## Academic Section of CAEP: Featured Education Innovation

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| Name of Innovation | Emergency Department Ultrasound Simulator (edus2) |
| Lead Innovators | Paul Kulyk, MD, B.Eng, B. Sc., Paul Olszynski, MD, MEd. |
| Lead Innovator's email address | p.olszynski@usask.ca |
| Website for this project | www.edus2.com |
| Division or Department website | www.medicine.usask.ca/emergency-medicine/ |
| Description of the Innovation | **Background**<br><br>The Emergency Department Ultrasound Simulator (edus2) is a simulated portable ultrasound device that allows for the integration of emergency department ultrasound (EDUS) into critical care simulations. Trainees using the edus2 gain the opportunity to determine whether to use EDUS (indications), demonstrate how to properly hold and place the probe (basic image generation) and interpret real patient scans (image interpretation), all within the context of a real case scenario illustrating the logistical challenges of clinical integration.<br><br>**The Innovation**<br><br>The edus2 plays pre-recorded video clips of real patient scans through the coupling of those video files to specific radio frequency identification device (RFID) cards placed under the skin of the simulation mannequin. Passing the simulated probe (a USB based RFID scanner placed within a hollowed curvilinear probe) over the RFID card under the mannequin's skin initiates the corresponding video. Multiple scans are possible during any given scenario including various thoracic, abdominal and pelvic pathologies. To our knowledge, this is the first such EDUS simulator that allows for actual use of a probe on any available manufactured High Fidelity Simulation (HFS) mannequin resulting in near seamless incorporation of EDUS into all HFS scenarios<br><br>**Conceptual Frameworks**<br><br>Several key educational frameworks support the integration of EDUS during critical care simulation. Learning takes place according to Bloom's three domains as students engage in the task through hands on use of the edus2 (1). Skill development is paired through interplay between the trainee and the instructor/preceptor. As per Cognitive Load Theory, as trainees become more proficient with EDUS (relying less on short-term memory and more so on both long-term and motor memory), they become increasingly capable of |

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| | focusing on the clinical picture before them (2). Faculty may identify aspects of trainee EDUS use that require further development and subsequently can create opportunities for deliberate practice. Simultaneously, clinical competence can be assessed using Miller's framework while recognizing the challenges inherent to the assessment of critical care skills (namely the infrequency and inability to standardize critical care encounters) (3). Lastly, Kirkpatrick's Hierarchy of evidence allows one to assess whether transfer of learning has taken place and may help with determining whether the intervention will have any impact on actual patient care (4).<br><br>**Limitations**<br><br>The edus2 is not appropriate for teaching image generation - the skill of generating quality images is best learned on real patients while under the direction of a qualified instructor.<br><br>We have made this educational innovation available to other training institutions on a not-for-profit basis (creative commons copyright). In hopes of achieving greater collaboration we have designed a website (www.edus2.com) at which other departments and programs can access all software and instructions required to run an edus2 at their own site while also being able to offer feedback and add to the video library. New users can freely download the software code and accompanying videos for use in their own institution. Additionally, each site is responsible for supplying its own laptop, USB based RFID scanner, RFID cards and machine stand. |
| References | References<br><br>1. Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I:Cognitive domain. New York: David McKay Company.<br><br>2. van Merrienboer, J. J., & Sweller, J. (2010). Cognitive load theory in health professional education: design principles and strategies. Med.Educ., 44(1), 85-93.<br><br>3. Miller, G. E. (1990). The assessment of clinical skills/competence/performance. Acad.Med., 65(9 Suppl), S63-S67.<br><br>4. Kirkpatrick, D. (1996). Revisiting Kirkpatrick's four-level model. Training and Development, 50, 54-59. |

**Figure 1.** Use of the edus2 in High Fidelity Critical Care Simulation


**Step 1**. Placement of RFID cards under the rubber skin of the HFS mannequin (multiple cards can be placed throughout the mannequin's body representing different scanning areas).
**Step 2**. Re-attachment of mannequin skin (in some mannequin models the rubber skin is either partially lifted or entirely removed and then re-attached for placement of cards).
**Step 3**. Trainee participating in the HFS scenario simply brings the edus2 to the patient's bedside and places the probe over the proper landmark for the scan they desire to perform. The edus2 plays the video that has been coupled to the RFID card (placed under the skin) once the probe is within signal proximity.

