

POCUS IN SURGERY

Course Syllabus and Lecture Summaries

25–26 November 2026 | University Clinical Centre of Serbia, Belgrade, Serbia

Target educational level: ADVANCED | Course language: Serbian | Expected participants: 24

Course overview

POCUS in Surgery is a two-day course focused on point-of-care ultrasound in surgical practice, with emphasis on rapid assessment, clinical integration and supervised practical skill development. It is intended for healthcare professionals who already have clinical experience and wish to strengthen their use of POCUS in acute surgical and perioperative settings.

Overall aim

To improve participants' ability to select, perform and interpret focused ultrasound examinations in relevant surgical scenarios and to integrate findings into clinical decision-making.

Learning objectives

- Optimise ultrasound machine settings and recognise common artefacts and pitfalls.
- Apply the eFAST protocol in trauma assessment, including abdominal, pelvic and thoracic windows.
- Recognise key ultrasound findings in selected causes of acute non-traumatic abdominal pain.
- Assess the abdominal aorta and recognise findings that may indicate urgent vascular pathology.
- Use a structured POCUS approach to shock, including cardiac, IVC and vascular assessment.
- Use lung ultrasound to support assessment of dyspnoea and postoperative respiratory complications.
- Explain safety principles and demonstrate basic ultrasound-guided needle visualisation and access techniques under supervision.

Teaching and learning methods

Short lectures, demonstration, image-based teaching, small-group supervised practical workshops on models/phantoms, discussion and a final knowledge test.

Assessment and feedback

A final knowledge assessment and interactive discussion are scheduled for Day 2, from 16:30 to 17:00. The assessment will evaluate participants' understanding of the key theoretical concepts covered during the course and their knowledge of the clinical applications of point-of-care ultrasound (POCUS) in surgical practice.

The discussion will provide an opportunity to review the main learning points, clarify outstanding questions and address challenges encountered during the practical sessions. Participants will be encouraged to reflect on the integration of POCUS into their clinical workflows and to identify areas for further learning and skills development.

Feedback will also be collected from participants to evaluate the educational content, practical training and overall organisation of the course, helping to inform future improvements.

Lecture summaries

Ultrasound Physics and Artifacts in Point-of-Care Ultrasound (POCUS)

Point-of-care ultrasound (POCUS) has transformed rapid bedside decision-making across emergency and critical care medicine. However, accurate image interpretation fundamentally relies on a sound understanding of basic ultrasound physics and image formation. This lecture provides a clinically oriented review of core acoustic principles, including sound wave propagation, attenuation, acoustic impedance, and transducer selection. Emphasizing the transition from physical principles to bedside practice, we examine how beam-tissue interactions dictate image quality and how machine controls—such as gain, depth, and focal zones—can be optimized to minimize diagnostic error. Furthermore, acoustic artifacts represent a double-edged sword in POCUS: while some artifacts degrade image quality and mimic pathology (e.g., side-lobe, mirror-image, and reverberation artifacts), others serve as indispensable diagnostic clues critical for rapid triage (e.g., acoustic shadowing, posterior acoustic enhancement, and lung ultrasound features such as A-lines and B-lines). By mastering the physical origins of ultrasound and recognizing key artifacts, clinicians can avoid common interpretive pitfalls, optimize scanning technique, and enhance diagnostic accuracy in time-sensitive clinical scenarios.

eFAST Protocol in the Trauma Room

Point-of-care ultrasound (POCUS) has become an important extension of the surgeon's clinical examination, enabling rapid bedside assessment and supporting time-critical decision-making in trauma care. The extended Focused Assessment with Sonography for Trauma (eFAST) protocol provides a structured, focused ultrasound examination for the early detection of life-threatening thoracoabdominal injuries. In the trauma room, its value lies in the immediate integration of sonographic findings with the patient's hemodynamic status, physical examination, and the need for urgent surgical intervention.

This lecture will focus on the practical application of eFAST from the surgeon's perspective, emphasizing a systematic scanning technique, recognition of key anatomical landmarks, and interpretation of findings that may directly influence clinical management. The abdominal examination will cover the right upper quadrant, with particular attention to Morison's pouch and the hepatorenal recess, followed by the left upper quadrant, including the splenorenal recess and perisplenic space. The pelvic window will address the detection of free intraperitoneal fluid in the dependent pelvic spaces, with consideration of its clinical significance in patients with suspected intra-abdominal injury.

The thoracic component will focus on the sonographic identification of pneumothorax and hemothorax, including the assessment of lung sliding, B-lines, the lung point, and pleural fluid. Particular emphasis will be placed on recognizing ultrasound findings that require immediate action and on integrating eFAST into the primary survey and resuscitation workflow.

The lecture will also address the diagnostic limitations of eFAST, the importance of correlating ultrasound findings with the clinical picture, and the appropriate next steps when the examination is negative or inconclusive. Special attention will be given to the role of POCUS in identifying patients who may require urgent operative management, determining the need for further imaging, and avoiding delays in definitive treatment. The objective is to empower surgeons to use eFAST as a rapid, repeatable, and clinically relevant bedside tool that complements their examination and supports timely, informed decisions in the management of injured patients.

