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3D manufacturing at the simulation centre of Masaryk University: training and innovation for medicine

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Medical Faculty
Masaryk University

Healthcare Simulation

- Focuses on education
- Teach to save lives (or increase quality of healthcare)
- Both pregradual students and professionals
- Developing practical skills
- Bridging gap between theory and clinical practice
- Well controlled and repeatable environment

SIMU is where you can **make mistakes**,
but the mistake is **not to learn from them**


Teaching area 8500 m2
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4 1 1
operační sál 1
operating theatre 1


SPRINT


Technique 2
00:08:31
Atraumatic Grasper
Patient File
Full Screen
Trocars Config
Procedure
Anatomy
Split
Guidance
Convert
Finish
elo


35.0
35
16
1000ml | INFU-SURG®
Ethox
DELL

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Scope of Teaching

Scope of Teaching

- **Undergraduate teaching** of all years of general medicine and dentistry
- Curriculum revision, reaccreditation
- Simulation medicine as a pillar of teaching at the Faculty of Medicine
- Gradual integration of subjects

- **Postgraduate courses**

- **Faculty development** (BPSBE, ABCD, ACDC, SaT, etc.)
- Cooperation with other simulation centres

Scope of Teaching

4700 students	130+ subjects	400.000 contact hours
Tens of technicians	Hundreds of teachers	Czech and English

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Scope of Teaching

34
courses

135
runs

2000+
participants

Czech and
English

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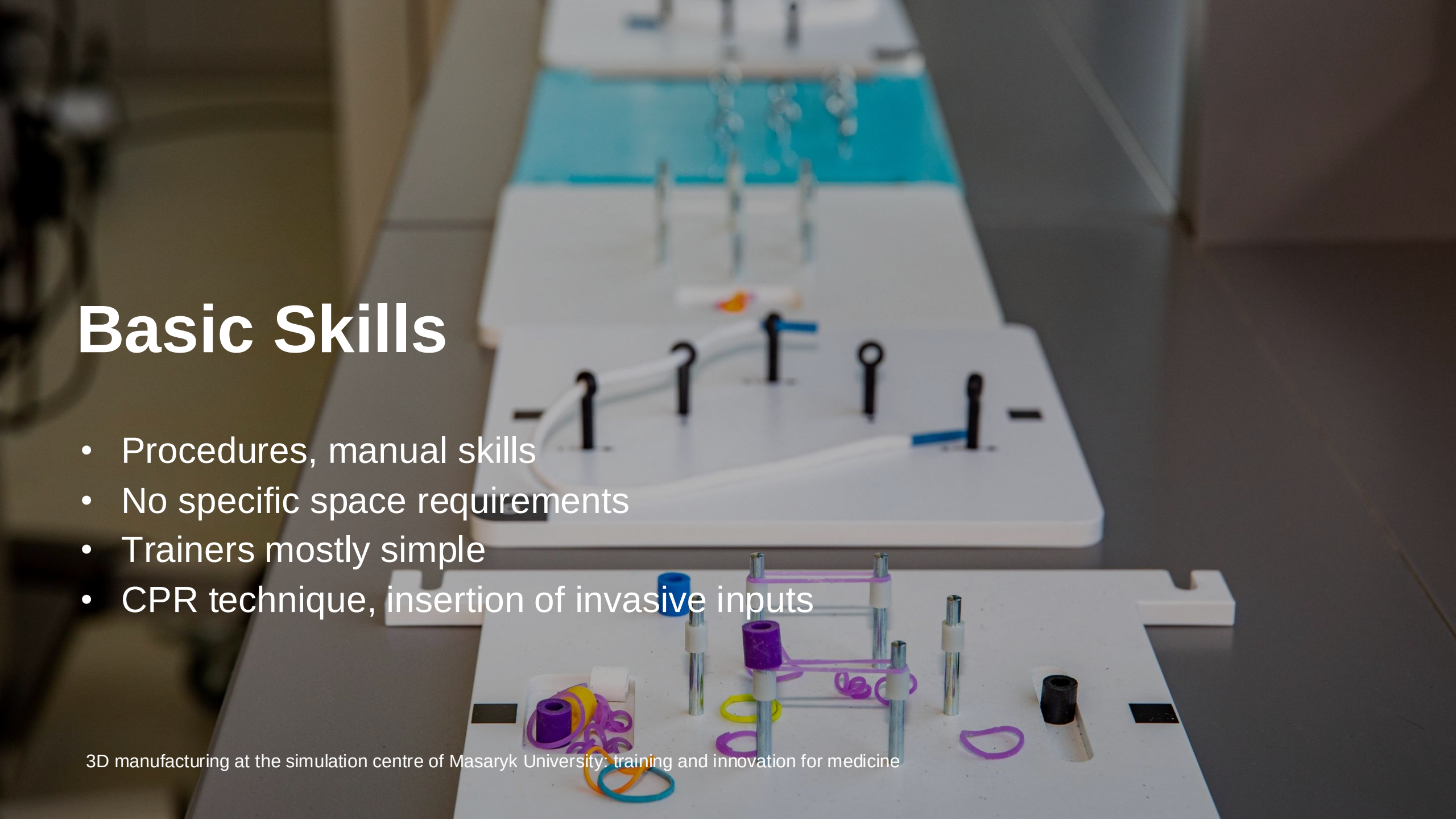
Teaching methodologies

Basic Skills

- Procedures, manual skills
- No specific space requirements
- Trainers mostly simple
- CPR technique, insertion of invasive inputs



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Low-fidelity Simulations

- Practicing procedures, decision-making process
- Low space requirements
- High staffing and training requirements
- Training in CPR procedures

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High-fidelity Simulations

- Soft skills, communication, teamwork
- Decision making, algorithms
- Extreme demands on preparation, materials, equipment and personnel
- Complex situations

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Standardized Patient

- Soft skills, communication,
- High demands on staff and figures
- Communication training

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3D, VR, and AR Virtual Simulations

- Prevalence of surgical disciplines
- Training in surgical and invasive procedures

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Cooperative learning methods

