Univerza v Mariboru
Medicinska fakulteta

Erasmus+
BLENDED INTENSIVE PROGRAMME

UKC MARIBOR

TEACHING MATERIALS

2nd Intensive Clinical Skills Course and Simulation-Based Learning for Undergraduate Medical Students

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Faculty of Medicine, University of Maribor

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Contents

Programme 4

INVITED LECTURES

Clinical Peer Teaching at the Faculty of Medicine, University of Maribor 8

ECG Basics 9

Acute Coronary Syndrome 10

Management of COPD and Asthma Exacerbations – from Assessment to Intervention 11

Advanced Internal Medicine Procedures 12

Urinalysis – a Quick Review for Everyday 13

LECTURES WITH WORKSHOPS

Chest X-ray Interpretation 16

Clinical Simulations – Universal Approach to the Critically Ill Patient 17

Blood Test Results Interpretation 18

Management of COPD and Asthma Exacerbations – from Assessment to Intervention (Simulation Workshop) 19

WORKSHOPS

Digital Rectal Examination 22

Blood Pressure Measurement 23

Venepuncture 24

Arterial Blood Sampling 25

Peripheral Venous Cannulation 26

Intravenous Infusion Set-up 27

Urinary Bladder Catheterisation 28

Urinary Catheter Withdrawal 29

Nasogastric Tube Insertion 30

Intramuscular Injection 31

Ultrasound – eFAST and FoCUS 32

Programme

Day 1

09:00 – 09:15 Registration

09:15 – 09:30 Course Opening, Programme Overview and Introductions – **Sebastjan Bevc**

09:30 – 10:00 Presentation of the Faculty of Medicine, Clinical Skills Lab, Simulation Centre and Clinical Peer Teaching – **Sebastjan Bevc**

10:00 – 12:00 Group Rotations: Clinical Skills Training – Peripheral IV Cannulation, Arterial Blood Sampling, Foley Catheter Insertion, Bedside Ultrasound – **MF tutors**

12:00 – 13:00 Lecture: ABCDE Approach – **Sonia Luka**

13:00 – 14:30 Lunch Break

14:30 – 16:30 Lecture and Group Work: Cardiopulmonary Resuscitation and Arrhythmias – **Gabriel Cismaru, Sonia Luka, Jan Biteznik**

16:30 – 17:00 Summary of Day One

Day 2

09:00 – 10:00 Lecture: Interpreting Blood Counts – **Mojca Dreisinger**

10:00 – 11:00 Lecture: Basics of ECG – **Gabriel Cismaru**

11:00 – 13:00 Group Work: ECG in Clinical Practice and Feedback – **Sebastjan Bevc, Jan Biteznik**
Group Work: ABCDE Simulation and Feedback – **Luka Varda**

13:00 – 14:30 Lunch Break

14:30 – 16:30 Group Work: ECG in Clinical Practice and Feedback – **Nino Vreča, Jan Biteznik**
Group Work: ABCDE Simulation and Feedback – **Luka Varda**

16:30 – 17:00 Summary of Day Two

Day 3

09:00 – 10:00 Lecture: Management of COPD and Asthma Exacerbations – from Assessment to Intervention – **Janja Tarčuković**

10:00 – 11:00 Lecture: Acute Coronary Syndrome – **Gabriel Cismaru**

11:00 – 13:00 Group Work: Asthma Simulation and Feedback – **Katarina Božič, Janja Tarčuković, Jan Biteznik**

13:00 – 14:30 Lunch Break

14:30 – 16:30 Group Work: Asthma Simulation and Feedback – **Katarina Božič, Janja Tarčuković, Jan Biteznik**

16:30 – 17:00 Summary of Day Three

Day 4

09:00 – 10:00 Lecture: Interpreting Chest X-rays – **Iztok Fošnarič**

10:00 – 11:00 Lecture: Urinalysis – **Tadej Petreski**

11:00 – 13:00 Group Work: Acute Coronary Syndrome Management Simulation and Feedback – **Luka Varda, Nino Vreča**

13:00 – 14:30 Lunch Break

14:30 – 16:30 Group Work: Pulmonary Embolism Management Simulation and Feedback – **Luka Varda, Nino Vreča**

16:30 – 17:00 Summary of Day Four

Day 5

09:00 – 11:00 Group Rotations: Clinical Skills Training – Peripheral IV Cannulation, Arterial Blood Sampling, Foley Catheter Insertion, Bedside Ultrasound – **MF tutors**

11:00 – 12:00 Lecture: Presentation of Advanced Internal Medicine Procedures – **Sonia Luka**

12:00 – 13:00 Simulation Protocols - Group Work and Discussion – **Sonia Luka, Jan Biteznik, Luka Varda, Tadej Petreski, Nino Vreča, Sebastjan Bevc**

13:00 – 14:30 Lunch Break

14:30 – 15:30 Course Summary and Feedback

15:30 – 16:30 Final Test

16:30 – 17:00 Course Closing

INVITED LECTURES

Clinical Peer Teaching at the Faculty of Medicine, University of Maribor

Sebastjan Bevc

Clinical peer teaching is an innovative and increasingly valued element of medical education at the Faculty of Medicine, University of Maribor. It is based on the principle that students, particularly those in higher years of study, can effectively teach and mentor their junior colleagues in a structured clinical setting. This model is widely recognised for its dual benefits: enhancing the learning outcomes of the students being taught while simultaneously developing the teaching and leadership skills of the student tutors.

