

THE DEVELOPMENT OF LOW-COST SIMULATORS FOR MEDICAL TRAINING IN PUNCTURES

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Introduction. Medical procedures involving punctures require practical training for utmost effectiveness and low risks. Therefore, a project with the purpose of training medical students was developed constructing 4 low-cost simulators for the following procedures: thoracocentesis, pericardiocentesis, femoral artery cannulation, and urinary bladder puncture.

Materials and methods. The project was undergone using low-cost materials: mannequin structures, artificial skeletons, polysiloxane polymers, tubes, and reservoirs. The pericardial and pleural puncture simulators were made using an artificial skeleton of the upper body that was covered in skin-resembling silicone and filled with sponges and reservoirs for the pleural and pericardial cavity. Moreover, the femoral artery and bladder punctures were constructed using a mannequin of the inferior body that was carved up in the respective anatomical places, which were filled with tubes, polymers and reservoirs to resemble the femoral artery and the bladder.

Results. Models respected the topography of the actual organs and anatomical structures of the human body. Punctures were performed by considering the anatomical landmarks for the correct needle placement and depth. Thoracocentesis was carried out by finding the intercostal spaces of the simulator, whilst for pericardiocentesis the stern and the costal arches were taken into account. For the femoral artery and bladder: the iliac crest, the umbilicus and the pubic bone were used to determine the needle direction and entry point. In order to assess the functionality of the simulators, procedures were practiced in different stages of the project: first by the developers and afterwards by students during scientific workshops. Performance was functional and closely resembling real-life medical scenarios. Students offered positive feedback, identifying correct anatomical landmarks, and aspirating the liquids into syringes accordingly.

Conclusions. Low-cost medical simulators for several punctures were successfully incorporated in student medical training, taking into account key anatomical elements and clinical scenarios. Additional developments to the project could improve anatomical accuracy and efficiency.

Keywords: anatomy, low-cost, simulation, punctures, practice.