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ECMO simulation and beyond

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The last couple of decades has brought a lot of changes in thoughts and technology in the domain of simulation-based healthcare education, ranging from emergency preparedness using screen-based technology to the practice of precise surgical procedures with computerised simulators with haptic and performance feedback.[1] There is a perpetually evolving educational and technological simulation continuum available to educators and clinicians promoting the practical and cognitive aspects of healthcare delivery. It is becoming an increasingly competitive market area from an industry perspective as more and more governments invest on technology to support educational initiatives and programmes in order to increase patient safety and standards of care.[2] Although industry strives to develop more advanced and realistic simulators, it is increasingly argued that it is not necessarily linked to better learning outcomes.[3] For an effective use of simulation as an educational approach, a key aspect is to focus on selecting the approach that best addresses the intended learning objectives.[4]

Extracorporeal membrane oxygenation (ECMO) is a bridge therapy that can be separated into several phases from a training perspective such as patient selection, cannulation type (veno-venous (VV)/ venous-arterial (VA)/VVA) and process (ultrasound guided cannulation, fluoroscopy cannula placement, securing the cannula, etc.), ECMO patient management and issues, and ECMO circuit issues.[5] Overall, it is a complex system that all ECMO team members need to grasp at least theoretically in order to be able to support one another at any stage when a problem occurs. The safest way to become familiar with ECMO is to use simulation; however, at present, there is no single simulation platform that allows us to seemingly practise the succession of phases without transiting from one type of simulator to another type, and this is what we are trying to address. At best, and generally only for demonstration purposes (appropriate in that

case), we are "simulating the simulation" as a form of deception.[4] We currently pretend the ultrasound or fluoroscopy procedure by playing a video making observers believe that it is a live view or we ask them to imagine a colour change in the oxygenated blood, which might be a more significant gap.
Several teams have developed their own simulation solution[6] to bridge a gap in the market or save on the purchase of prohibitive technologically advanced simulators that still have limitations. The simulations for ECMO training often either start post cannulation, whereby a team of learners has to fix a machine or patient issue during the ECMO run, or they concentrate on very technical skills such as cannulation insertion and water drills to practise circuit change. Both aspects are critical but still leave room for missed educational opportunities involving the whole team. Collaboration, generally without commercial ambition, between clinicians, educators, and engineers is now pushing the boundaries of ECMO simulation, making it a more affordable and common practice, but ultimately industrial support is generally required to "mass-produce" and distribute the solutions as we need them: functional, effective, and affordable, so the use of simulation for ECMO training can become a common practice and clinical teams are better prepared to initiate ECMO and deal with emergency situations. We hope to introduce ELSO very soon with a collaboratively developed simulator that meets all key training requirements.

Keywords: ECMO, simulation, technology, fidelity, collaboration

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