

# ***Point-of-Care Ultrasound Certificate Program (POCUS-CP)***

## ***Longitudinal Curriculum Proposal***

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### **Background**

Advances in ultrasound image quality and machine portability in recent years have allowed for its expanded clinical use at the bedside, or point-of-care (POCUS). Though initially a practice common to the emergency department, POCUS has become a part of training and daily practice across medical and surgical specialties. In the past 10 years the interest has progressed to the undergraduate medical education level, with many schools offering a range of opportunities for exposure to the practice, from elective courses to school-wide longitudinal curricula. The introduction of the 4<sup>th</sup> year POCUS elective, ultrasound lab in the anatomy course for first year students, and the ultrasound mini-elective have been well received and supported by the UPSOM student body.

POCUS encompasses a broad variety of applications for the medical student; from sonographic evaluation of human anatomy to dynamic study of the cardiovascular system in the critically ill patient, making it an ideal tool to integrate from the early stages of medical education. The POCUS-CP will provide students sequential and advancing opportunities for experiential learning. Students will gain the technical skills required to achieve competency in POCUS from a multidisciplinary group of instructors who will continue to serve as potential mentors as the students develop their unique interests and begin to solidify their future plans as physicians.

The POCUS-CP draws upon the resources of existing departments within the medical school including: Emergency Medicine, Anesthesia, Radiology, Critical Care Medicine, Cardiology, Pulmonary Medicine, Internal Medicine, Trauma Surgery, and Pediatrics. The proposed POCUS-CP will incorporate and expand upon the present resources available to medical students. The skill set gained will allow the participants to serve as educators to their peers and collaborate with students that may also benefit from POCUS knowledge, such as those involved in the Global Health and Resuscitation Area of Concentrations.

## **Aims of the POCUS-CP**

Goals and Objectives :

- Develop sound understanding of ultrasound physics, and gain proficiency in image acquisition and interpretation
- Understand the clinical indications for and limitations of POCUS application in the areas of
  - Anatomy and physiology
  - Physical examination
  - Pathology
  - Diagnosis
  - Procedural guidance
- Demonstrate proficiency as a peer-educator
- Demonstrate ability to integrate POCUS into a variety of clinical settings to enhance in the rapid diagnosis and aid in management of time-sensitive conditions
- To promote integration of POCUS relevant to students' future interests

## **Requirements of the POCUS-CP**

### 1. Faculty Mentor

Each student enrolled in the POCUS-CP will have a faculty mentor. Available mentors will be drawn from the various medical school departments involved in areas of POCUS. The POCUS-CP executive committee will assist the student's interests.

The student and faculty mentor will communicate at least biannually via phone or email AND yearly in person in order:

- a. To assist the student in completion of core requirements,
- b. And to provide formal and informal career mentorship.

Successful completion of required communication will serve as final criteria for assessment of this requirement. This documentation will be reviewed by the POCUS-CP executive committee yearly to ensure completion of the requirement.

*A list of faculty committed to providing faculty mentorship is included in the attached appendix 2.*

### 2. Didactic Experiences

Each student will complete required didactic experiences during the POCUS CP. A suggested timeline for completion of such activities is detailed below.

- a. POCUS-CP Meetings:  
POCUS-CP meetings will be held for students and faculty 6 times a year. Each meeting will be jointly developed and lead by one faculty member and one student. Each meeting will comprise of an educational and administrative component.

Education may include a combination of hands-on workshops and discussions about topics in POCUS, and review of specific seminal POCUS literature (Journal Club). Topics will be suggested by students within the CP and/or executive faculty. These meetings will be open to the general student body, and workshops will take the place of current Ultrasound in Medicine Interest Group (UMIG) meetings.

Administrative requirements including group peer review of requirements and evaluation of specific CP components. Additionally, meetings may be used to introduce the CP to entering medical students and to recruit students to the CP.

- b. Online modules:

Students will have access to a cohort of online modules that are relevant to each topic to be covered during the certificate program. Students must complete the online module prior to participation in the related hands-on laboratory session. *See Appendix 1 for timeline and content details.*

- c. POCUS-specific Departmental Journal Clubs:  
CP students will be invited to participate in department specific journal clubs in the field of POCUS. These events will draw from existing journal clubs held in the Departments of Critical Care Medicine, Emergency Medicine, Physical Medicine and Rehabilitation, Cardiology, and Surgery.

