Lead rounds with ultrasound integration
- Teach junior learners
- Understand how to incorporate advanced critical care echocardiography principles

ICU Block 7

- Biliary Tree – Anatomy and Physiology
- GI Tract – Anatomy and Physiology
- Intestinal/Biliary – Core Clinical
- Ocular – Core Clinical

ICU Block 8

- Resuscitative TEE – Advanced Clinical
- LVAD Problem Focused Echocardiography – Advanced Clinical
- Cardiac Chamber Quantification – Advanced Clinical

ICU Block 9

- Advanced Critical Care Echocardiography
- Heart Lung Interactions

Hands-on Objectives

- Guide fluid, vasopressor, and ventilator management using ultrasound
- Add Advanced Critical Care Echocardiography Views
- Incorporate Doppler measurements
- Mentor junior fellows/housestaff

Portfolio Milestones (~150+ final images)

Cardiac – Parasternal Long Axis, Parasternal Short Axis, Apical, Subcostal, IVC
Lung - Lung sliding, pleural effusion, B-lines, A-lines, thickened pleura
DVT – Proper Anatomy with Compression
Aorta – Ascending/Descending/Abdominal
Bladder – Longitudinal, Transverse
Renal – Longitudinal, Transverse
Vascular Access – Internal Jugular, FemoralComplete all remaining views
Advanced Critical Echocardiography Views – RV inflow, PSAX multiple levels, Apical 2 chamber, Apical 3 Chamber, Subcostal Short Axis
Doppler measurements

Faculty sign-off with quality control
Graduation certificate preparation

Updated Image Portfolio Requirements (Total: 150 Images)

This revised image portfolio meets the CHEST consensus guidelines and incorporates a minimum distribution of ultrasound studies across all critical care domains. These images should be collected progressively across the fellowship and validated by ultrasound faculty.

Portfolio Requirements by Category

Study Type	Minimum Number of Images
Cardiac (PLAX, PSAX, Apical 4C, Subcostal)	50
IVC (longitudinal, inspiratory variation)	10
Lung Ultrasound (A-lines, B-lines, consolidation)	20
Pleural Ultrasound (simple effusion, complex effusion, pneumothorax/lung point)	20

Renal	10
Bladder	10
Abdominal Aorta	10
Vascular Access (IJ, subclavian, femoral)	10
DVT Ultrasound (compression, femoral/popliteal)	10

Total: 150 validated studies
All images must be reviewed and signed off by designated ultrasound faculty.

References:
1. Mayo PH, Copetti R, Feller-Kopman D, et al. Statement of Competence in Critical Care Ultrasonography. CHEST. 2009;135(4):1050-1060.
2. Via G, Hussain A, Wells M, et al. International evidence-based recommendations for focused cardiac ultrasound. J Am Soc Echocardiogr. 2014;27(7):683.e1-683.e33.
3. National Board of Echocardiography. Advanced Critical Care Echocardiography Certification Pathway. https://www.advancedcriticalcareecho.org