At the Faculty of Medicine in Maribor, peer teaching is most commonly applied in clinical skills training, bedside teaching, and small-group case discussions, and has been developed through elective courses in the third year of medical studies. Junior students benefit from a more approachable and supportive learning environment, as they often feel more comfortable asking questions and clarifying uncertainties with peers than with senior faculty. Additionally, the use of near-peer tutors helps bridge the gap between theoretical knowledge and clinical application, providing practical insights and advice directly relevant to examinations and future practice.

For senior students, engaging in peer teaching strengthens their ability to explain complex concepts, improves their communication and didactic skills, and encourages reflection on their own clinical knowledge. It also fosters professional development by preparing them for future roles as educators and mentors within the healthcare system. Last but not least, it also enables the organisation and implementation of national and international meetings on the topic of medical education.

Overall, clinical peer teaching at the Faculty of Medicine, University of Maribor contributes to a culture of collaboration, mutual support, and active learning. By promoting both knowledge transfer and professional growth, it enriches the academic environment and plays an important role in shaping competent and reflective future physicians.

LITERATURE:

Rižnik P, Bevc S. The evolution of clinical skills peer teaching at the Faculty of Medicine, University of Maribor: Razvoj kliničnega tutorstva na Medicinski fakulteti Univerze v Mariboru. Acta Medico-Biotechnica. 2016;9(2):17-24.

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Mihevc M, Masnik K, Petreski T, Pulko N, Bevc S. Effects of differential time and difficulty weighting on the improvement of OSCE quality metrics. Acta Medico-Biotechnica. 2022;15(1):29-40.

Tanveer MA, Mildestvedt T, Skjærseth IG, Arntzen HH, Kenne E, Bonnevier A, et al. Peer teaching in undergraduate medical education: what are the learning outputs for the student-teachers? A systematic review. Advances in Medical Education and Practice. 2023:723-39.

ECG Basics

Gabriel Cismaru

It is challenging for an individual without medical training to understand that the heart possesses its own electrical activity. This electrical activity can be captured using portable instruments known as electrocardiographs. When Willem Einthoven invented the first functional electrocardiograph in 1895, it weighed 272 kilograms. Modern devices have evolved, resulting in a range of small wireless devices that can be carried in the palm of one's hand.

The ECG uses standard paper with squares of 1 mm, corresponding to a 0.04-second time duration. The speed of the paper is 25 mm per second, and 10 mm of amplitude corresponds to 1 millivolt. A normal ECG shows a P wave, a QRS complex and a T wave. The surface intervals correspond to intra-cardiac intervals like PA=10-45 ms, AH=55-130 ms and HV=30-55 ms.

There are three main methods to measure the heart rate: the R wave method, where the number of R waves in a 10-second recording is multiplied by 6; the number of R waves in 6 seconds, multiplied by 10; and estimation, based on the squares between two consecutive RR waves, with values ranging from 300-150-100-75-60-50.

Three fundamental pieces of information are essential for interpreting an ECG.

1) What is the rhythm?

2) Is there a bundle branch block?

3) Are there any signs of ischemia?

If the student can answer these three short questions, they possess the capability to interpret an ECG and determine the proper treatment.

The ECG approach serves as the foundation for more sophisticated diagnostic methods, such as Holter ECG, stress testing, and long-term monitoring with loop recorders.

LITERATURE:

Khan E. Clinical skills: the physiological basis and interpretation of the ECG. British journal of nursing. 2004;13(8):440-6.

Becker DE. Fundamentals of electrocardiography interpretation. Anesthesia progress. 2006;53(2):53-64.

Jevon P. An introduction to electrocardiogram monitoring. Nursing in critical care. 2010;15(1).

Drew BJ, Funk M. Practice standards for ECG monitoring in hospital settings: executive summary and guide for implementation. Critical Care Nursing Clinics. 2006;18(2):157-68.

Acute Coronary Syndrome

Gabriel Cismaru

Acute coronary syndrome (ACS) represents a range of conditions that involve a sudden decrease in coronary blood flow, reduced oxygen supply to the myocardium, clinically manifested by anginal chest pain and electrocardiographic changes. The most common cause is atherosclerosis of the coronary artery. There are 2 forms of ACS: with ST elevation and without ST elevation. Usually, ST elevation ACS leads to STEMI, and non-ST elevation ACS leads to unstable angina and NSTEMI. The difference between the 3 entities is made by troponin elevation and ST changes on the electrocardiogram.

The ECG must be recorded and interpreted within 10 minutes of the patient's presentation to the emergency room. In STEMI, ST elevation is always present on a 12-lead ECG. However, in unstable angina and NSTEMI, there is ST depression or T wave inversion or even a normal ECG with pain. Of the three, STEMI is the most severe form, a medical emergency which needs coronarography or urgent thrombolysis.

Cardiac enzymes are used as biomarkers of myocardial lesions, increasing when myocardial cells present necrosis. Troponin T, troponin I, CK-MB and LDH increase during an acute myocardial infarction.

Differential diagnosis should be made with other diseases that can mimic an acute coronary syndrome: acute pericarditis, early repolarisation syndrome, left ventricular hypertrophy, left bundle branch block, ventricular pacing, Brugada syndrome and arrhythmogenic right ventricular dysplasia. Differential diagnosis should be made using ECG criteria and cardiac enzymes.

Both percutaneous coronary intervention (PCI) and thrombolysis are viable choices for ST-elevation myocardial infarction, depending upon the hospital's capabilities and the time of arrival.

LITERATURE:

Atwood J. Management of acute coronary syndrome. Emergency Medicine Clinics. 2022;40(4):693-706.

Smith JN, Negrelli JM, Manek MB, Hawes EM, Viera AJ. Diagnosis and management of acute coronary syndrome: an evidence-based update. The Journal of the American Board of Family Medicine. 2015;28(2):283-93.