#### 4. Laboratory Sessions

Level- and topic-specific laboratory sessions will be held for CP students. *See Appendix 1 for timeline and content details.*

#### 5. Peer Educators

When the schedule allows, 3<sup>rd</sup> and 4<sup>th</sup> year students who have been cleared as proficient in various studies will function as faculty at various POCUS events, including the anatomy sessions for first year students, the mini-electives, and at Ultrasound in Medicine Interest Group meetings. As system-wide interest grows I anticipate them becoming involved in various educational initiatives held by different departments catering to all levels of training, such as lectures and workshops related to the Global Health and Resuscitation AOCs.

## 6. Ultrasound Models, or “Trained Simulated Ultrasound Patients”

Primarily second year students involved in the certificate program will function as ultrasound models for various POCUS events around campus and departments. These opportunities will allow students a different perspective on POCUS, instruction at the faculty level, and serve as a review or deep dive on different POCUS topics.

Students will be provided a “bill of rights” and sign a consent form prior to participation. Involvement will be completely voluntary, and will play no role in grades or standing at the school of medicine.

### **Evaluation**

#### A. Ultrasound scans:

At the time of enrollment into the POCUS-CP, students will be provided a unique identifier that they will use when recording ultrasound scans into the system. Scans will be uploaded and stored in the secure Q-path archival system currently in use. This, combined with individually performed ultrasounds on their personal hand-held device which may be archived on a separate database, will be used to track total number of scans performed, will goals as follows:

Cardiac: 30

Pulmonary: 30

FAST: 20

Biliary: 15

Aorta: 15

Pregnancy: 10

Musculoskeletal: 15

Renal: 20

DVT: 15

#### B. Assessment of Didactic Experience Completion:

Due to the extensive time commitment required for the didactic component as above, coupled with students’ other demands on their time, attendance of 70% of laboratory sessions after declaration into the CP is required for successful completion.

#### C. Clinical Experiences

##### i. Scanning Shifts

During all three years, POCUS-CP students may join on ultrasound scanning shifts in the emergency department or other appropriate department (CCM, PACU, etc) when convenient for them, but at least 10 total over the course of

the 3-year program. These non-clinical shifts are lead by ultrasound faculty or emergency ultrasound fellows from the emergency department, and are exclusively for bedside teaching. Students will have access to the scanning schedule at least one month in advance. Scanning shifts must be approved by the involved faculty member.

#### ii. SOM Courses

CP students are encouraged to select clinical SOM courses that include aspects of POCUS during the required blocks, if possible. Each student will be required to complete the POCUS Independent Study elective during their fourth year (to be created), and 1 additional suggested course which potentially allows for use of POCUS including the Critical Care Medicine elective (CCM 5430), the Medical ICU Sub-I, diagnostic Radiology, Regional Anesthesia. Other courses that allow students to participate in aspects of POCUS may also meet this requirement if approved by the POCUS-CP executive faculty. Passing of this course is required for the successful completion of the CP.

#### Evaluation of the POCUS-CP:

Each student within the CP will be evaluated as Satisfactory or Unsatisfactory yearly. This evaluation will be done by: the student, the student's faculty advisor (with input from the student's mentor, if needed), and one of the executive faculty of the CP. Successful completion of each component of the CP (as applicable to the student's level of training) is sufficient for a Satisfactory evaluation.

If a student has not successfully completed one of the components of the CP (for instance, has not attended sufficient didactic sessions), so long as time remains in the student's standard medical school curricula, components can be completed in the following curricular year. Specific criteria for Satisfactory completion of each component of the CP are detailed above.

Students will each evaluate the POCUS-CP yearly by completing a survey detailing specific components of it. Specifically, the student will evaluate the yearly didactic and clinical curriculum. This survey will only contain information on the student's curricular year and no other identifiable information.

#### Late Enrollment:

If a student wishes to join the POCUS-CP after April of their first year, they must apply by September 30<sup>th</sup> of their MS2 year and demonstrate completion of all MS1 requirements in addition to MS2 requirements. Applicant will be conditionally accepted to the POCUS-CP until complete the following components by the end of December of MS2.

- Completion of all MS1 Ultrasound Modules: Applicant must also complete all first-year ultrasound modules prior to working with peer mentor.

- Completion of MS1 objectives: Upperclassmen involved in peer education will provide instruction during several make-up sessions held just before the start of the MS-2 year to ensure applicant has received all necessary instruction that would usually be covered first year in the CP.
- Attend all offered lab sessions in the fall: Applicants should also endeavor to attend all open lab sessions to further skills.