- Team-based and problem-based learning
- Decision making, communication and reasoning
- Demanding in terms of preparation and training of facilitators
- Effective for large groups of students

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Objective Structured Clinical Examination

- Evaluation of the student in a simulated situation
- Evaluation using a standardised form

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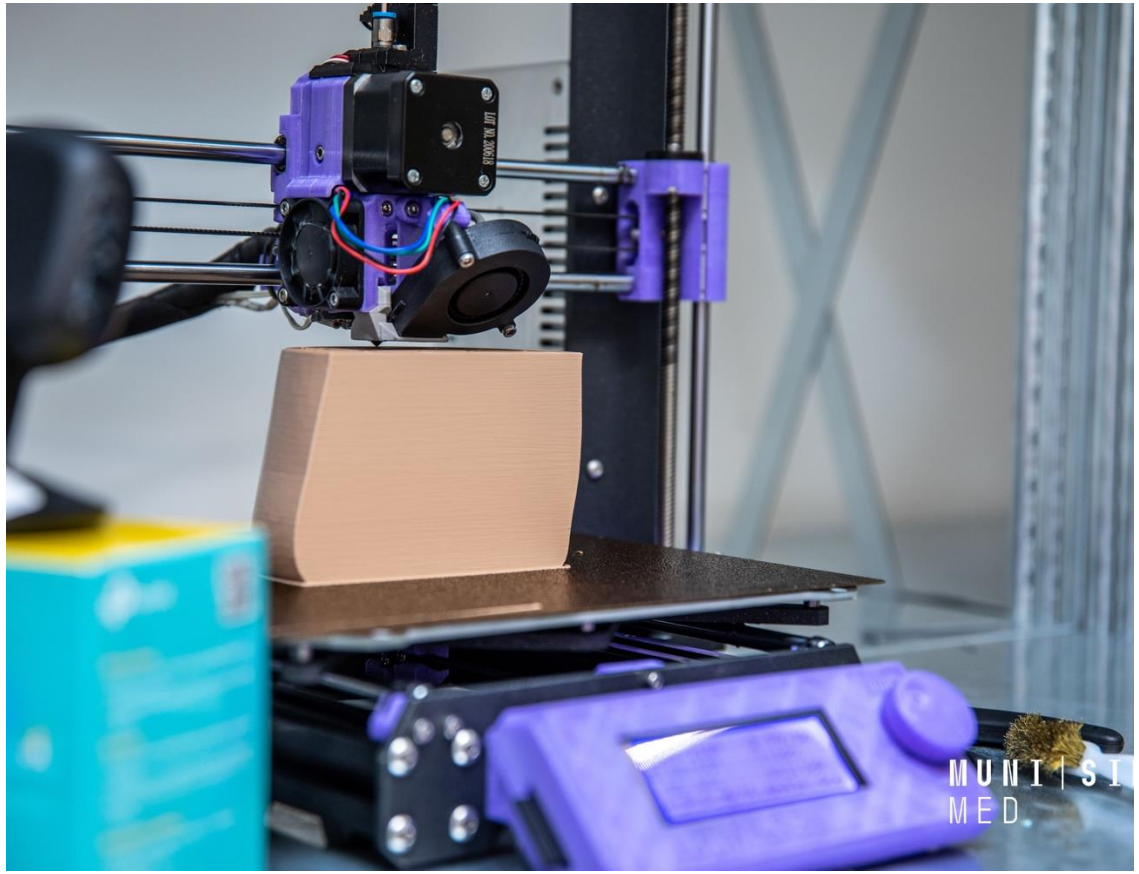
3D manufacturing

Scope of development and production

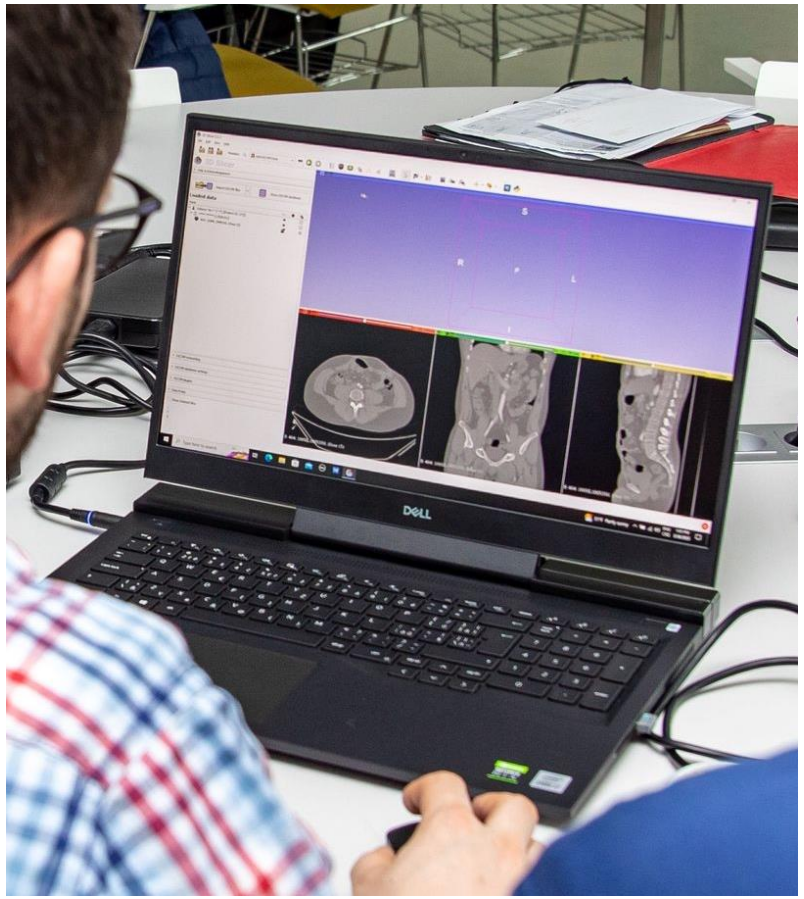
- 3D printing and silicone moulding
- Spare parts
- Consumables
- Creating new and innovative trainers and simulators
- Reflection of teaching needs
- Development and design, verification and validation