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Rao SV, O'Donoghue ML, Ruel M, Rab T, Tamis-Holland JE, Alexander JH, et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI guideline for the management of patients with acute coronary syndromes: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Journal of the American College of Cardiology. 2025;85(22):2135-237.

Management of COPD and Asthma Exacerbations – from Assessment to Intervention

Janja Tarčuković

Acute exacerbations of chronic obstructive pulmonary disease (COPD) and asthma are among the most frequent causes of emergency admissions and acute respiratory failure. Optimised management requires early recognition, structured assessment, and evidence-based interventions to prevent deterioration. This lecture provided an integrative overview of current best practices in the emergency treatment of COPD and asthma exacerbations, based on guideline recommendations and core physiological principles of respiratory care.

A systematic approach following the ABCDE algorithm was emphasised to ensure prioritisation of life saving actions. Airway assessment and protection remain the first step, followed by tailored oxygen therapy. Target oxygen saturation levels are 88–92% in COPD patients and above 94% in asthma, avoiding hyperoxia that can precipitate CO_2 retention. In COPD patients, controlled oxygen is preferably administered via a Venturi mask (FiO_2 24–35%), escalating to non rebreather masks (10–15 L/min) if severe hypoxaemia persists. When respiratory efforts diminish or acidosis develops in conscious patient, a trial of non invasive ventilation (NIV) with bilevel positive airway pressure (BiPAP) may be indicated before proceeding to intubation and invasive mechanical ventilation.

Bronchodilator therapy is central to acute management. Short acting β_2 agonists (salbutamol 5 mg) delivered by nebuliser (≥ 6 L/min flow) should be repeated every 15–20 minutes, often combined with ipratropium bromide 0.5 mg, to achieve additive bronchodilation. Nebulisers should be oxygen driven unless hypercapnia is present, in which case air driven systems are preferred. Systemic corticosteroids, such as hydrocortisone 200 mg IV, should be administered promptly, followed by prednisone 0,5 mg/kg/day. Infection induced exacerbations may require antibiotics (macrolides and/or amoxicillin).

The session also discussed escalation thresholds, criteria for hospitalisation, and practical considerations for interprofessional teamwork during respiratory emergencies. By merging evidence, physiology, and structured clinical reasoning, the lecture aimed to enhance students' ability to rapidly stabilize acutely breathless patient, titrate oxygen and pharmacotherapy safely, and communicate effectively during emergency management, using both a systematic approach and sound clinical judgement.

LITERATURE:

1. Tintinalli JE, Ma OJ, Yealy DM, Meckler GD, Stapczynski JS, Cline DM, Thomas SH. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. 9th ed. New York: McGraw Hill Education; 2020.

2. Soar J, Böttiger BW, Carli P, Jimenez FC, Cimpoesu D, Cole G et al. European Resuscitation Council Guidelines 2025: Adult advanced life support. Resuscitation. 2025; 110769.

3. Tarčuković J, Šuper Petrinjac E, eds. Simulation of Clinical Skills: A Practical Guide. University of Rijeka, Faculty of Medicine; 2025.

Advanced Internal Medicine Procedures

Sonia Luka

Advanced internal medicine procedures form an integral part of contemporary clinical care. They are defined by intentional access to the body through incision, puncture, or similar approaches, requiring technical instruments and a trained operator. Globally, invasive procedures are performed on a massive scale, with estimates exceeding 230 million annually, and most individuals will undergo several such interventions during their lifetime. This highlights the need for rigorous, evidence-based training and education to support safe and effective practice.

Bedside procedures are frequently required for both diagnostic clarification and therapeutic intervention. Competence in these skills is essential across disciplines, particularly when caring for patients with multiple comorbidities who may present in different hospital departments. Early, structured training not only enhances students' technical ability but also builds professional assurance. Insufficient confidence in procedural performance has been associated with an increased tendency to delegate tasks to interventional radiology or subspecialty services, thereby limiting hands-on experience and slowing skill acquisition. In contrast, simulation-based learning, direct supervision, structured feedback, and standardised assessment frameworks provide a safe environment to gain proficiency and reinforce decision-making capacity.

Incorporating procedural training into international mobility programs, such as the BIP Intensive Course on Clinical Skills and Simulation-Based Learning for Pregraduate Medical Students, provides participants with an important platform to gain early exposure to essential clinical skills. This knowledge remains valuable regardless of future specialisation, helping to reduce uncertainty in clinical practice, enhance patient safety, and facilitate a smoother progression into residency training. Advanced internal medicine procedures represent a critical component of safe and effective patient care. The structured approach offered within the BIP Intensive Course highlights how procedural knowledge can be systematically introduced at the undergraduate level. Such early engagement strengthens conceptual understanding, builds confidence, and prepares students to meet the varied demands of modern healthcare. By fostering transferable knowledge and awareness, theoretical training contributes not only to individual professional development but also to the overall quality and safety of medical practice.

LITERATURE:

Cousins S, Blencowe NS, Blazeby JM. What is an invasive procedure? A definition to inform study design, evidence synthesis and research tracking. BMJ open. 2019;9(7):e028576.

Louis AS, Lee C, Page AV, Ginsburg S. Anticipation or avoidance: internal medicine resident experiences performing invasive bedside procedures. Canadian Medical Education Journal. 2023;14(5):5-13.

Thai T, Louden DK, Adamson R, Dominitz JA, Doll JA. Peer evaluation and feedback for invasive medical procedures: a systematic review. BMC Medical Education. 2022;22(1):581.

