

## Ascites-tap Simulator for Abdominal Examination and Removal of Ascites Fluid

Sir,

Intraperitoneal fluid accumulation is called ascites, which causes an increase in abdominal volume, weight gain, abdominal pain, and shortness of breath; different causes have been identified for ascites, including chronic heart failure, cirrhosis, chronic kidney disease, intra-abdominal malignancies, and tuberculosis.<sup>[1]</sup> Intraperitoneal fluid aspiration (paracentesis) is the main way to detect the cause of ascites; this intervention is carried out in two ways: traditional and under ultrasound guidance.<sup>[2]</sup> Traditional paracentesis requires clinical skill. Medical students can increase their clinical and communication skills using a variety of teaching aids, models, and medical simulators in the Clinical Skills Centers. In various studies, the effect of practical training on simulators was compared with patients, and it is specified that using simulator-based methods had better results. In most cases, the lumbar puncture (LP) training on a simulator was taken initially in 1994, and in a study, students who were trained on the LP simulator had better practical test results than the video tutorial group under the website.<sup>[3]</sup> In the year 2003, a simulator for intra-articular injection was introduced.<sup>[4]</sup> In a similar case, a paracentesis simulator model was created and used in education.<sup>[5]</sup> In Iran, studies have been conducted based on the using of foreign simulators and have been compared solely with educational methods. In two separate studies, the practical results of cardiopulmonary resuscitation test were studied in two groups of students that training on simulators and traditional education group through lectures and educational films. Finally, the use of simulator for rehabilitation education was accepted.<sup>[6]</sup> In another study, a group of students who trained the process of tracheal intubation on simulators had higher scores of practical tests than those who did not receive this training.<sup>[7]</sup> Sanctions, high prices of simulators, and lack of annual education budgets are the most problems in Iranian universities. The goal of this research was to design an Iranian simulator for examination and paracentesis of ascites. We attempted to create a variety of features in simulator such as appropriate appearance, size, anatomy, surface markers for best catheter insertion, and doing ascites examinations including “fluid wave” and “shifting dullness.” Then, the final simulator [Figure 1] was transferred to the clinical skills center of Isfahan University of Medical Sciences and was examined by the experts. After several stages, the defects of the final product were completed and confirmed. One of the challenges of the study was to determine the materials used to make mannequins. These materials should be cheap, affordable, and safe and had good quality. We tested different materials. Finally, we used silica, latex, and foam



Figure 1: Ascites-tap simulator

combinations for this purpose. Furthermore, the consistency and reduction of the leakage from the needle entry site were also a challenge to the design, which after the combination of several material types, internal fluid bag was made of materials that have the least damage in student's frequent tests and economically feasible to replace with low cost. This mannequin has three main parts. The first part is a silicone skin that covers the entire surface of the mannequin. This skin is very flexible and has the same color as the human skin. Repeated use of Intravenous line catheter can cause skin damage, but the use of silicon has solved this problem. The second part is a large piece of red foam. This part actually plays the role of the intra-abdominal muscles and viscera. The third part is a large silicone-latex bag. This bag is the peritoneal space that is filled with water through a hose. The volume of this bag is about 10 L and is covered with a layer of silicone glue. This adhesive layer reduces the leakage of liquid out of the bag.

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### Conflicts of interest

There are no conflicts of interest.

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