Anatomically aCCuratE 3D modEls

Goal is to create models of

- Anatomical structures (including pathologies)
- Publicly available
- Verified and validated



Co-funded by
the European Union

Anatomically aCCuratE 3D modEls

Partners

CZ Masaryk University (Brno)

SK Comenius University (Bratislava)

DE Ludwig Maximilian University of Munich

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COMENIUS UNIVERSITY BRATISLAVA

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

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Anatomically aCCuratE 3D modEls

In numbers

- 70 models
- 13+ technicians involved
- 3+ workshops
- 1 web portal
- 24 months of implementation
  (10/2022 – 10/2024)

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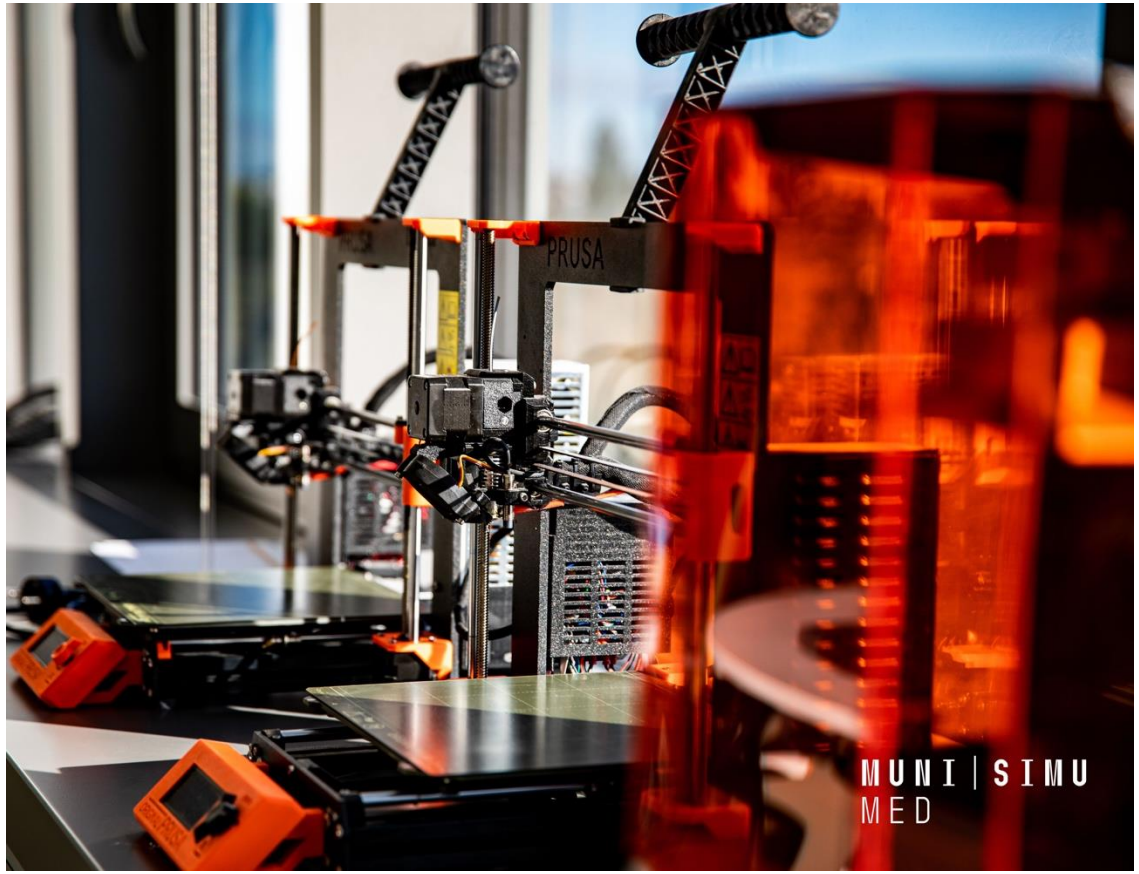
Anatomically aCCuratE 3D modEls

Internal goals

- Learn segmentation from CT and MRI
- Develop an expertise in 3D printing in a medical school environment
- Share procedures and knowledge
- Being active in the community
- Publishing for the general public



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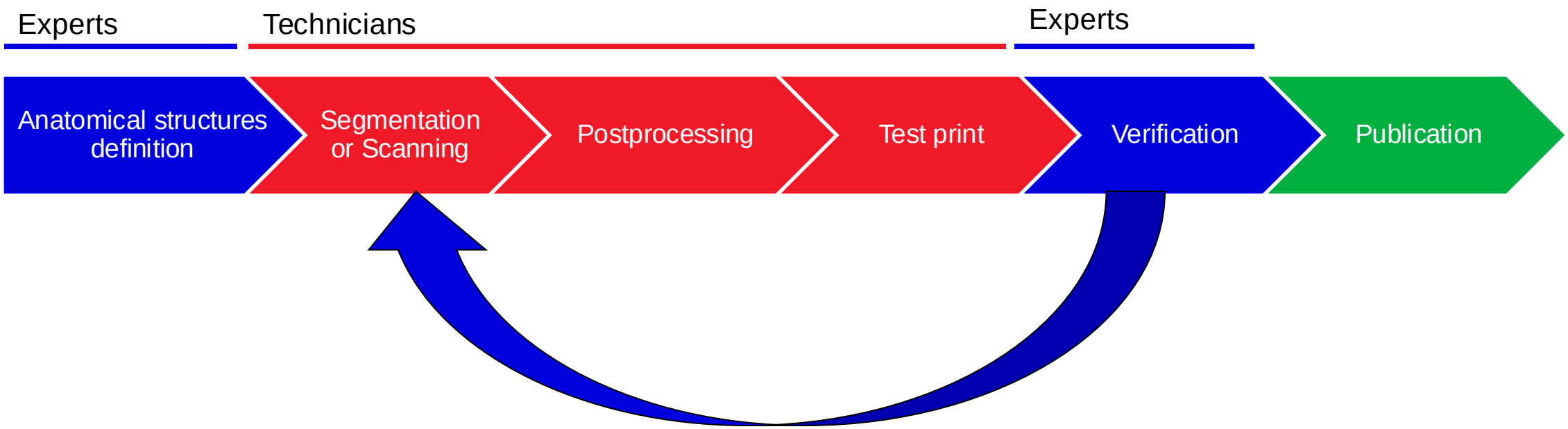
3D model creation model