Urinalysis – a Quick Review for Everyday

Tadej Petreski

Urinalysis is a cost-effective, rapid, and powerful diagnostic tool. By providing a good sample, conducting the correct basic tests, and taking a focused look under the microscope, you can distinguish between kidney and urinary-tract problems, determine the appropriate course of action for haematuria or proteinuria, and identify chronic kidney disease (CKD) early.

Specimen quality comes first. Aim for a clean-catch, midstream sample; a second-morning urine is practical for most screening. Use a 24-hour urine collection to quantify abnormalities such as proteinuria, electrolyte excretion, or to measure creatinine clearance. It is important to deliver the sample to the lab within two hours or keep it refrigerated.

Chemical testing starts with the dipstick (specific gravity, pH, leukocyte esterase, nitrite, blood, protein, glucose, ketones, bilirubin/urobilinogen). Remember the common traps: blood can read positive with free haemoglobin or myoglobin from rhabdomyolysis; protein can be falsely high in alkaline urine or falsely low if very dilute; nitrite can be negative if urine sat in the bladder too briefly or if the organism does not reduce nitrate; SGLT2 inhibitors can cause glucosuria even when plasma glucose is normal. To measure protein more precisely, use a spot albumin-to-creatinine ratio (UACR) or protein-to-creatinine ratio (UPCR).

Microscopy tells us about cells, casts, or crystals in the urine. Dysmorphic red cells—especially acanthocytes—and red cell casts point to a glomerular source. Isomorphic red cells and visible clots suggest a urologic source. White cell casts are indicative of pyelonephritis or interstitial nephritis; granular or waxy casts suggest tubular injury or chronic disease.

For haematuria, first confirm it on microscopy (commonly defined as three or more red cells per high-power field). A glomerular pattern typically accompanies proteinuria and an “active” sediment; a urologic pattern is associated with irritative symptoms, clots, or cancer risk factors and may necessitate imaging and cystoscopy using a risk-based approach. For proteinuria, determine whether it is transient (associated with fever or exercise) or persistent. A “nephritic” picture refers to haematuria accompanied by modest proteinuria and often reduced kidney function, as well as hypertension. A “nephrotic” picture refers to the heavy loss of protein in urine (>3.5 g/day), extremity or facial oedema, serum hypoalbuminemia, and hyperlipidemia.

LITERATURE:

Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int. 2024;105(4S):S117-S314.

Hitzeman N, Greer D, Carpio E. Office-Based Urinalysis: A Comprehensive Review. Am Fam Physician. 2022;106(1):27-35B.

Haq K, Patel DM. Urinalysis: Interpretation and Clinical Correlations. Med Clin North Am. 2023;107(4):659-79.

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LECTURES WITH WORKSHOPS

Chest X-ray Interpretation

Primož Caf, Iztok Fošnarič

Purpose:

Despite the introduction of advanced imaging modalities, chest X-ray (CXR) interpretation remains a fundamental diagnostic tool for many pathologies.

The purpose of the workshop is introduction of the systematic approach to CXR interpretation (for example, **ABC** approach - **A**irway, **B**ones, **C**ardiac silhouette, **D**iaphragm, **E**dges of heart, **F**ields of the lungs, **G**astric bubble, **H**ila, **I**nstrumentations), review of the normal anatomy of the thorax, recognition of typical patterns of lung disease and underlying pathologies (pneumonia, heart failure, pneumothorax, pleural effusion, tumor masses, lung abscess, hiatal hernia, pulmonary embolism). We will discuss the technical aspects of CXR and the advantages/limitations of alternative imaging methods (CT, MRI, US).

AIMS:

1. *Understand the importance and indications of CXR examination.*
2. *Understand the structure of a CXR (technical aspects, Silhouette sign, Air bronchogram sign, Signs of lung/lobar collapse).*
3. *Select the appropriate imaging method for pulmonary pathology (CXR, CT, MRI, US).*
4. *Apply the systematic (ABC) approach when reading a chest X-ray.*
5. *Familiarisation with literature that is helpful in reading chest X-ray images.*

Clinical Simulations – Universal Approach to the Critically Ill Patient

Tadej Petreski, Jure Fluher, Luka Varda, Sebastjan Bevc

Purpose:

Immediately and secondary endangered patients represent a stressful situation for the physician in which quick and effective action is required. To prevent errors in patient care, we follow the protocol of the primary ABCDE examination, which includes assessing the airway (A), breathing (B), circulation (C), neurological deficit (D), and additional factors – whole body examination (E). The protocol encompasses all the necessary clinical examinations, clinical and laboratory tests and therapeutic measures that are essential for a critically ill patient in an emergent situation. The purpose of the lecture and workshop is to expose medical students to a patient in a life-threatening situation and to perform the primary ABCDE examination, patient care, and a secondary examination on a manikin. If cardiorespiratory stability is achieved, the patient will be transferred to hospital care using the SBAR (Situation, Background, Assessment, and Recommendations) approach. Besides improving students' clinical thinking and approach to such patients, the workshop emphasises teamwork, communication skills within the team, and the introduction of patients to a senior on-call doctor.

AIMS:

1. *To communicate effectively with the patient and medical team in a clinical situation.*
2. *To use the ABCDE protocol in a critical situation for a patient at risk of both direct and indirect harm.*
3. *To perform a secondary or re-examination in a clinical situation.*
4. *To perform skills of digital rectal examination, peripheral venous cannulation, intravenous infusion set-up, venepuncture and arterial blood sampling on the trainer.*
5. *To use the SBAR approach to hand over a patient to hospital care in a clinical situation.*
6. *To learn how to properly use the manikin and supplies.*
7. *To critically assess errors and identify opportunities for improving the overall approach to caring for the critically ill patient based on feedback.*

Blood Test Results Interpretation

Mojca Dreisinger, Zlatko Roškar, Tadej Petreski

Purpose:

A complete blood count (CBC) is the most basic and common test in medicine, providing a wealth of information. The key is to correctly evaluate the results and correlate them with anamnestic data, clinical findings, and any other tests.

