

**DESCRIPTION OF COURSE UNIT FOR DOCTORAL STUDIES  
AT VILNIUS UNIVERSITY**

<b>Scientific Area/eas, Field/ds of Science</b>	Medical and Health Sciences (M 000): Medicine (M 001)			
<b>Faculty, Institute, Department/Clinic</b>	Faculty of Medicine, Institute of Clinical Medicine, Clinic of Children's Diseases			
<b>Course unit title</b> (ECTS credits, hours)	<b>Paediatric Intensive Care: Possibilities of Recovery and Function Support of Acute Organ Failure</b> 6 credits (162 hours)			
<b>Study method</b>	<b>Lectures</b>	<b>Seminars</b>	<b>Consultations</b>	<b>Self-study</b>
Number of ECTS credits	-	1	0,5	4,5
<b>Method of the assessment</b> (in 10 point system)	<p>The student is required to present a report on a specific topic that is coordinated with the coordinating lecturer. The report has to include an analysis of the most recent scientific publications and has to be presented for evaluation.</p> <p>Evaluation criteria (minimum passing grade – 5 points):</p> <ul style="list-style-type: none"> <li>a) relevancy, novelty, and compliance with the chosen topic of the report (2 points);</li> <li>b) the structure and scope/volume of presentation, clear presentation of knowledge, argumentation, conciseness, specificity (2 points);</li> <li>c) identifying and raising problematic issues, presenting and validating conclusions (2 points);</li> <li>d) demonstration of the potential applicability of knowledge on the reviewed topic in the dissertation (2 points);</li> <li>e) visual presentation of the report, ability to participate in the discussion, oratory skills (2 points).</li> </ul>			
<b>PURPOSE OF THE COURSE UNIT</b>				
<p>To learn and compare the peculiarities of clinical physiology, mechanisms, and causes of pathology in the organs and systems of children of different ages groups; to know the possibilities of recovery and support of vital organs functions, including the methods and techniques currently used to achieve these goals; to analyze the strengths and weaknesses of the methods used for recovery and support of organ functions, trends in modern research to improve these methods.</p>				
<b>THE MAIN TOPICS OF COURSE UNIT</b>				
<p><b>Respiratory</b> physiology and respiratory failure. Peculiarities of respiratory function in different age groups of children (neonatal period, infancy, early childhood, adolescence), transportation of oxygen from environment air to the cell. Causes and mechanisms of respiratory dysfunction in different age groups, types of hypoxia. Non-invasive and invasive methods for administering oxygen and supporting respiratory mechanics, their disadvantages and advantages, opportunities for improvement, and scientific achievements.</p> <p>Clinical physiology of <b>hemodynamics</b>, peculiarities in different age groups, available methods for its monitoring (non-invasive and invasive): possibilities of cardiac and organ blood circulation monitoring in children with different age. Causes and pathogenesis of various origins of shock. Methods of recovery and support of cardiac work and organ blood circulation: fluid therapy, inotropic and</p>				

vasoactive drugs, life-saving technologies (ECMO, artificial heart), weaknesses of their application, directions and possibilities of improvement, currently relevant scientific topics.

Clinical physiology of **kidney** function, the role of kidney function in the regulation of arterial blood pressure, water - electrolytes, and acid-base balance. Acute kidney injury, causes, pathogenesis, diagnostic criteria, and monitoring methods. Methods of recovery and support of kidney function: conservative (drugs, fluids), kidney replacement therapy, kidney transplantation. Kidney replacement therapies for children of all ages and in a variety of clinical situations; strengths and weaknesses of these methods (application indications, contraindications, complications), perspectives of the equipment used, relevant scientific research for the improvement of these methods.

Acute **liver** failure, characteristics in the pediatric population. Clinical physiology of liver function, pathogenesis, and diagnosis of liver disorders. Fulminant liver failure. Therapies that restore and support liver function: pharmacological therapy and extracorporeal replacement therapy (therapeutic plasma exchange (TPE), coupled plasma filtration adsorption (CPFA), MARS). Strengths and weaknesses of the application of these methods (indications, contraindications and complications), perspectives of the technologies used, and relevant scientific research for the improvement of these methods. Indications for liver transplantation.