Acute Non-Traumatic Abdomen – The Role of POCUS in Surgical Decision-Making

Acute abdominal pain is one of the most common reasons for urgent surgical consultation, and clinical examination and laboratory findings are often insufficient for a reliable diagnosis. Point-of-care ultrasound (POCUS) provides a rapid, repeatable and non-invasive answer to a focused clinical question without ionizing radiation. This is particularly important in pregnant women and young patients. The examination should be systematic. Life-threatening conditions are excluded first: free fluid, abdominal aortic aneurysm and pneumoperitoneum. The examination is then guided by the location of pain. Ultrasound reliably demonstrates the key signs of acute cholecystitis, acute appendicitis, small bowel obstruction, obstructive uropathy and diverticulitis, and it is valuable in the differential diagnosis of gynecological causes of pain in women. According to EFSUMB recommendations, an "ultrasound first" approach is applied in suspected appendicitis and diverticulitis. Computed tomography (CT) is reserved for negative or inconclusive ultrasound findings. The method has limitations in mesenteric ischemia, complications of pancreatitis and technically difficult examinations, where CT is the

modality of choice. Interpreting POCUS findings in the clinical context enables rapid decisions on operative treatment, further imaging or observation.

Point-of-Care Ultrasound (POCUS) in evaluation and management of trauma patients

Point-of-Care Ultrasound (POCUS) has revolutionized the initial evaluation and management of trauma patients, becoming an indispensable tool for the modern trauma surgeon. In the critical "golden hour" of trauma care, rapid and accurate diagnostic modalities are essential for reducing morbidity and mortality. POCUS provides immediate, bedside, and real-time visualization of internal injuries without exposing unstable patients to the risks of transportation or radiation associated with computed tomography (CT) scans.

The standard Focused Assessment with Sonography for Trauma (FAST) and its extended version (eFAST) allow trauma surgeons to quickly detect free intraperitoneal fluid, hemopericardium, pneumothorax, and hemothorax. Beyond free fluid detection, advanced POCUS applications assist in assessing hemodynamic status, evaluating cardiac contractility, monitoring fluid responsiveness via inferior vena cava diameter, and guiding invasive procedures like central venous access. By integrating ultrasound directly into the physical examination, surgeons can differentiate types of shock, accelerate surgical decision-making, and prioritize operative interventions. Ultimately, POCUS enhances diagnostic precision, streamlines triage protocols, and significantly improves patient outcomes in high-stress emergency environments, solidifying its role as a core competency in contemporary trauma surgery.

Focused point-of-care cardiac ultrasound in intensive care medicine: a bedside approach to assessing ventricular function, inferior vena cava and pericardial effusion

Introduction: The use of Point-of-care (POCUS) echocardiography has become an essential component in the clinical evaluation of the patient in intensive care medicine. It allows for fast screening, aiding the clinician in gathering relevant information for further therapeutic approaches in a patient with hemodynamic instability and shock. It is not a replacement tool for echocardiography, rather an orientational one that gives the clinician specific answers to certain clinical questions. The goal: Present a clinically-guided focused echo of the heart, with emphasis on the size and function of the left and right ventricles, as well as the characteristics of the inferior vena cava and presence of a pericardial effusion.

Clinical approach: Focused cardiac ultrasound allows for a qualitative estimate of the systolic function of the left ventricle, as well as recognizing changes in size and function of the right ventricle which could indicate acute pressure overload or disturbances in pulmonary circulation. Estimation of the diameter of the inferior vena cava and its' respiratory variations may provide additional information of the pressure in the right atrium, however findings must be interpreted in the context of mechanical ventilation use, overall cardiac function and clinical picture.

Pericardial effusion detection should be interpreted in regards to its' hemodynamic significance, including Signs of cardiac tamponade, not solely based on its' size.

Conclusion: When performed by a trained intensivists , cardiac POCUS offers a wider and more versatile clinical evaluation of the critically ill patient. The integration of ultrasonographic findings with clinical assessment greatly aids in early recognition of life-threatening conditions, individualization of hemodynamic management and timely referral to a comprehensive echocardiography. Understanding the limits of certain ultrasonographic parameters is key for a safe and effective application of this approach.

From Shock to Diagnosis: The Role of the RUSH Protocol in Emergency Care

Shock is a state of global hypoperfusion with complex pathophysiology, in which rapid identification of the underlying cause is essential for timely patient management. Point-of-care ultrasound (POCUS) enables a rapid and systematic assessment of potential causes of shock in hemodynamically unstable patients.