The first step in examining the CBC results is to check whether the values of the cell types (erythrocytes, leukocytes and platelets) are within the reference range. Not every deviation indicates a medical condition or haematological disease, but may be the result of lifestyle habits, physiological changes, stress, medication or laboratory error. The greater the deviation of the measured values in an individual cell type and/or if there is a deviation in two or all three cell types, the greater the likelihood that it is a primary blood disease. The proportion of patients with blood diseases is small, but in certain conditions, rapid recognition and prompt action are crucial.

It is best to approach the reading of the complete blood count step by step, evaluating all three cell types. When interpreting the red blood count, the most important information is the concentration of haemoglobin (Hb). The values of the number of erythrocytes, the volume of compressed erythrocytes (haematocrit), and the estimate of the mean corpuscular volume (MCV) are also important. The white blood count includes the number of all leukocytes; therefore, to define disease states, a blood differential test is necessary, from which we can determine the number of individual types of leukocytes (neutrophils, lymphocytes, eosinophils, monocytes, basophils) and the presence of any immature granulocytes. When defining quantitative changes in the number of leukocytes, it is essential to consider the absolute values of individual leukocyte subtypes. When evaluating the platelet blood count, it is essential to consider that determining the number of platelets with a haematology analyser can be unreliable. Therefore, especially in cases of reduced and greatly increased numbers, a microscopic examination of the blood count is recommended.

AIMS:

1. *Review of a normal complete blood count.*
2. *Recognition of reactive changes in blood count.*
3. *Recognition of the most common blood diseases and acute life-threatening conditions in haematology.*
4. *Familiarisation with basic procedures in acute life-threatening conditions in haematology.*

Management of COPD and Asthma Exacerbations – from Assessment to Intervention (Simulation Workshop)

Katarina Božić, Janja Tarčuković

Purpose:

This high fidelity simulation workshop provides hands on training in the structured assessment and management of patients presenting with acute COPD and asthma exacerbations. Participants are immersed in scenario based exercises replicating real life emergencies, applying the ABCDE approach to identify and treat respiratory distress, hypoxaemia, and hypercapnia. Guided by facilitators, students practice essential procedures including oxygen delivery, bronchodilator administration, and safe application of non invasive ventilation.

AIMS:

1. *Develop clinical reasoning and decision-making skills in acute care scenarios.*
2. *Strengthen prioritisation and time-management under pressure.*
3. *Enhance teamwork and interprofessional communication in clinical practice.*
4. *Promote reflective learning through debriefing and discussion.*
5. *Increase awareness of how clinical decisions influence patient outcomes.*
6. *Build confidence in safe and effective bedside care.*

WORKSHOPS

Digital Rectal Examination

Ula Jelen, Sebastjan Bevc, Marko Zdravković, Klara Masnik

Purpose:

Rectal examination is a simple clinical method that can provide the clinician with a wealth of important information, especially in cases of gastrointestinal bleeding, inflammatory bowel disease (IBD), haemorrhoids, constipation, trauma, and neurological conditions (such as spinal cord injuries leading to incontinence). In men, palpation of the prostate is also essential for ruling out pathologies, including malignancies and inflammation. In the case of prostate enlargement or detectable surface irregularities, further diagnostic testing is required. In addition to its role in detecting pathologies, the examination is also used to facilitate the insertion of rectal tubes and the administration of suppositories.

The final part of the examination involves inspecting the examiner's finger for traces of blood or mucus. Dark, sticky blood (melena) is associated with bleeding in the upper gastrointestinal tract, anatomically defined as the portion above the ligament of Treitz (ligamentum suspensorium duodeni). Melena may result from conditions such as peptic ulcers or gastric cancer. At the same time, fresh blood (haematochesia) suggests bleeding from the lower gastrointestinal tract due to, for example, haemorrhoids, anal fissures, or colorectal cancer. An excessive amount of mucus may indicate IBD, including ulcerative colitis and Crohn’s disease, or malignancies.

The examination is brief but often uncomfortable for the patient, although it is rarely painful. Effective communication during the procedure is crucial for minimising patient discomfort, promoting cooperation, and fostering trust between the patient and the healthcare provider.

AIMS:

1. *Appropriate communication with the patient during a digital rectal examination.*
2. *Knowledge of the protocol for performing the digital rectal examination.*
3. *Knowledge of the supplies needed for performing the digital rectal examination.*
4. *Successfully completing the digital rectal examination.*
5. *Proper performance and interpretation of faecal occult blood test results and next steps in the event of a positive result.*
6. *To learn how to properly handle digital rectal examination trainers in the simulation centre.*
7. *Improving skill performance based on feedback provided.*

Blood Pressure Measurement

Arne Klemen Marušič, Radovan Hojs, Sebastjan Bevc, Marko Zdravković, Nejc Pulko

Purpose:

The Riva-Rocci technique, developed in the late 19th century by Scipione Riva-Rocci, is a method for measuring blood pressure using a sphygmomanometer and stethoscope. It formed the foundation of contemporary blood pressure assessment. It involves inflating a cuff around the upper arm to a pressure that collapses the underlying artery, then slowly releasing the pressure while listening for the return of blood flow. Initially, the returning blood flow is turbulent, producing sounds known as Korotkoff sounds. The pressure at which these sounds are first heard corresponds to the systolic pressure, and the pressure at which they disappear is the diastolic pressure. Several common mistakes can affect the accuracy of the measurement. For instance, placing the cuff too tightly or loosely can artificially elevate or lower the reading. Incorrect arm positioning – above or below heart level – can similarly result in underestimation or overestimation of blood pressure, respectively. To ensure accurate results, standard preparation guidelines should be followed. The patient should rest for at least five minutes in a chair with back support, with their feet flat on the floor and legs uncrossed. They should avoid caffeine, alcohol, tobacco use, or exercise for at least 30 minutes before the measurement. Additionally, the reading should be taken at least two hours after a meal, with an empty bladder, and without the patient speaking during the procedure.