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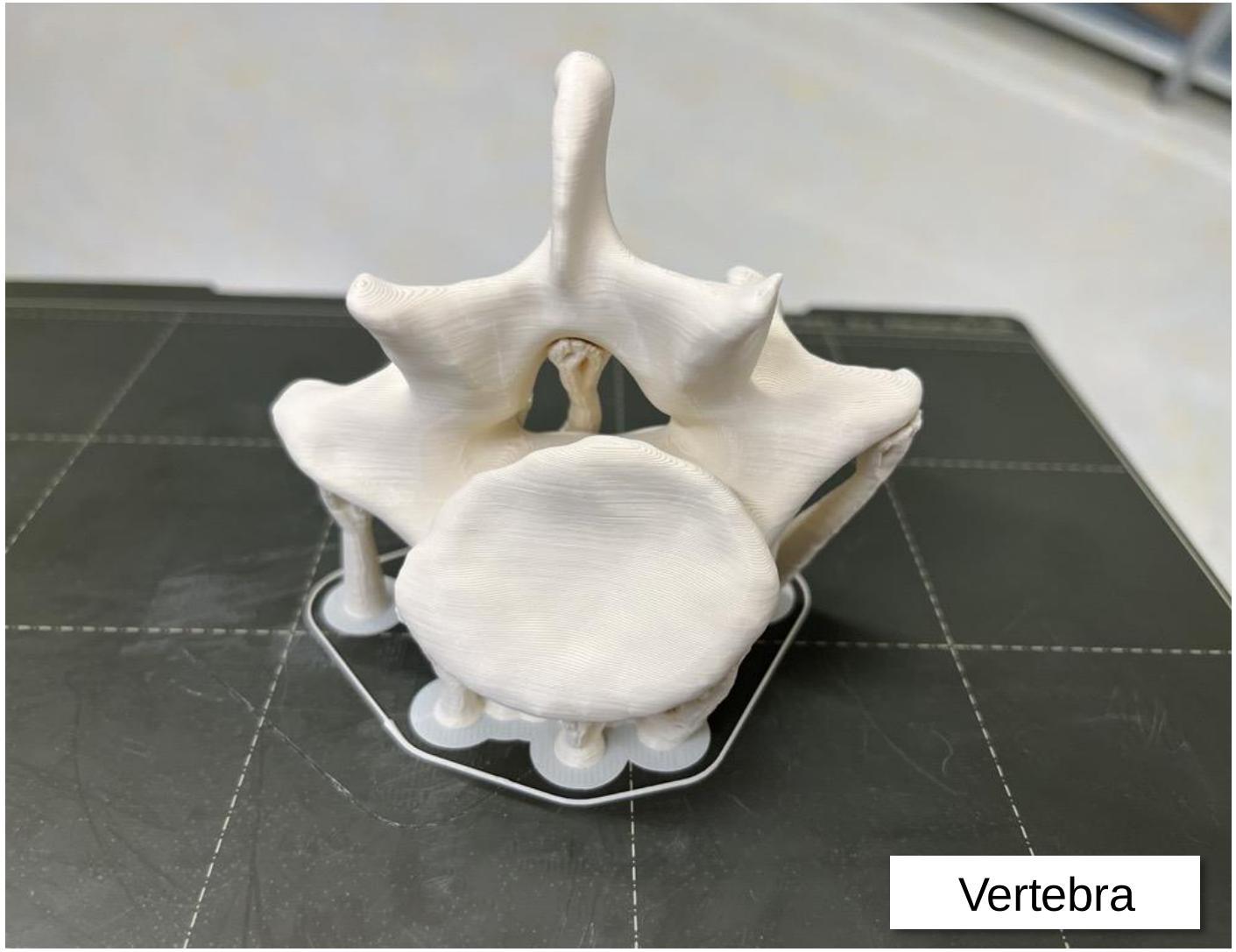
The Results



