



Advantages of 3D Printing: Italy's 3D4Med Lab Investigates Benefits for Medical Education and Pre-Surgical Planning





Italy's 3D4Med Lab: Exploring the Potential of 3D Printing in the Medical Field

In 2011, 3D4Med began as a research project to explore the potential of 3D printing in the medical field. In the last 10-plus years, the Italy-based, clinical 3D printing laboratory of the polyclinic San Matteo of Pavia, a joint venture with the University of Pavia, has seen significant growth and success in its applications. Today, the lab is devoted to the use of 3D printing technologies for a variety of medical functions, from pre-surgical planning to training in surgical specialties.

Pediatric Surgery: 3D Printed Models for Simulation and Surgical Planning

One of the clinicians leveraging 3D printing technology to improve surgical planning is Alessandro Raffaele, a pediatric surgeon at San Matteo Hospital who is working with 3D4Med to develop 3D printed models for simulation and surgical planning for pediatric surgery.

In an event series hosted and organized by Stratasys and 3D4Med called "3D Printing in the Clinical World," Raffaele described the challenge of preparing for pediatric surgeries, which are performed in smaller anatomical spaces and cavities.

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Dr. Alessandro Raffaele,
Pediatric surgeon, San Matteo Hospital



“We need to develop a model with small structures and with this technology, you can reproduce structures of the body with different materials,” Raffaele said. “3D printed models allow us to train technical skills that are very, very hard to learn on live patients.”

The three-event series explored how 3D printing can become an integral part of everyday hospital life. Experts from 3D4Med discussed multiple uses for 3D printing, including support for planning surgical and interventional procedures, preoperative training and simulation, informed consent, and training and development of new medical devices.

Tactile 3D Printed Models: Understanding Mechanical and Anatomical Information

Professor Andrea Pietrabissa, head of the General Surgery II Unit and Clinical Scientific Advisor for 3D4Med also noted that tactile 3D printed models help clinicians better understand mechanical and anatomical information.

“I think the value of 3D printing is the capability to reproduce case-specific challenges,” Pietrabissa said. “The mechanical properties provide excellent force feedback, which is not available with virtual reality. In minimally invasive surgeries that entail a complete loss of tactile feedback, surgeons must rely on vision alone to guide their performance. Practicing these cases with 3D printed models gives clinicians earlier feedback and helps improve planning.”

Raffaele also described the learning and training opportunities ahead of complex surgeries for specialists.

“3D printing gives expert surgeons the opportunity to continue in their training and maintain their skills”, Raffaele said. “One of the big advantages of 3D models is to improve the learning curve. For example, since we have a low case number per year in some malformative pathologies, with 3D models, we can train and perform the same procedure many, many times, so the learning curve improves in a shorter period of time.”



Stratasys' Technology and Partnership: Contributing to 3D4Med's Development

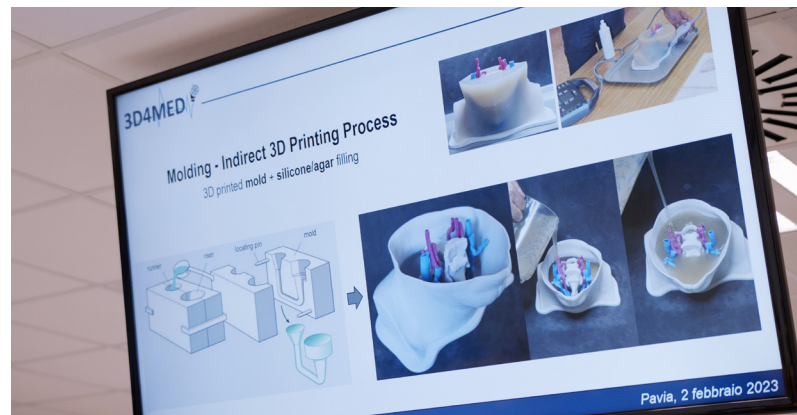
Stefania Marconi, an assistant professor in the Department of Civil Engineering and Architecture at the University of Pavia and coordinator of the 3D4Med lab, noted that Stratasys' 3D printers for medical applications have been the lab's first choice for creating accurate, patient-specific models for surgical planning and training.

"Our surgeons were impressed by the realism of the anatomical models in terms of morphological reproduction and in terms of mechanical properties," Marconi said. "The Digital Anatomy Printer has been extremely important for the reproduction of mechanical properties of tissues, and the introduction of the GelMatrix, TissueMatrix, and BoneMatrix materials pave the way to very realistic simulation."

Pietrabissa also noted 3D4Med's consistent partnership with Stratasys and the contributions that Stratasys technology has made to the lab's development.

"We have a strong collaboration built throughout the years with this company, which is very much valuable for us and for our local users," Pietrabissa said. "The issue of training in surgery has really evolved in the last few years, and new methodologies are raising that range from immersive virtual reality environments through 3D printing itself or cadaveric models."

Through 3D4Med and the University of Pavia's research and partnerships, 3D printing technology is providing surgeons and clinicians with more accurate, realistic 3D printed models for pre-surgical planning, training, and device development. The lab is continuing to explore the potential of 3D printing to improve healthcare and patient outcomes.





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