If applicant has already completed the mini-elective offered first year but not applied for CP in April of MS1 year, they may use these to count towards CP requirements. They will still be required to complete all associated modules if not previously completed. Applicant will also still be expected to complete 10 clinical scanning sessions and obtain all required scans as laid out in the requirements.

## **Appendix 1**

### Timeline of the POCUS Certificate Program

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#### **First Year (M1)**

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**Fall semester:** in conjunction with anatomy (All students, majority is demonstration only)

1. Introductory to Point-of-Care Ultrasound (online module students will review prior to first session) history of ultrasound, basic physics, definitions/terms, screen orientation, technique, “knobology”

2. Introduction to thoracic ultrasound (laboratory session, pre-review online module)

Overview: review screen orientation, knobology, depth, focus, frequency, gain

Left parasternal long axis view (PLAX): phased-array probe. B-mode only; identification of heart chambers, valves

3. Introduction to abdominal ultrasound (laboratory session, pre-review module)

Curvilinear probe. Show organ of students’ choice and help them identify it and relationship to surrounding structures. Liver, gallbladder, kidneys, Morison’s pouch, diaphragm, spleen, bladder

Mini-Elective: Point of Care Ultrasound Basics

Session 1: Ultrasound Basics

Session 2: Kidneys, bladder, abdominal aorta

Session 3: Heart and inferior vena cava

Session 4: Head and neck

#### **Spring Semester:**

Mini-Elective: Point of Care Ultrasound Basics

Session 1: Ultrasound Basics

Session 2: Kidneys, bladder, abdominal aorta

Session 3: Heart and inferior vena cava

Session 4: Head and neck

Mini-Elective: Introduction to Regional Anesthesia: Ultrasound Guided Nerve Blocks

4 Sessions

**Students apply for a spot in the POCUS Certificate Program in April of M1 year**

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***Unless otherwise noted, all activities below apply only to POCUS CP students***

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***Second Year (M2)***

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**Didactics:** students will review relevant material via online modules prior to participation in laboratory sessions. Students will be required to have completed the module to participate.

**Fall Semester**

**August**

1. Head and Neck scanning as a platform to review Ultrasound physics (laboratory session): ultrasound wave formation, piezoelectric effect, tissue interfaces, common artifacts, color Doppler, spectral Doppler, power Doppler, ultrasound safety issues, ALARA (as low as reasonably achievable) principle, etc.  
Identification of the major vessels, airway, thyroid, brachial plexus, eye  
*Pathology: thyroid nodule, retinal detachment*

**September**

2. Cardiac: standard cardiac views (laboratory session)  
Parasternal long and short axis, apical 4 and 5 chamber, subxiphoid; chambers, valves, wall thickness and motion.  
*Pathology: systolic dysfunction*
3. Abdominal aorta, IVC, Volume status assessment (laboratory session)  
AAA screening; transverse and longitudinal, B-mode, color flow and pulse wave, three measurements, characteristics that differentiate aorta from IVC, collapsibility/distension  
*Pathology: AAA*

**October**

4. Abdomen 1(laboratory session)  
Kidneys, urinary bladder, non-gravid uterus, prostate. Identify structures and measure organ size  
*Pathology: intrarenal stones, hydronephrosis*
5. Pulmonary (laboratory Session)  
Anterior and lateral thoracic scanning. Identify lung sliding, artifacts, effusion  
*Pathology: B lines, effusion, pneumothorax*

**November**

6. Abdomen 2 (laboratory Session)  
Liver, gallbladder, spleen  
*Pathology: +FAST, cholelithiasis, cholecystitis*

7. Musculoskeletal and Lower extremity venous ultrasound (laboratory session)

Identification of bones, tendons, and joint spaces; Rule out deep venous thrombosis (DVT) in femoral, saphenofemoral junction, and popliteal vein: compression test

*Pathology: +DVT, knee effusion*

**December**

Ultrasound OSCE: apical four-chamber view and identify all structures, multiple views of the abdominal aorta with measurements, DVT study (example only)

**Spring Semester**

**January**

Content review from Fall Semester

**February**

1. Assessment of patient with undifferentiated shock or shortness of breath (laboratory session)  
RUSH protocol: rapid ultrasound for shock/hypotension—assess LV function, rule out pericardial effusion/tamponade, assess for RV strain from pulmonary embolus (PE), volume status from IVC size and dynamics, scan abdomen and pelvis for free fluid, assess lungs for pneumothorax and pulmonary edema, assess aorta for rupture, assess femoral vein for DVT
2. Ultrasound OSCE

**Open ultrasound labs**

During the first 2 years (M1 and M2) open laboratory sessions are held twice monthly during a time when no other classes are scheduled. Students are encouraged to come in pairs or small groups and practice their ultrasound skills on each other. At least one ultrasound faculty member is available to help with scanning and answer questions.