AIMS:

1. *Appropriate communication with the patient during a blood pressure measurement.*
2. *Knowledge of the protocol for performing the blood pressure measurement.*
3. *Knowledge of the supplies needed for performing the blood pressure measurement.*
4. *Successfully completing the blood pressure measurement.*
5. *Improving skill performance based on feedback provided.*

Venepuncture

Luka Jančič, Eva Timošek, Primož Jarc, Iza Smrečnik

Purpose:

Venepuncture is one of the most commonly performed medical procedures. Venous blood is usually obtained from the patient's cubital area; however, the location of the puncture may differ depending on the accessibility of the patient's veins that are suitable for puncture. The process of venepuncture is considered relatively fast and almost painless. This should not distract us from the importance of some aspects of the procedure or the procedure itself. During the process, the patient is typically seated or lying in a supine position. Before the patient's skin is punctured, the proper disinfection process, tourniquet placement, and preparation of the needle itself are necessary. When the puncture is performed, the sterile field must not be broken. It is also crucial not to leave the tourniquet in place for an extended period – prolonged tourniquet application can lead to falsely elevated electrolyte levels (e.g., potassium) and unnecessary discomfort. After successfully obtaining the blood sample, the needle must be discarded appropriately to prevent potential injuries to ourselves or our patients. The entire procedure must be carried out professionally to avoid complications such as infection, bruising, or lightheadedness.

AIMS:

1. *Appropriate communication with the patient during a venepuncture.*
2. *Knowledge of the protocol for performing the venepuncture.*
3. *Knowledge of the supplies needed for performing the venepuncture.*
4. *Successfully completing the venepuncture.*
5. *Using the appropriate vacutainer blood collection tube for the required test and knowing the correct order of venous blood collection according to the required tests.*
6. *To learn how to properly handle venepuncture trainers in the simulation centre.*
7. *Improving skill performance based on feedback provided.*

Arterial Blood Sampling

Ula Jelen, Vesna Vrčko, Luka Završnik, Jan Koščak

Purpose:

Arterial blood sampling is considered the gold standard for conducting blood gas analysis. It is a diagnostic method that allows for the evaluation of a patient's oxygenation, ventilation, and acid-base balance. In the case of correct sampling, the test is reliable and fast, providing information about pH, PaO_2, $PaCO_2$, HCO_3^-, anion gap, and SaO_2. Another important measurement is the alveolar-arterial oxygen gradient, which provides insight into the difference in partial pressures between the alveoli and arterial blood. It helps understand the respiratory, circulatory, and metabolic status of the body, making it indicated in conditions that may potentially cause disturbances in any of these areas. It is always performed in critically ill patients, including those with respiratory failure, acute or chronic, and in conditions that may lead to metabolic acidosis (such as cardiac, renal, or liver failure, hyperglycaemic states in diabetes mellitus, sepsis, burns, or poisoning) or in patients on mechanical ventilation.

As it is the most accessible, the radial artery is usually used for blood sampling. Allen’s test must be conducted before performing a radial artery puncture. This is a screening technique used to assess the collateral circulation of the hand and has no absolute contraindications. It evaluates the integrity of the anastomosis between the superficial and deep palmar arches, which provide the primary blood supply to the hand. The test is considered positive if blood flow is reestablished within 5–15 seconds after releasing the ulnar artery; in this case, the puncture is considered safe.

Alternative sites include the brachial and femoral arteries; however, these are located deeper beneath the skin surface, have less developed collateral circulation, and carry a higher risk of injury to surrounding structures, primarily when performed by less experienced practitioners.

AIMS:

1. *Knowledge of indications for arterial blood sampling.*
2. *Knowledge of the protocol and supplies needed for arterial blood sampling.*
3. *Adequate information and obtaining the patient's consent for arterial blood sampling and appropriate communication with the patient during the procedure.*
4. *Proper performance and interpretation of Allen's test results and next steps in the event of a negative result.*
5. *Successful implementation of arterial blood sampling on a trainer.*
6. *Improving skill performance based on feedback provided.*

Peripheral Venous Cannulation

Jan Bitežnik, Špela Kozinc, Kaja Čeh, Leja Ocvirk

Purpose:

Inserting an intravenous cannula is a procedure used to gain access to a patient's venous system. In a critical situation, this is the basis for administering life-saving drugs and fluids. It is essential to pay special attention to proper patient identification, ensuring sterility, and providing adequate care of the area after insertion. It is also helpful to learn about the different types of cannulas, which vary in size and, consequently, in their flow rates. If we start with the largest, which is used in life-threatening situations, it is 14G (G stands for gauge, meaning one-hundred-thousandth of an inch), allowing a flow rate of approximately 240 mL/min. It is recognised by the orange colour of the cap. Next comes grey with 16G and 180 mL/min (used in resuscitation), green with 18G and 90 mL/min (used in surgical patients), pink with 20G and 60 mL/min (used for regular intravenous therapy), blue with 22G and 36 mL/min (used in oncology patients or people with thinner vessels) and finally yellow with 24G and 20 mL/min, which is used in children.

