

DIDACTIC LEARNING OBJECTIVES

ESICM-EuroELSO online courses

In alignment with ELSO Didactic Course criteria

Foundation course refers to the Foundation course in ECLS/ECMO (online)

Advanced course refers to the Advanced course in ECLS/ECMO (online)

Additional face-to-face activities include the pre-congress Advanced Case-Based course in ECLS/ECMO and the Practical Workshop in ECLS/ECMO. Their learning objectives are not listed below.

Faculty members covering the lectures are detailed in the course programmes

Title	Learning Objective	Learning Objective	Lecture (as assigned in previous editions)
ECMO Overview	Describe the different modes of ECMO support.	Discuss global trends in ECMO utilization.	Foundation Course <i>Introduction to ECMO</i>
History of ECMO	List the key milestones in the development of ECMO.	Describe the evolution of the Extracorporeal Life Support Organization.	Foundation Course <i>Historical growth</i>
Circuit Overview	Define the main components of an ECMO circuit.	List circuit monitoring tools.	Foundation Course <i>The ECMO circuit</i>
Cannulas and Tubing	Describe the differences in ECMO cannula design.	List the considerations for selecting the appropriate ECMO cannula.	Foundation Course <i>How to choose your canula</i> <i>The ECMO circuit</i>
Pump	Describe the requirements of a blood pump used in ECMO.	Explain the physics and working principles of a centrifugal pump.	Foundation Course <i>The ECMO circuit</i>
Membrane Lung and Blender	Describe the structure and function of the membrane lung	Describe the function of the blender	Foundation Course <i>The ECMO circuit</i>
Pressure Monitoring	List the different pressure zones in an ECMO circuit	Discuss the utility of monitoring drainage pressure, pre- and post ML pressure	Foundation Course <i>The ECMO circuit</i>
Other Circuit Components	Describe the utility of the flowmeter	Describe the function of the heater, circuit clamps	Foundation Course <i>The ECMO circuit</i>
Cannulation	List the differences between percutaneous and open cannulation	Outline the process of percutaneous cannulation Discuss the role of ultrasound in cannulation	Foundation Course <i>Canulation for adult cardiac & respiratory ECMO</i>
VV ECMO Configurations	List the different configurational options for	Review the benefits and limitations of specific configurations	Foundation Course <i>Canulation for adult cardiac & respiratory ECMO</i>

	VV ECMO		Advanced Course <i>Indications and challenges of 'non-standard' ECMO configurations</i>
VA ECMO Configurations	List the different configurational options for VA ECMO.	Review benefits and limitations of specific configurations.	Foundation Course <i>Canulation for adult cardiac & respiratory ECMO</i> Advanced Course <i>Indications and challenges of 'non-standard' ECMO configurations</i>
Cannulation Complications	Identify complications of ECMO cannulation	Describe steps to prevent, recognize, and treat complications	Foundation Course <i>Canulation for adult cardiac & respiratory ECMO</i> Advanced Course <i>Role of imaging for safe ECMO canulation and troubleshooting</i>
Oxygen Delivery & Uptake	Describe the normal physiology of oxygen delivery and uptake.		Foundation Course <i>ECMO for Adult respiratory failure</i>
Gas Transfer in the Membrane Lung	Describe the key determinants of oxygen uptake in the membrane lung.	Describe the key determinants of carbon dioxide removal in the membrane lung.	Foundation Course <i>ECMO for Adult respiratory failure</i> <i>The ECMO circuit</i>
Hemodynamic Monitoring on VV ECMO	List the hemodynamic changes that accompany VV ECMO	Describe the changes in hemodynamic monitoring on VV ECMO	Foundation Course <i>ECMO for Adult respiratory failure</i>
Hemodynamic Monitoring on VA ECMO	Discuss the hemodynamic changes that accompany VA ECMO	Describe the changes in hemodynamic monitoring on VA ECMO	Foundation Course <i>ECMO for adult cardiac failure</i>
Drainage Insufficiency	Define and diagnose drainage insufficiency.	Troubleshoot drainage insufficiency.	Advanced Course <i>Circuit related complications</i>
Return Obstruction	Define return obstruction and identify its causes.	Diagnose and manage return obstruction.	Advanced Course <i>Circuit related complications</i>
Respiratory Failure	Provide an overview of respiratory failure	List standard management strategies for respiratory Failure Discuss the rationale of VV ECMO in respiratory failure	Foundation Course <i>ECMO for adult respiratory failure</i>