Vertebra

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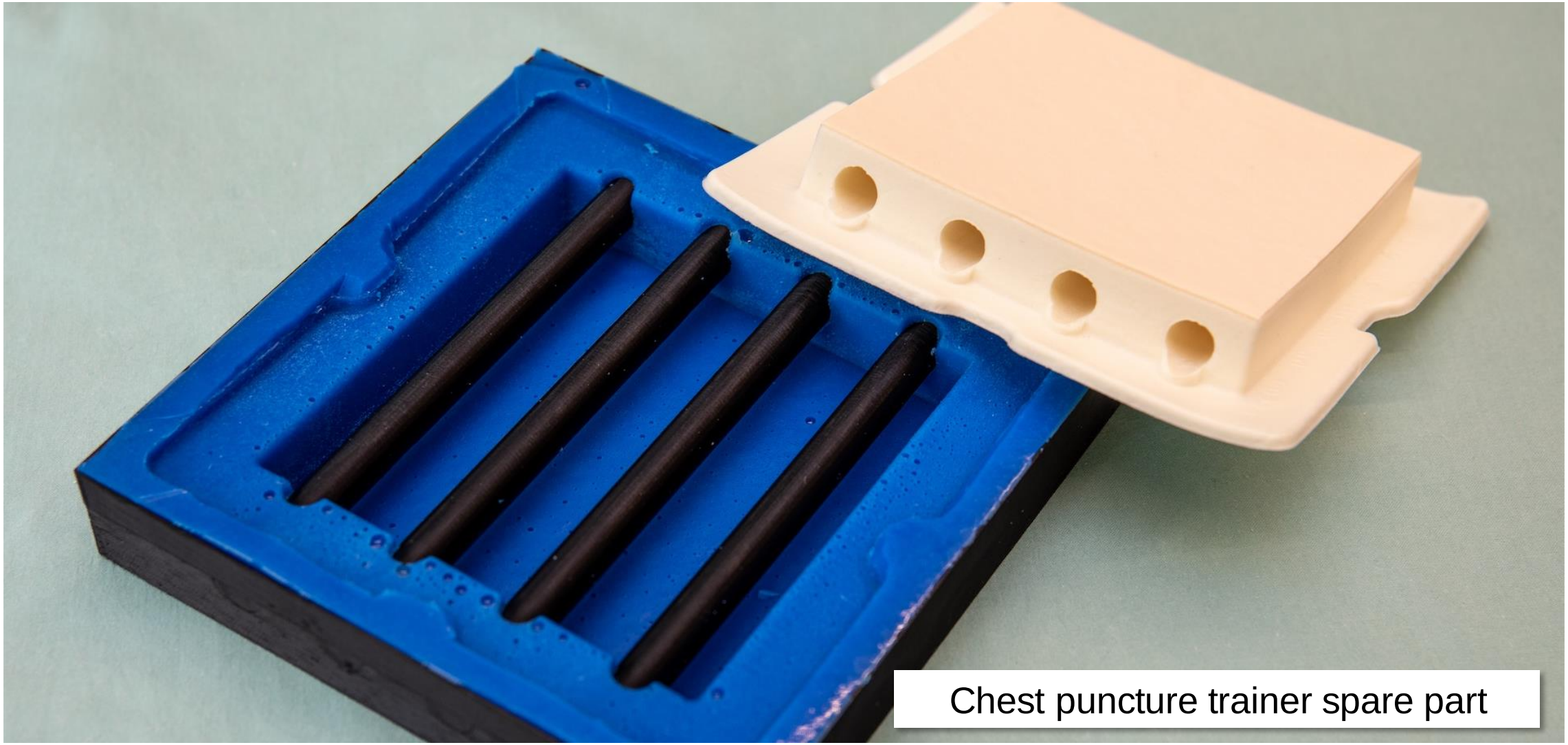
Suturing skills trainer

Laparo suturing skills trainer



Chest puncture trainer spare part

Obstetric suturing trainer

Umbilical cord catheterization

Femur

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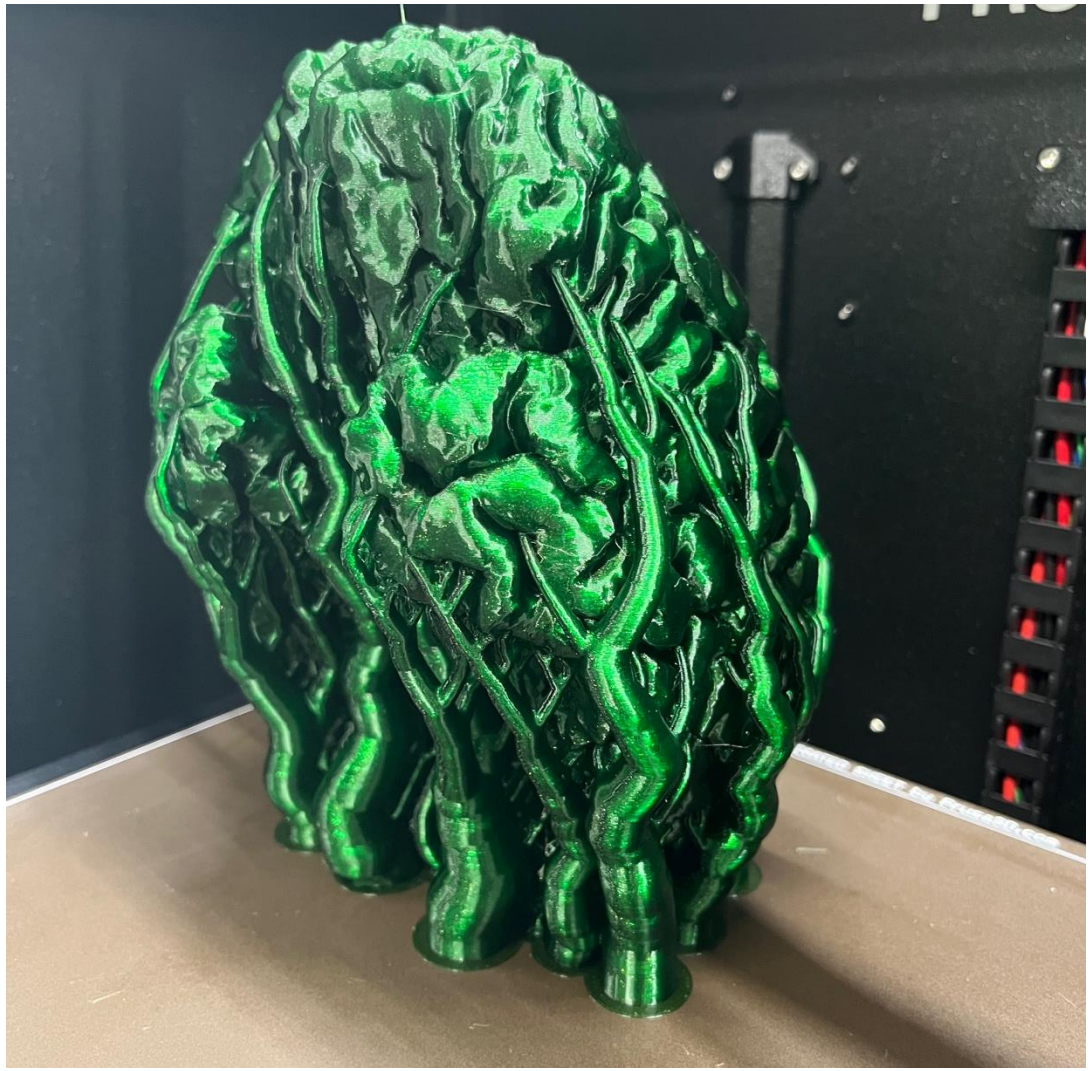
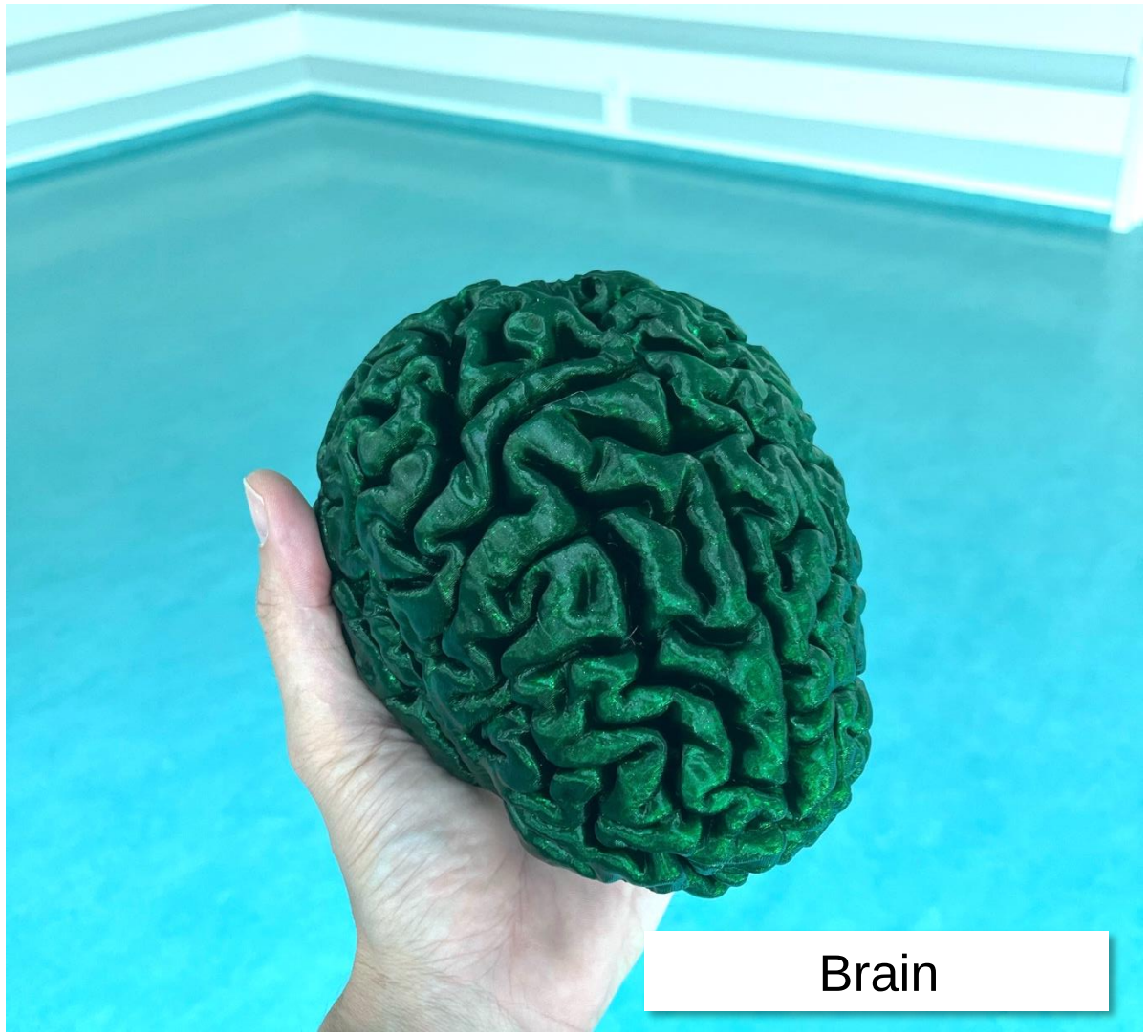
Colon laparoscopic suturing





