

***EDITORIAL***

**Medical Simulation: Utilize, Inspire, Embrace, Verify**

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I too have experienced the enthusiasm of an individual seeking to learn a new task. More years ago than I care to elaborate and before the proliferation of health care simulators, I visited the ER with a painful ache and had an interesting training experience with a youthful ER nurse. She looked around possibly to see if anyone could help or oversee her and noting that everyone else was busy and my veins were attractively prominent, she promptly asked if I would mind if she practiced drawing blood. Under duress due to pain perhaps, I agreed. I am not sure if the art and science of phlebotomy includes the part of chasing the vein with the needle under the epidermis or whether it is at the 3<sup>rd</sup> or 4<sup>th</sup> stick that phlebotomy starts to become something akin to torture but thankfully after the 4<sup>th</sup> stick, I received an apology and a surrender from the novice nurse and we waited for a more experienced practitioner. That day I wished for a better way and hoped that no one else would need to endure the painful or even perilous results of such inexperience.

The future is now. The world has entered a new age of inspiration for medical simulators. The apprentice model of medical training is fast being complemented for increasingly more procedures. The mantra of *see one, do one, teach one* has become *see one, simulate many, do confidently*. Patients are the greatest beneficiaries of this paradigm shift. Physicians can practice new procedures, rehearse difficult cases, and plan using patient-specific precision. Only a few roadblocks remain. The greatest of which is complacency, which manifests as a resistance to accept this change. The resistance could be due to financial or operational reasons but the recognition of the advantages should be at the forefront so that organizations can seize the

opportunity when patient benefit greatly outweighs the costs. Contemporary physicians should be challenged to see opportunities to adopt technology that promise better outcomes for patients and this includes simulation. As we have all become familiar, commercial airline pilots are typically required to obtain many hours of flight time on sophisticated flight simulators practicing maneuvers and fault scenarios too dangerous or expensive to replicate on real aircraft. These hours simulating are also frequently logged as flight time credits.

Realistic part task trainers are the predecessors in the medical industry to sophisticated surgical simulators. The effectiveness of part task trainers are undeniable to the extent that they've become part of the medical skills curriculum in numerous countries. The challenge now for clinicians is to not only recognize utility in popular and available simulators but to recognize opportunity in creating new healthcare simulators for the betterment of the patient; and then, forming sustained collaborations with technology researchers that can develop and disseminate those ideas.

At Old Dominion University's (ODU) Modeling, Simulation and Visualization Engineering (MSVE) Department in Norfolk, Virginia, we are doing our part fostering significant collaborations with Eastern Virginia Medical School (EVMS) and Children's Hospital of the King's Daughters (CKHD). MSVE has pioneered the Virtual Pathology Stethoscope [1,2], which is now available from Cardionics, Inc. [3], provided an innovative surgical tool designed using simulation called the Pectus Bar Extractor [4,5,6] currently in use, and has developed a

unique prototype surgical simulator [7,8] for the Nuss Procedure -- a minimally invasive procedure for pectus excavatum repair.

Sustained long term relationships between clinicians and engineers have enabled this innovation. Engineers are trained problem solvers and clinicians can identify activities that present ongoing hurdles to providing the best care for their patients. Along with the challenge for clinicians to identify these opportunities to improve healthcare through utilizing and spurring development of innovative devices and training via simulation, another call to action is for administrators to put in place the framework to support such strategic partnerships between clinicians and engineers. Long term relationships require an investment in personnel and equipment and also require some quality time clinicians must take away from their patients to make these investments pay off in the long run. Once such an infrastructure is in place, collaborations among the groups can be flexible enough to seek industry and other institutional support when promising results are ready to translate into commercialized every day use.

This exciting simulation age that we are now firmly entrenched will continue to last quite a long time and we must be aware and beware of the benefits and pitfalls. Close attention must be given to the specific uses of a simulator and the particular procedures for which it was assessed and approved. These are readily apparent for focused skills trainers but as medical simulators become more complex, the positive training aspects may not be easily distinguishable from the negative training aspects especially for the novice. This is not to say that therefore we should avoid simulators. On the contrary, we should embrace but verify and use only as directed.

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