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## ***Third Year (M3) - Clerkships***

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During the Pre-Clerkship block, POCUS-CP students will be provided a hand-held ultrasound (model and concept to be confirmed) for their individual use, and an overview of its basic function, appropriate use, etc.

### ***Phase 1- Introduction in May 2021***

#### **Specialty Care**

##### **Emergency Medicine**

Students will actively integrate POCUS into their clinical care of the patient including diagnosis and resuscitation

##### **Pediatric Emergency Medicine**

Students will accompany their patient when they obtain ultrasounds for abdominal pain in the evaluation of appendicitis, intussusceptions, etc

##### **Ophthalmology**

Students will perform ocular ultrasound to evaluate for retinal detachment, vitreous detachment, and vitreous hemorrhage

#### **OB/GYN**

For OB clinic patients: determine fetal number, heart rate, placental location, and fetal position

#### **Anesthesiology**

Students will perform ultrasound-guided peripheral IVs in the pre-op setting and central lines when indicated. Potential for expansion to regional anesthesia

#### **Surgery**

Assess a trauma patient using the (e)FAST exam

### ***Phase 2- Introduction in May 2022***

#### **Internal medicine**

Demonstrate ultrasound guided arterial blood draw, IV placement, and central venous line placement

#### **Family and ambulatory medicine**

Abdominal aortic aneurysm (AAA) screen—elderly patient with risk factors for AAA, student must discuss the procedure with the patient, perform the ultrasound examination, discuss results, and educate the patient about AAA

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***Fourth Year (M4) – Clerkships and Electives, Scholarly Project***

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All POCUS CP students will participate in a POCUS elective which will be tailored to their future interests. In addition, suggested electives and POCUS integration is outlined below.

**Regional Anesthesia (elective)**

Demonstrate knowledge of the relevant sonoanatomy for performing various nerve blocks. Demonstrate ability to perform ultrasound-guided nerve blocks.

**Radiology (elective)**

Students will spend one day per week with the faculty reading or performing ultrasounds, and one day per week with interventional radiology faculty performing ultrasound-guided procedures

**Critical care medicine (elective) – Children’s Hospital, Hospital of Veterans Affairs, Montefiore**

Students will integrate POCUS into their daily assessment of their patients or when there is an acute change in status. They will review pathology and scanning (heart, lung, abdomen) to assess volume status with static and dynamic scans of IVC, heart function, pericardial effusion, evidence of pulmonary embolus, pneumothorax and pulmonary edema

**Cardiology (elective)**

Students will integrate POCUS cardiac exam in relevant patients presenting with acute MI, valvular pathology, CHF, etc. Students will spend 1 day per week with the echocardiography technologist

**Physical Medicine and Rehabilitation (elective)**

Students will work with faculty to understand sonographic evaluation of the ankle, knee, and shoulder in the injured patient, as well as how to perform ultrasound-guided injections

At graduation upon successful completion of all requirements, students will receive a Certificate of Excellence in Clinical Ultrasound to be awarded with their diploma.

## ***Appendix 2***

### Faculty list

#### ***Executive Committee***

Emily Lovallo, MD *Emergency Medicine*

Marek Radomski, MD *Emergency Medicine*

#### ***Other POCUS CP Faculty***

#### **Emergency Medicine**

David Thomas, MD

Brett Beel, MD

#### **Pulmonary/Critical Care**

Stephanie Maximous, MD

Phillip Lamberty, MD

#### **Family Medicine**

Victoria McCurry, MD

Timothy Gaul, MD

#### **Pediatrics**

Jennifer Marin, MD

Desiree Neville, MD

#### **Sports Medicine/Musculoskeletal**

Kentaro Onishi, MD

Andrew Cordle, MD

Eric Helm, MD

#### **Radiology**

Mitch Tublin, MD

Anil Dasyam, MD

#### **Anesthesiology**

Michael Boisen, MD

Steven Orebaugh, MD

Kathirvel Subramanian, MD

#### **Cardiology**

Joshua Levenson, MD

#### **Critical Care**

Christopher Schott, MD

#### **Surgery**

*Vaishali Schuchert, MD*

#### **OB/GYN**

*Allison Serra, MD*

*Heather Hohmann, MD*

#### **Internal Medicine**

Raghunandan Purushothaman, MD