Brain

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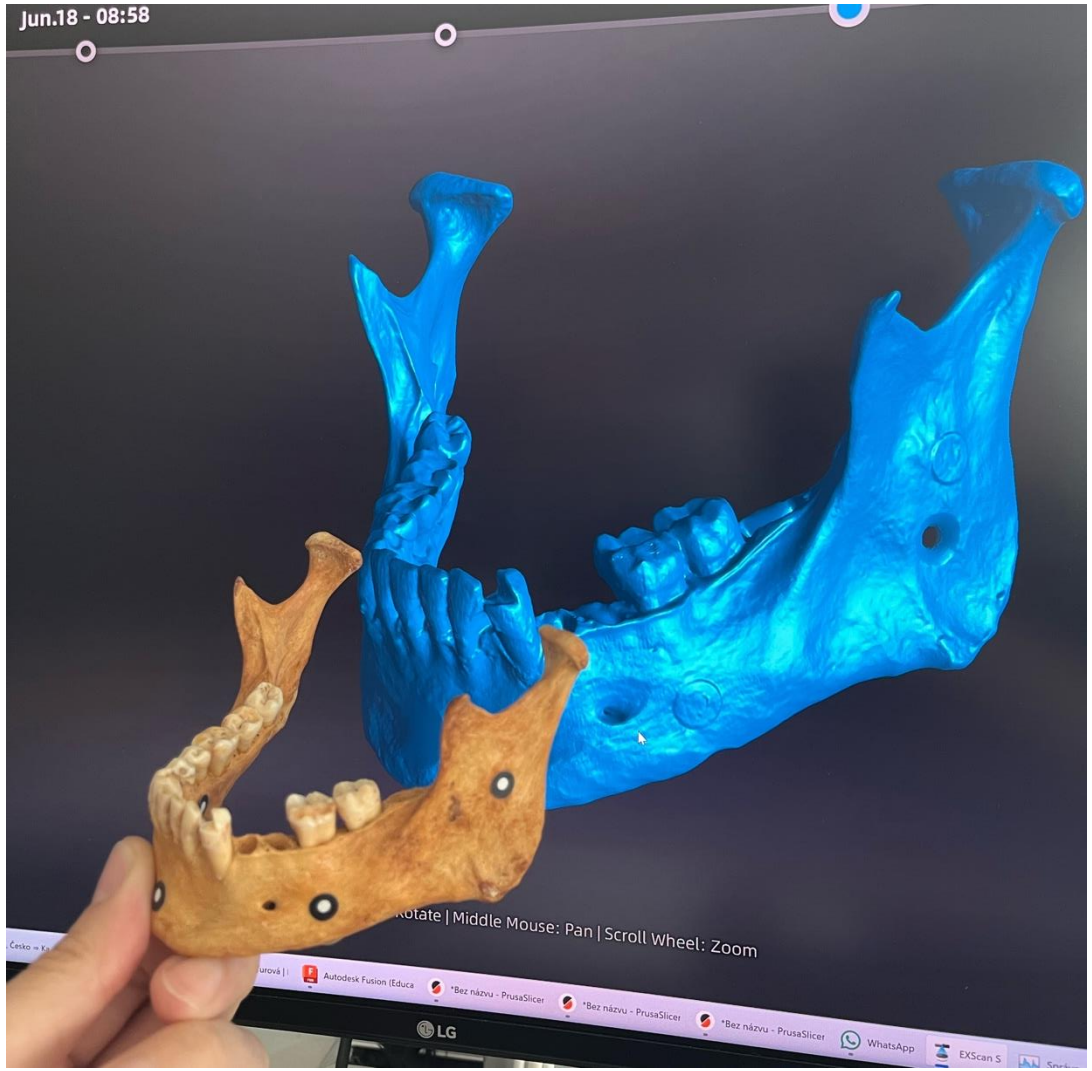