AIMS:

1. *Knowing the indications and contraindications for peripheral venous cannulation.*
2. *Knowing the different sizes of venous cannulas.*
3. *Knowledge of appropriate supplies needed for peripheral venous cannulation.*
4. *Knowing the appropriate sites for peripheral venous cannulation.*
5. *To communicate appropriately with the patient before, during and after peripheral venous cannulation.*
6. *Correct implementation of the peripheral venous cannulation protocol.*
7. *Knowledge of measures to take in the event of unsuccessful peripheral venous cannulation.*
8. *To improve the peripheral venous cannulation technique with the help of tutors.*

Intravenous Infusion Set-up

Nik Slavic, Nina Flajšar, Živa Ramšak, Lucija Knafelc

Purpose:

After intravenous (IV) access is established, IV infusion can be administered for a correct clinical indication. In modern clinical practice, IV infusions can be used in both inpatient and outpatient settings, as their use varies depending on patient needs. While in most clinical settings, IV infusions are administered by nurses, it is the physician who orders the dosage and content of an IV drip. When applying an IV drip system, one can choose between multiple active pharmaceutical ingredients (APIs), such as antibiotics, drugs, and glucose, and non-APIs, for example, saline. It is also important to note that the IV infusion system cannot be used to administer blood to patients; this is done via a specialised transfusion system.

The most common indications for administering an IV infusion are dehydration, resulting from severe vomiting or diarrhoea, electrolyte imbalance, hypovolemia, hemodynamic stabilisation, parenteral nutrition, sepsis or anaesthesia. Contraindications are equally important – IV infusion, especially saline, may be omitted in cases of hypervolemia, pulmonary oedema, and heart failure, as well as specific metabolic disorders. In cases of kidney failure, whether acute or chronic, one must evaluate the risk-to-benefit ratio in each scenario.

AIMS:

1. *To communicate appropriately with the patient while performing the skill.*
2. *Knowledge of intravenous infusion set-up protocol.*
3. *Knowledge of the supplies needed for performing the intravenous infusion set-up.*
4. *Successfully completing the intravenous infusion set-up.*
5. *Knowing the differences between fluids that can be administered to a patient by infusion.*
6. *Improving skill performance based on feedback provided.*

Urinary Bladder Catheterisation

Maša Marolt, Tina Fakin, Janina Ulbl, Patricija Tomše

Purpose:

Urinary catheter insertion is a standard procedure in a hospital environment that requires particular knowledge and skills. It is typically used in the inpatient setting, but can also serve as an outpatient solution for chronic urinary retention. Catheterisation of the bladder ensures adequate urine flow in patients who, for various reasons, are unable to urinate independently. This skill is crucial not only for basic physiological function but also for preventing complications such as infections, urethral injuries, and mechanical problems with the urethra.

Indications for its use include acute urinary retention, especially in patients with benign prostatic hyperplasia, neurological disorders, or post-surgical care. Furthermore, it is used for measuring diuresis in patients with acute kidney failure of any origin. Other indications are also chronic urinary retention and use during surgeries. Catheters are also used to relieve symptoms in patients in palliative care who have severe difficulty controlling urination. However, catheterisation should be avoided in certain situations, such as suspected or confirmed urethral trauma, severe urethral stricture or recent reconstructive urethral surgery. In such cases, alternative urinary drainage methods must be considered to avoid further complications.

AIMS:

1. *To communicate appropriately with the patient before, during and after urinary bladder catheterisation.*
2. *Knowing the indications for urinary bladder catheterisation.*
3. *Knowing the supplies needed for urinary bladder catheterisation.*
4. *Knowledge of urinary bladder catheterisation protocol.*
5. *Correct sterile glove placement and proper handling around the sterile field.*
6. *Knowledge of the differences in the procedure for urinary bladder catheterisation in men and women.*
7. *To learn how to properly handle urinary bladder catheterisation trainers in the simulation centre.*
8. *Improving skill performance based on feedback provided.*

Urinary Catheter Withdrawal

Jan Bitežnik, Sebastjan Bevc, Marko Zdravković, Matic Mihevc

Purpose:

Withdrawal of the catheter is the logical step that follows insertion after it has fulfilled its therapeutic purpose. When considering it, one must always find the perfect balance between not removing the catheter too quickly (so that the condition has not truly resolved) and not removing it too late to prevent complications. In general, indications for catheter removal include malfunction, relapsing or recurrent urinary tract infections, resolution of urinary retention or obstruction, completion of close urine output monitoring, healing of sacral or perineal wounds, improved patient mobility, and after the immediate postoperative period (typically within 24–48 hours for most surgeries). Early removal (within 24 hours postoperatively) is associated with lower rates of urinary tract infections and shorter hospital stays, although it may slightly increase the risk of recatheterization. Ongoing catheterisation must be justified by a current clinical need, and routine daily review is essential to minimise unnecessary catheter days and associated morbidity.

