Cleveland Clinic

Body Donation Program Partnership Enhances Proximal Humerus Intraosseous Vascular Access Simulation

Simulation and Advanced Skills Center (SASC)

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Background

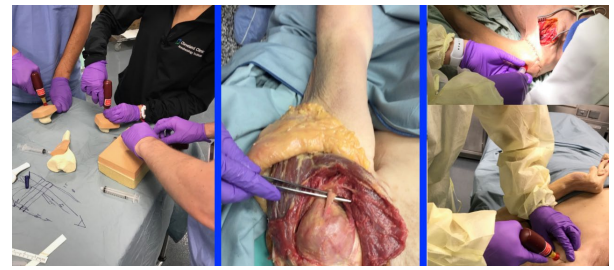
Intraosseous (IO) vascular access cannulation is an important procedural skill for clinicians involved in the care of acutely ill or injured patients. However, the need for IO needle placement is relatively rare, necessitating accurate methods of simulation for the development and maintenance of this high-acuity low-occurrence skill [1,2].

For many years IO training has centered around the use of low-fidelity task trainer models which do not always prepare providers for challenges they may encounter in clinical practice such as patient positioning, landmark identification, needle selection, and confirmation of placement [3]. More recently, virtual reality (VR) and augmented reality (AR) have been used to increase the fidelity of medical training, but these modalities fall short when it comes to procedural training given the inherently physical nature of procedural skills. These technologies also require significant financial resources which not all institutions have access to [4].

Partnering with a body donation program provides a unique opportunity for the incorporation of fresh cadaver training that reflects the realities of clinical practice while utilizing a resource already available in medical training programs.

Course Description

Through a partnership between the Cleveland Clinic Body Donation Program and the Simulation and Advanced Skills Center we were able to develop a simulation workshop on IO vascular access combining fresh cadaver simulation with traditional model-based training. Each workshop began with 30 minutes of didactics focused on definitions, indications, contraindications, anatomy, and techniques. This was followed by 90 minutes of model and fresh cadaver simulation covering equipment, anatomy, landmarking, and insertion technique. These workshops utilized discrete learning goals, immediate instructor feedback, repetition of the procedure, and learner assessment in line with the concepts of deliberate practice and mastery learning [5].



From 2017-2023 we ran 44 workshops with a total of 153 participants including medical students, residents, fellows, and staff from surgical and non-surgical specialties. Workshops were held in the Surgical Skills Training Lab and run by cardiothoracic anesthesia staff. A survey measuring baseline knowledge and experience was given to participants before each workshop, and a survey measuring which components of the workshop were most beneficial as well as increases in knowledge and confidence was administered after the workshop.

Outcomes

All participants were able to perform IO cannulation at least eight times and achieved IO access within 60 seconds by their final attempt. Additionally, post-survey respondents reported median increases in knowledge and confidence of 100% (IQR: 90-100%). Respondents also noted that each aspect of the workshop (didactics, dry lab, cadaver landmarking, and cadaver practice) constituted a key component of their learning. After completion of the workshop, multiple providers reported that they utilized the skills they learned with real patients and noted that their experience in the workshop helped them successfully obtain IO access. This demonstrates the learners' ascent to the final "does" stage of Miller's Pyramid of Clinical Competence, wherein providers are able to integrate what they have learned into clinical practice [6].

This evidence supports the conclusion that combining fresh cadaver and model-based simulation is an effective method for increasing proficiency and confidence of learners at various stages of training in procedural skills such as IO cannulation and may even provide additional improvements in best-practices. It is possible that incorporating fresh cadaver simulation into training for other procedural competencies may similarly increase provider preparedness and allow for higher-fidelity simulation than can be achieved through non-cadaver models or VR/AR modalities.

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