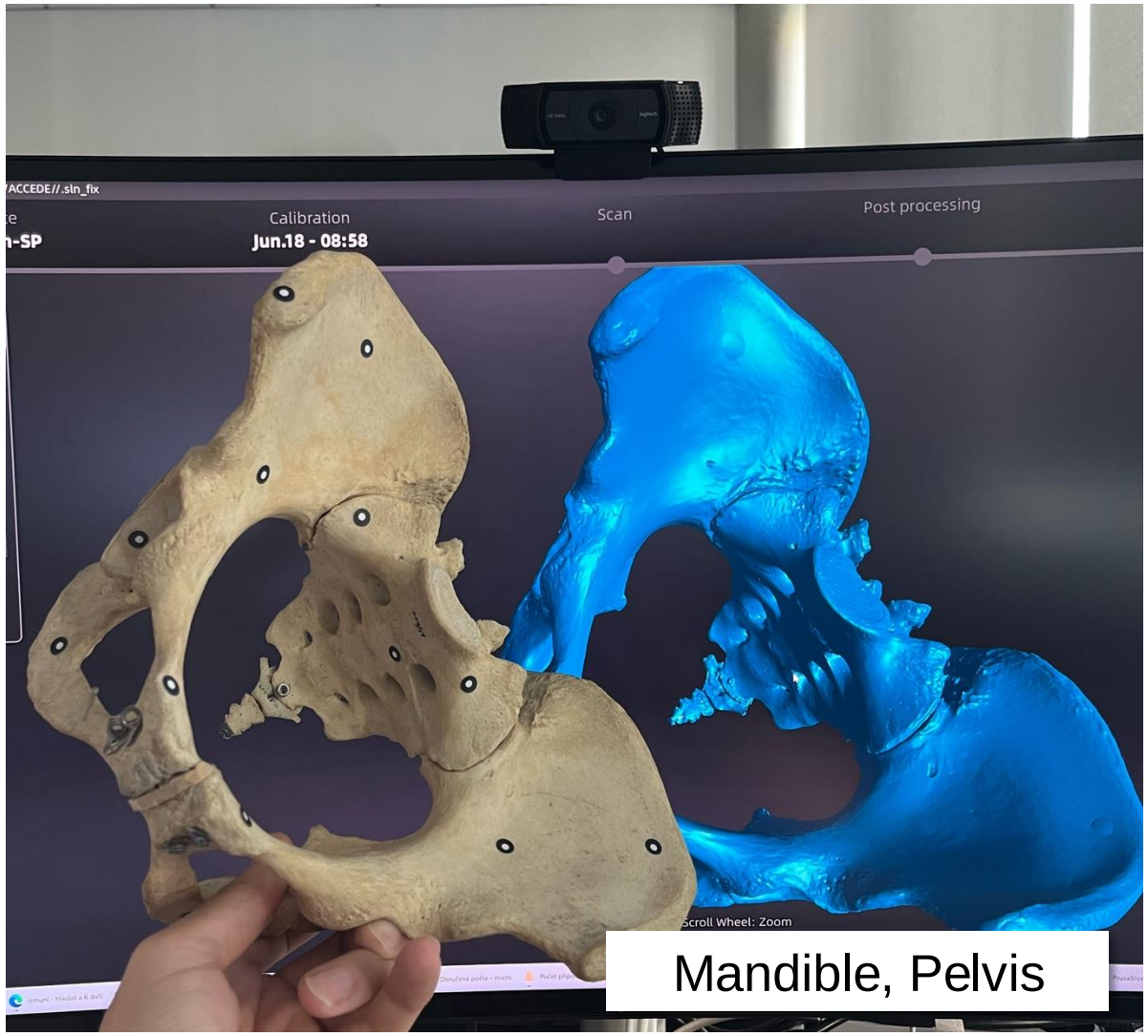

Mandible, Pelvis

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Vertebra, Backbone

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Innovation & Research

Doctoral Programme

- Interdisciplinary (medical, pedagogical and technical disciplines)

- Department of Simulation Medicine
- Czech and English

- Research-oriented
- Innovation in the field
- Opened 09/2022

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Doctoral Programme

MUDr. Tamara Skřišovská, Ph.D., DESAIC

- First graduate (August 2024)
- *„Simulation Training for Identification and Prevention of Critical Incidents in Anesthesia and Intensive Care “*
- Vicepresident of SESAM