AIMS:

1. *To communicate appropriately with the patient before, during and after urinary catheter withdrawal.*
2. *Knowing the indications for urinary catheter withdrawal.*
3. *Knowing the supplies needed for urinary catheter withdrawal.*
4. *Knowledge of urinary catheter withdrawal protocol.*
5. *To learn how to properly handle urinary bladder catheterisation trainers in the simulation centre.*
6. *Improving skill performance based on feedback provided.*

Nasogastric Tube Insertion

Jan Biteżnik, Tadej Petreski, Sebastjan Bevc

Purpose:

Gastric suction is the most common indication for inserting a nasogastric tube (NGT), which is used in cases of ileus, volvulus, or other conditions that prevent the typical passage of intestinal contents. In this case, we are talking about an emptying tube. On the other hand, NGTs can also be used due to impaired food intake, which can occur due to impaired consciousness, upper gastrointestinal injuries, psychological problems and other causes. We are therefore talking about a feeding tube. Regular care of the NGT is necessary, as long-term use can lead to the formation of pressure ulcers along the entire length of the tube. It is also essential to ensure that the fastening tape is changed regularly, and the tube is changed according to the manufacturer's instructions (plastic NGTs are usually changed every 7 days, and silicone NGTs every 3 to 6 weeks). When changing, make sure that the NGT is inserted through a different nostril than the previous one. The most common other complications are patient discomfort, sinusitis, and epistaxis. They usually resolve with the removal of the tube. In the case of incorrect positioning of the tube and simultaneous administration of medications and/or food, the latter can enter the lungs, leading to aspiration pneumonia and even death. Electrolyte disturbances (hyponatremia) occur less frequently due to excessive fluid intake after NGT.

AIMS:

1. *Appropriate communication with the patient during a nasogastric tube insertion.*
2. *Knowledge of the protocol for performing the nasogastric tube insertion.*
3. *Knowledge of the supplies needed for performing the nasogastric tube insertion.*
4. *Successfully completing the nasogastric tube insertion.*
5. *Knowledge of measures to take in the event of unsuccessful peripheral venous cannulation.*
6. *To learn how to properly handle nasogastric tube insertion trainers in the simulation centre.*
7. *Improving skill performance based on feedback provided.*

Intramuscular Injection

Lucija Plankelj, Radovan Hojs, Sebastjan Bevc, Saša Klezin

Purpose:

Intramuscular injection (IM) involves administering medications into the deeper layers of specifically selected muscles. These bulky muscles have good vascularity, allowing the injected drug to rapidly enter the systemic circulation and reach the target site of action, bypassing first-pass metabolism. Drugs may be administered intramuscularly for both prophylactic and curative purposes. The most common medications administered via the IM route include antibiotics (such as streptomycin), biologicals (including immunoglobulins, vaccines, and toxoids), and hormonal agents (for example, testosterone replacement therapy).

Specific anatomical landmarks must be considered when administering IM injections to minimise the risk of neurovascular complications. These include dorsogluteal region (5 to 7.5 cm below the iliac crest, upper outer quadrant within the buttocks), ventrogluteal region (the heel of the opposing hand is placed in the greater trochanter, the index finger in the anterior superior iliac spine, and the middle finger below the iliac crest – the drug is injected into the triangle formed by the index, middle finger and the iliac crest), deltoid (2.5 to 5 cm below the acromion process), vastus lateralis (the middle third of the line joining the greater trochanter of the femur and the lateral femoral condyle of the knees).

Some contraindications to consider before administering IM injections include active infection, cellulitis, or dermatitis at the injection site, a known allergy or hypersensitivity to the drug, thrombocytopenia, coagulation defects, and associated muscular atrophy.

We also need to be aware of some common complications, such as persistent pain at the injection site, muscle fibrosis and contracture, abscess at the injection site, gangrene, nerve injury, skin slough, vascular injury, periostitis, and osteomyelitis.

AIMS:

1. *Appropriate communication with the patient during an intramuscular injection.*
2. *Knowledge of the protocol for performing the intramuscular injection.*
3. *Knowledge of the supplies needed for performing the intramuscular injection.*
4. *Successfully completing the intramuscular injection.*
5. *Knowledge of measures to take in the event of unsuccessful intramuscular injection.*
6. *To learn how to properly handle intramuscular injection trainers in the simulation centre.*
7. *Improving skill performance based on feedback provided.*

Ultrasound – eFAST and FoCUS

Špela Klep, Gregor Prosen

Purpose:

The use of point-of-care ultrasound (POCUS) is becoming an increasingly established and indispensable part of clinical practice. It enables us to quickly diagnose life-threatening conditions, such as bleeding, at the patient's bedside, and is a crucial tool for determining further treatment.

With the eFAST (Extended Focused Assessment with Sonography for Trauma) examination, we can identify hemoperitoneum, hemopericardium, and haemothorax, as well as other intra-abdominal injuries, and exclude pneumothorax. We will perform the ultrasound examination at standard eFAST examination sites, while helping ourselves with four key questions:

a) Do we see fluid in the peritoneal cavity (hemoperitoneum)?

b) Do we see pericardial effusion?

c) Do we see fluid in the pleural space (haemothorax)?

d) Is pleural sliding present?

With focused cardiac ultrasound (FoCUS) examination, we can assess the basic ultrasound projections of our pump and the ultrasound appearance of normal cardiac anatomy and function. We can assess key parameters of cardiac function and hemodynamics. The following questions will help us in the focused examination of the heart:

a) Is there a pericardial effusion or are there ultrasound signs of tamponade?

b) What are the diameter and collapsibility of the inferior vena cava?

c) What does left ventricular systolic function look like?

d) What does the right ventricle look like?

AIMS:

1. To know the meaning and indications of eFAST and FoCUS examinations.

2. To know the difference between FAST and eFAST examination.

3. To know the typical locations of free fluid retention in the abdomen and chest.

4. To be able to choose the appropriate probe for eFAST and FoCUS examination.

5. To know the structure of the eFAST examination and be able to independently display all 4 observational windows.

6. To know the structure of the FoCUS examination and be able to independently visualise the heart in all four projections and the inferior vena cava.

7. To identify free fluid in typical locations in the thoracic and abdominal cavities on an ultrasound image (FAST).

8. To identify pleural sliding on an ultrasound image (eFAST).

9. To know the basic (normal) anatomy of specific ultrasound projections of the heart.

10. To be able to recognise the anatomical parts of the heart on specific ultrasound projections.

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