**Step 1** **Step 2** **Step 3**

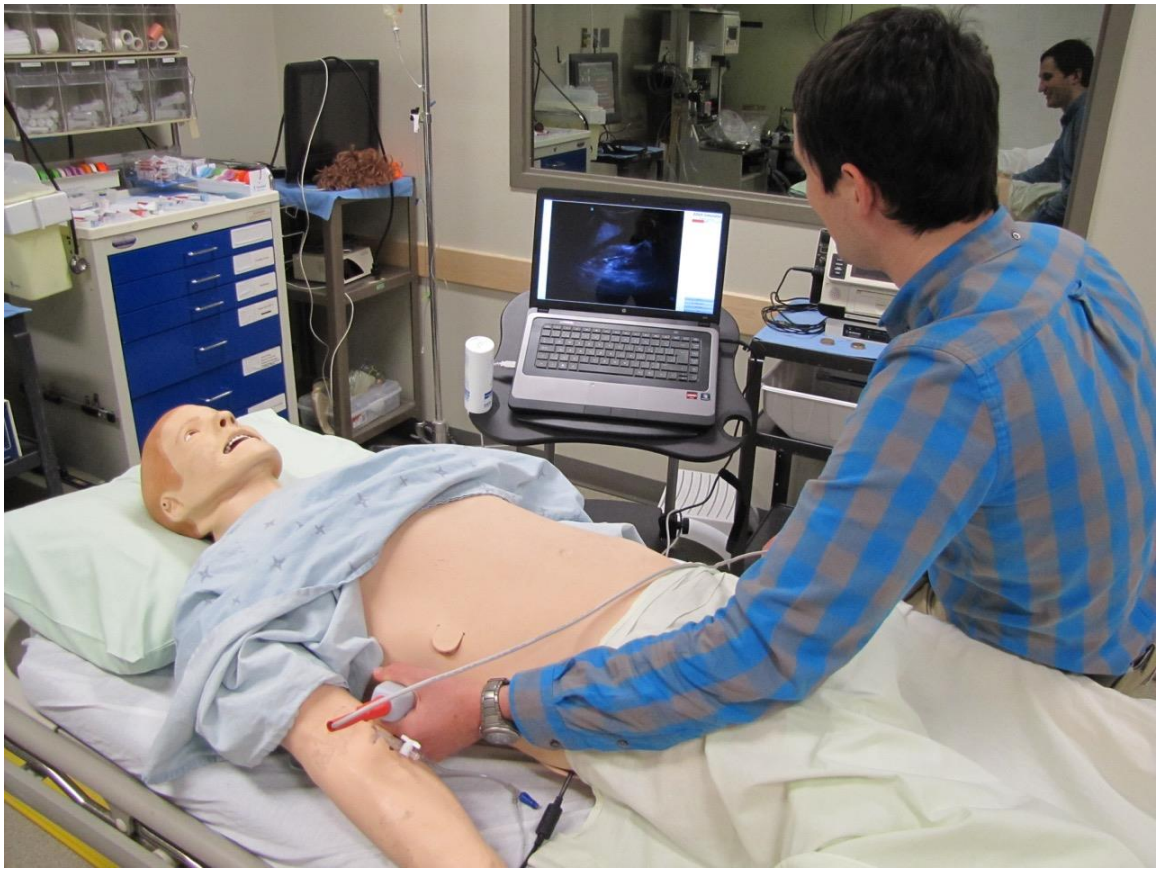

**Figure 2.** Use of edus2 on mannequin

**Submitted by:**

Paul Olszynski, MD, MEd, CCFP (EM)
Emergency Medicine
Director, ED Ultrasound
Saskatoon Health Region
Director, Ultrasound-Guided Med Ed
University of Saskatchewan
RUH Room 2686
cell: 306-370-0357