Acute **metabolic decompensation**. The most common metabolic emergencies in children: 1) emergency hereditary metabolic disorders with hypoglycemia, hyperammonemia, and metabolic acidosis; 2) decompensation of diabetes mellitus with diabetic ketoacidosis and hyperglycemic hyperosmolar coma. Factors provoking metabolic emergencies, clinical syndromes, and the significance of laboratory tests in the diagnosis of metabolic crises: hypoglycemia, hypoketotic hypoglycemia, hyperglycemic ketoacidosis, hyperammonemia, anion gap metabolic acidosis, myoglobinuria. Treatment strategies: emergency management of metabolic crisis, prevention of treatment complications, pharmacological and extracorporeal correction of hyperammonemia, and other possible methods of treatment for congenital metabolic diseases. The analysis of identified abilities of restoration and support of metabolic dysfunction and scientific research that is being carried out to improve these opportunities.

## RECOMMENDED LITERATURE SOURCES

1. Zimmerman, Jerry J. Fuhrman and Zimmerman's Pediatric Critical Care. Elsevier; 6th edition 2021.  
<https://www.clinicalkey.com/#!/browse/book/3-s2.0-C2018001172X>
2. Robert M. Kliegman & Joseph St. Geme. Nelson Textbook of Pediatrics, 2-Volume Set, 21st Edition. 2020.  
<https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20161017121>
3. Etsuro K. Motoyama and Jonathan D. Funder. Respiratory physiology. Smith's Anesthesia for Infants and Children, 3, 28-77.e12. Elsevier 2021.  
<https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20180024354>
4. Kendig's Disorders of the Respiratory Tract in Children. 9th Edition 2019.  
<https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20150012928>
5. Recommendations for mechanical ventilation of critically ill children from the Paediatric Mechanical Ventilation Consensus Conference (PEMVECC). Intensive Care Med (2017) 43:1764–1780 DOI 10.1007/s00134-017-4920-z
6. Acute Circulatory Failure in Children (Shock and Sepsis). Pediatric and Neonatal Critical Care. Todd J. Kilbaugh, Maurice S. Zwass and Patrick Ross. Miller's Anesthesia, 79, 2513-2584.e13. Elsevier 2019.
7. Singh et al. Recommendations for hemodynamic monitoring for critically ill children—expert consensus statement issued by the cardiovascular dynamics section of the European Society of Paediatric and Neonatal Intensive Care

- (ESPNIC). Critical Care (2020) 24:620. <https://doi.org/10.1186/s13054-020-03326-2>
8. Aparna Hoskote, Brigitte Stiller and Ravi R. Thiagarajan. What's new in mechanical support strategies for the intensivist in children with severe cardiac failure. Intensive Care Med (2021) 47:1152–1155 <https://doi.org/10.1007/s00134-021-06500-4>
  9. Sidharth K. Sethi, Timothy Bunchman, Ronith Chakraborty, Rupesh Raina. Pediatric acute kidney injury: new advances in the last decade. Kidney Res Clin Pract 2021;40(1):40-51 pISSN: 2211-9132. <https://doi.org/10.23876/j.krcp.20.074>
  10. Sidharth Kumar Sethi, Rupesh Raina, Mignon McCulloch, Timothy E. Bunchman. Critical Care Pediatric Nephrology and Dialysis: A Practical Handbook. Springer; 1st ed. 2019 edition. <https://link.springer.com/book/10.1007/978-981-13-2276-1>
  11. Harveen Singh Girish L Gupte. Paediatric acute liver failure: a practical approach. Paediatrics and Child Health Vo31, Issue 12, December 2021, P. 435-441. <https://www.sciencedirect.com/science/article/pii/S175172222100161X?via%3Dihub>
  12. Akash Deep, Satoshi Nagakawa and Pierre Tissieres. Non-transplant options in paediatric acute liver failure—what is new? Intensive Care Med 2021. <https://doi.org/10.1007/s00134-021-06576-y>
  13. A.A.M.Morris, J.V.Leonard. Acute presentations of inherited metabolic disorders: investigation and initial management. Paediatrics and Child Health Volume 25, Issue 3, March 2015, Pages 97-102 <https://www.sciencedirect.com/science/article/pii/S1751722214002042?via%3Dihub>
  14. Emily C. MacNeill, Chantel P. Walker. Inborn Errors of Metabolism in the Emergency Department (Undiagnosed and Management of the Known). Emerg Med Clin N Am 36 (2018) 369–385 <https://doi.org/10.1016/j.emc.2017.12.014>

#### **CONSULTING LECTURERS**

1. Coordinating lecturer: Virginija Žilinskaitė (Assist. Prof. dr.).
2. Vaidotas Urbonas (Prof. dr.).
3. Karolis Ažukaitis (Assist. Prof. dr.).

#### **APPROVED:**

By Council of Doctoral School of Medicine and Health Sciences at Vilnius University:  
29<sup>th</sup> of September 2022

Chairperson of the Board: Prof. Janina Tutkuvienė