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# **APPLICATION OF ADVANCED TECHNOLOGIES IN PREOPERATIVE PLANNING OF PAEDIATRIC NEUROSURGICAL AND CRANIOFACIAL PROCEDURES**

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## **ABSTRACT**

The lecture aims to present an interdisciplinary application of advanced technologies, such as Virtual Reality (VR) and Augmented Reality (AR), in the preoperative planning of complex neurosurgical and craniofacial procedures in paediatric patients, including those with rare diseases. Applied solutions, developed through close collaboration between medicine Biomedical engineering introduces a new standard in diagnostic and therapeutic processes by enhancing both the precision and safety of surgical interventions.

In the lecture, we will present innovative methods for generating personalised anatomical models using medical imaging technologies (CT, MRI) and their integration into virtual environments. These models enable detailed biomechanical analysis of cranial and cerebral structures, taking into account age-specific anatomical challenges. Particular emphasis will be placed on the role of computer simulations in identifying potential complications and optimising surgical techniques—an essential aspect in procedures requiring precise reconstruction and the minimisation of damage to adjacent tissues. We will also explore the real-time application of AR technologies in the operating room, which provides surgeons with access to holographic visualisation of anatomical structures during surgery.

Selected clinical cases will be presented to illustrate the practical implementation of these technologies, their impact on improving treatment outcomes, and their contribution to reducing hospitalisation time in paediatric patients.