Patient Selection for VV ECMO	List the indications and contraindications for VV ECMO support.		Foundation Course <i>ECMO for adult respiratory failure</i>
Initiation of VV ECMO	Describe the steps in initiating a patient onto VV ECMO.		Foundation Course <i>ECMO for adult respiratory failure</i>
VV ECMO Maintenance	Describe titration of blood flow and gas flow to achieve adequate support on VV ECMO	Describe the concept of native lung rest	Foundation Course <i>ECMO for adult respiratory failure</i>
Recirculation	Define and identify recirculation.	Troubleshoot recirculation.	Foundation Course <i>ECMO for adult respiratory failure</i> <i>Canulation for adult cardiac and respiratory ECMO</i> Advanced Course <i>Role of imaging for safe ECMO canulation and troubleshooting</i>
Weaning VV ECMO	Describe the process of weaning VV ECMO support.	List exit strategies for the VV ECMO patient.	Foundation Course <i>ECMO for adult respiratory failure</i> Advanced Course <i>VV ECMO for respiratory failure</i>
Cardiac Failure	Provide an overview of cardiac failure	List standard management strategies for cardiac Failure Discuss the rationale of VA ECMO in cardiac failure	Foundation Course <i>ECMO for cardiac failure</i>
Patient Selection for VA ECMO	List the indications and contraindications for VA ECMO support.		Foundation Course <i>ECMO for cardiac failure</i>
Initiation of VA ECMO	Describe the steps for initiating a patient		Foundation Course <i>ECMO for cardiac failure</i>
VA Maintenance	Describe vasopressor use and blood flow titration for cardiovascular support.	Describe the concept of native heart rest. Describe ventilator management and blood and gas flow titration for pulmonary support.	Foundation Course <i>ECMO for cardiac failure</i> <i>Clinical case adult cardiac ECMO</i> Advanced Course <i>Drug pharmacokinetics during ECMO support</i>
Left Ventricular Distention -- PRIORITY	Describe the mechanism of LV distention	List strategies to unload the left ventricle	Foundation Course <i>ECMO for cardiac failure</i> Advanced Course <i>Focus on LV congestion and</i>

			<i>ventricular-arterial uncoupling: medical and surgical unloading strategies</i>
Differential Oxygenation	Define and identify differential oxygenation.	Troubleshoot differential oxygenation.	Advanced Course <i>VA ECMO patient interaction: differential oxygenation</i>
Weaning VA ECMO -- PRIORITY	Describe the process of weaning VA ECMO support	List exit strategies for the VA ECMO patient	Foundation Course <i>ECMO for cardiac failure</i> Advanced Course <i>Weaning from VA ECMO</i>
Sedation	Identify the role of sedation during ECMO support.	Discuss the paradigm shift towards awake ECMO.	Foundation Course <i>ECMO for respiratory failure ECMO for cardiac failure</i> Advanced Course <i>Capita selecta: Drug pharmacokinetics during ECMO support</i>
Physiotherapy	Describe the rationale for physiotherapy during ECMO.	Identify appropriate candidates for physiotherapy on ECMO.	Advanced Course <i>Short topics: Awake ECMO and physiotherapy in ECMO</i>
Anticoagulation	List anticoagulation strategies on ECMO.	Discuss anticoagulation monitoring on ECMO.	Foundation Course <i>Anticoagulation in ECMO; monitoring and management</i>
Procedures	Discuss considerations for procedures on the ECMO patient.		Advanced Course <i>Short topics: Procedures on ECMO</i>
Renal Replacement Therapy	Identify the benefits and limitations of administering RRT via a dialysis catheter.	Identify the benefits and limitations of administering RRT via the ECMO circuit.	Advanced Course <i>Short topics: CRRT in ECMO</i>
Hospital Transport	Identify considerations and logistics for intrahospital transport.	Identify considerations and logistics for interhospital transport.	Advanced Course <i>Short topics: Inter and intra hospital transport</i>