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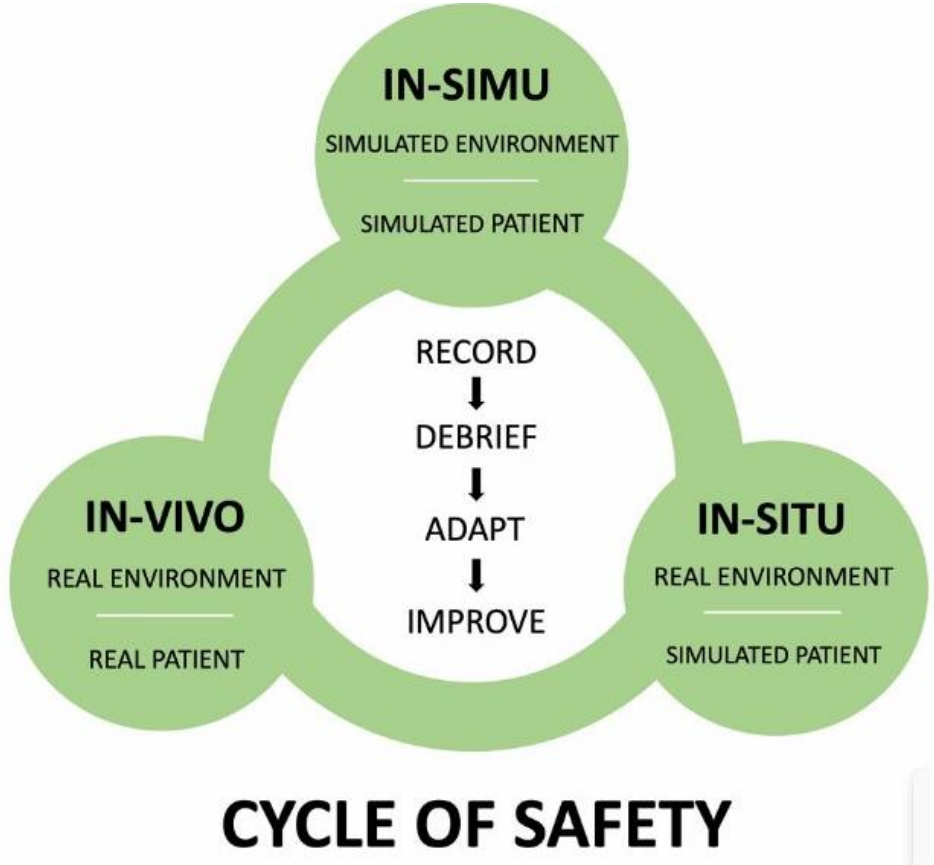
Simulation Centres as Test Beds

J. Hilbrand, J. Travěnec: “Envisioning the Smart Simulation of Tomorrow”



Thesis 7 of “**Envisioning the Smart Simulation of Tomorrow**”

“Simulation Centers Will Be The R&D Testbeds for Tomorrow's Advanced Clinical Decision Support Systems”

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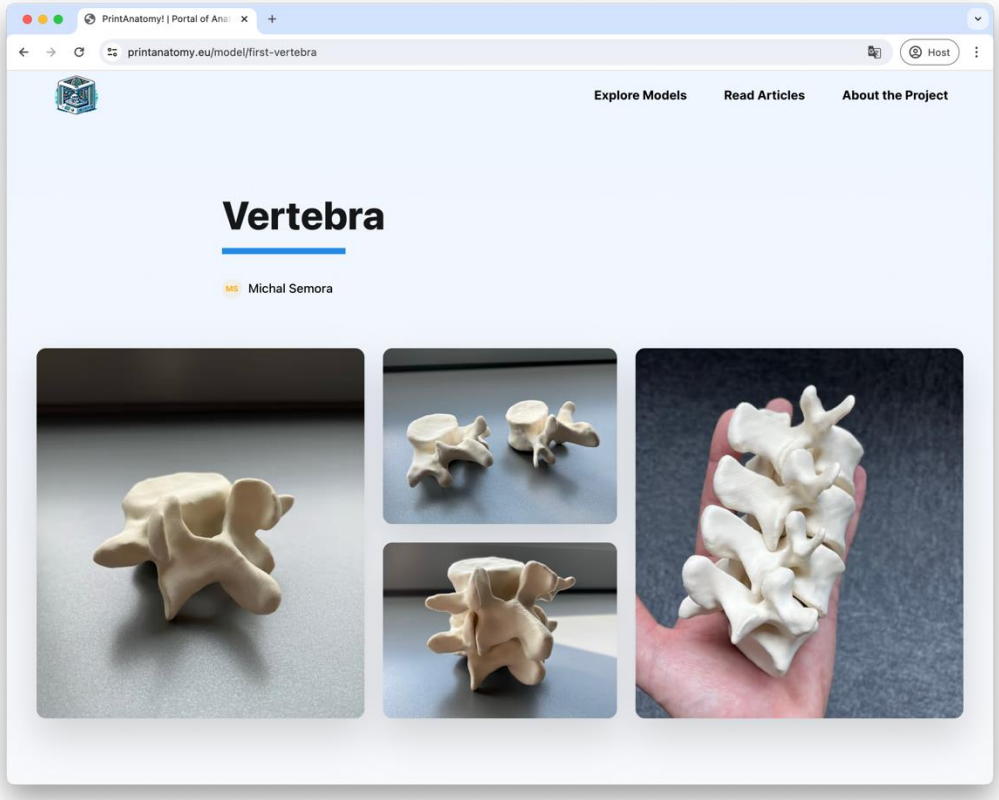
Benefits of Using SCs as Testbeds

J. Hilbrand, J. Travěnec: “Envisioning the Smart Simulation of Tomorrow”

- Safe environment to test and iterate on new technologies before clinical deployment
- Ability to gather real-time feedback and data to improve system functionality
- Enhanced training for healthcare professionals on the use of new decision support tools.

Portál PrintAnatomy!



PrintAnatomy!

https://printanatomy.eu

Hyde Park Civilizace

Simulační centrum: výuka mediků i lékařů

Obsah dílu

reálná situace v tréninkových podmínkách Simulačního centra Lékařské fakulty Masarykovy univerzity

Vyrobeno 2023 • Česko • P ST HD

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Department of Simulation Medicine, Faculty of Medicine,
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Simulation Centre, Faculty of Medicine,
Masaryk University
2024