The Rapid Ultrasound in Shock and Hypotension (RUSH) protocol provides a structured approach to ultrasound assessment based on three main components. The evaluation of the "pump" involves assessing cardiac function, including the size and contractility, the presence of signs of cardiac tamponade, and the potential detection of pneumothorax. The "tank" is assessed by examining the inferior vena cava, and the presence of free fluid. The evaluation of the "pipes" includes examination of the abdominal aorta and major veins. Integration of ultrasound findings enables rapid differentiation among the four major types of shock.

The RUSH protocol represents a practical and systematic POCUS approach that facilitates the rapid identification of common causes of shock and guides initial clinical management. Its particular value lies in the ability to integrate the assessment of multiple organ systems during a single, focused, and relatively brief examination.

Thoracic POCUS: When Does Ultrasound Change Surgical Decision-Making?

Point-of-care ultrasound (POCUS) is a rapid, non-invasive, and readily available diagnostic tool that is playing an increasingly important role in modern thoracic surgery and interventional pulmonology. The ability to perform examinations at the bedside, without exposing patients to ionising radiation, facilitates timely clinical decision-making and the assessment of treatment outcomes following therapeutic procedures.

POCUS is particularly valuable in the diagnosis of pneumothorax, the detection and characterisation of pleural effusions, the identification of peripheral pulmonary consolidations, and the assessment of postoperative complications. Ultrasound-guided interventional procedures, including thoracentesis, pleural drainage, and biopsy of subpleural lesions, improve procedural accuracy and reduce the risk of complications.

In the perioperative period, POCUS enables dynamic assessment of the lung parenchyma and pleural space, allowing repeated examinations without the need to transport the patient. Its application is particularly valuable in critically ill and haemodynamically unstable patients, in whom the rapid identification of pathological findings can directly influence therapeutic management.

Nevertheless, ultrasound has certain limitations, particularly in the assessment of deeply located intrapulmonary lesions, making computed tomography indispensable in many clinical scenarios.

The aim of this lecture is to illustrate the capabilities, advantages, and limitations of POCUS through practical clinical cases, with particular emphasis on its impact on surgical decision-making and the importance of multidisciplinary collaboration between radiologists and surgeons.

Ultrasound-guided surgical procedures and interventions

Targeted puncture and drainage of intra-abdominal fluid collections and abscesses

Intra-abdominal fluid collections may develop from postoperative complications, inflammatory conditions, infections or trauma. They can arise in various anatomical locations, including the peritoneal cavity, pelvis, and retroperitoneal space or they can occur inside parenchymal abdominal organs. Image-guided percutaneous drainage is a minimally invasive treatment option that can reduce the need for surgical intervention in appropriately selected patients.

Ultrasound (US) plays an important role in the diagnosis, localization and drainage of accessible collections, offering real-time needle guidance without ionizing radiation. Depending on the collection's location, visibility, and anatomical accessibility, the entire procedure may be performed under US guidance, or US may be used for initial needle puncture, followed by guidewire and catheter placement under fluoroscopic or CT guidance.

This lecture will address patient selection, preprocedural assessment, safe access planning, puncture techniques, guidewire manipulation, catheter placement and potential complications. Special attention will be placed on practical tips for avoiding adjacent organs and vascular structures, selecting an appropriate access route and ensuring effective drainage. Representative clinical cases will illustrate different approaches, technical challenges and the role of US-guided interventions in everyday surgical practice. The aim is to improve procedural safety and technical success through the effective use of ultrasound-guided interventions.

Ultrasound-Guided Surgical Procedures and Interventions: Intra-Abdominal Collection Drainage and Vascular Access

Introduction: Ultrasound (US) has become an essential tool in modern clinical practice, enabling real-time visualization of anatomical structures and facilitating minimally invasive procedures. Its portability, lack of ionizing radiation, and ability to provide immediate guidance make it particularly valuable for intra-abdominal interventions and vascular access.

Discussion: Ultrasound-guided needle aspiration and drainage of intra-abdominal fluid collections and abscesses represent effective alternatives to more invasive surgical approaches in appropriately selected patients. Real-time

imaging allows precise localization of the target, selection of a safe access route, and monitoring of needle and catheter placement, potentially reducing complications and improving procedural success. Similarly, ultrasound-guided central and peripheral vascular access improves vessel identification and facilitates accurate needle placement. This technique may reduce unsuccessful attempts and complications, including arterial puncture, hematoma formation, and mechanical injury. Successful implementation requires appropriate equipment, adherence to aseptic technique, knowledge of relevant anatomy, and adequate operator training. Clinical assessment and careful patient selection remain essential to determine procedural indications and anticipate potential risks. Conclusion: Ultrasound-guided interventions are valuable components of contemporary minimally invasive care. Their application in intra-abdominal collection drainage and vascular access can enhance procedural precision and patient safety while reducing reliance on more invasive techniques. Standardized protocols, continuous training, and appropriate clinical monitoring are essential to optimize outcomes and support the broader integration of ultrasound-guided procedures into routine practice.

Course schedule and faculty

The detailed session times, teaching methods and faculty assignments are provided in Appendix 1 — Preliminary Scientific Programme.

Suggested references

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