Complications Overview	List medical and mechanical complications of ECMO.		Advanced Course <i>ECMO circuit related complications VV ECMO for adult respiratory failure: patient related ECMO complications VA ECMO for adult cardiac failure: patient related ECMO complications</i>
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Neurological Complications	List the etiology and risk factors for neurological complications.	Discuss the management of ischemic and hemorrhagic strokes.	Advanced Course <i>VV ECMO for adult respiratory failure: patient related ECMO complications</i> <i>VA ECMO for adult cardiac failure: patient related ECMO complications</i>
Bleeding	List the etiology of bleeding	Discuss the management of bleeding	Foundation Course <i>Anticoagulation in ECMO</i>
Thrombosis	List the etiology of thrombosis	Discuss the management of thrombosis	Foundation Course <i>Anticoagulation in ECMO</i>
Hemolysis	Understand the etiology and risk factors of hemolysis on ECMO	Discuss how to prevent and manage hemolysis	Advanced Course <i>ECMO circuit related complications</i>
Limb Ischemia	List the risk factors for developing limb ischemia on VA ECMO	Describe how to monitor limb perfusion Discuss the prevention and management of limb ischemia	Foundation Course <i>ECMO for cardiac failure: assessment and treatment of complications secondary to the patient: limb ischemia</i>
Cardiac Arrest During ECMO	Discuss the management of cardiac arrest on VV ECMO	Discuss the management of cardiac arrest on VA ECMO	Foundation Course <i>ECMO for cardiac failure</i>
Pump Failure	Define pump failure.	Describe how to identify and manage pump failure.	Advanced Course <i>Circuit related complications</i>
Membrane Lung Dysfunction	Define membrane lung dysfunction.	Describe how to diagnose and manage membrane lung dysfunction.	Advanced Course <i>Circuit related complications</i>
Air Embolism	Define air embolism and its determinants.	Define strategies to prevent air embolism. Describe how to detect and manage air embolism	Advanced Course <i>Circuit related complications</i>
Circuit Disruption	Identify determinants of circuit disruption	Recognize early signs of circuit disruption Manage circuit disruption	Advanced Course <i>Circuit related complications</i>
Accidental Decannulation	Manage an accidental decannulation		Advanced Course <i>Circuit related complications</i>
Coming Off ECMO Emergently	List the indications for coming off ECMO emergently	List the steps required to come off and back on ECMO emergently	Advanced Course <i>Circuit related complications</i>
Historical Studies	List the historical ECMO studies and identify their limitations.		Foundation Course <i>Introduction to ECMO</i>

Recent Evidence for VV ECMO	Interpret the results and limitations of the main cohort studies on VV ECMO.	Interpret the results and limitations of the CESAR and the EOLIA trials.	Foundation Course <i>ECMO for respiratory failure</i>
Recent Evidence for VA ECMO	Interpret the results and limitations of the main cohort studies on VA ECMO.	Describe the results of trials comparing ventricular assist devices to VA ECMO	Foundation Course <i>ECMO for respiratory failure</i>

All these topics will be explained during interactive lectures by field experts as well as addressed in more detail during clinical case discussions.

Additionally, there will be other topics covered in the Advanced Course, such as:

- ECPR: Evidence, Indications/contra-indications, post resuscitation care and neuro prognostication on ECMO, organizing an ECPR program
- ECCO2R : Evidence, indications, techniques
- Drug pharmacokinetics during ECMO support
- VA ECMO versus other short-term circulatory support (Impella, IABP...)
- Awake ECMO: potential benefits and pitfalls