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Healthcare varies widely around the world but most ‘well to do’ or ‘wealthy’ nations provide ‘universal care’; although to varying degrees and with different levels of success. The exception to ‘universal care’ is the US. What we need to address is the lack of coverage throughout the world of consistent quality care and those who provide the care.

According to the World Health Organization (WHO) and other international as well as national associations, this lack of coverage will become an increasingly difficult problem over the next twelve to fifteen years.

This is due to a number of factors including aging populations that are living longer, an aging healthcare workforce, political and socio-economic concerns and cost. According to an on-going study conducted by the American Association of Medical Colleges (AAMC), one third of physicians are over 55 years of age, and the population over the age of 65 is expected to double by 2030.

A study conducted by WHO which included 165 nations, predicts that by 2030, the global demand for healthcare workers will rise to 80 million, while the supply of healthcare workers is expected to grow to 65 million over the same period, which still leaves a projected worldwide shortage of 15 million healthcare workers. The demand for a skilled healthcare workforce will be highest in upper middle-income countries, driven by economic and population growth and aging. These shortages may fuel global competition for skilled healthcare workers. Middle-income countries will face workforce shortages because their demand will exceed supply. By contrast, low-income countries with low growth in both demand and supply, will still be in the same situation they are today or may be in even worse shape. This is due (as it is today) to their healthcare providers ability to meet the growing demand for healthcare providers in more affluent countries.

Over the past decade a number of economic and policy changes have been enacted in many countries to prepare for the pending shortage. In the US for example, the AAMC called for an increased number of medical schools and a larger number of medical graduates. Unfortunately, although medical graduates increased Congress did not increase the quota of residency positions and for the first time in decades all US students did not receive placements. This is a good example of how policy makers, accreditation and licensing agencies and healthcare providers must work hand-in-hand to achieve their desired aims.

In a 2017 article in Human Resources for Health, Jenny X. Liu and others talked about how the shortage could be lessened through better use of technology, improved skills development, and institutional reforms. They also discussed that a major challenge facing the international community is determining the kind of additional investments needed to increase the number of healthcare workers; how to achieve greater productivity and efficiency with current and future providers; and how to achieve a more effective distribution and deployment of healthcare providers within and across countries. Opportunities exist to change the trajectory of the number and types of health workers that are needed to meet public health goals and the growing demand for health workers. Improvements in worker productivity supported by technology-driven efficiency gains, as well as changing the skills mix and other cost-savings approaches could potentially lead to fewer health workers needed to provide equivalent levels of healthcare services. On the other hand, advances in technology could also increase the scope and complexity of healthcare interventions, and may lead to even greater demand for more and higher skilled workers.

To meet the latter goal in the US since 2012, 53% of nurses have baccalaureate degrees. Further, nurse practitioners and other advanced practice nurses (such as nurse anesthetists, clinical nursing specialists, and nurse midwives) can perform many of the same tasks that were once done by physicians – but at a lower cost. This economic reality is driving the demand for even more nurses.

Education and training is key and policy makers, governments, healthcare agencies and accrediting and licensing organizations need to work together uniformly and with stated goals to alleviate the shortage.

Judith Riess
Editor in Chief, Medical Training Magazine

judith@halldale.com
Editor’s Comment. Healthcare needs to address the looming problem of the worldwide shortage of caregivers.

iEXCEL: The Transformation of Health Professions Education. Jeffrey P. Gold, MD and Pamela J. Boyers, PhD profile the Interprofessional Experiential Center for Enduring Learning (iEXCEL) at the University of Nebraska Medical Center.

A New Approach for Changing Times. Dr. Marie-Ève LeBel describes changes in the Canadian surgical residency programs in her field of orthopaedics.

Interview. Judith Riess interviews Anurag Singh, CEO, Education Management Solutions.


Collaboration & Innovation for Shared Services in Medical Simulation and Training. Brent Cross shares some of Jump Trading’s device development and the need to collaborate.

IPSSW Conference Report. Andy Smith reports from the recent IPSSW conference in Boston.

Bridging Data from the Simulation Laboratory to the Clinical Setting. This article describes an assessment and evaluation tool that validates simulation’s effectiveness in the clinical field.


On the cover: Using head-mounted displays to manipulate holograms with gestures and navigate with movements. Image credit: University of Nebraska Medical Center.
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Outcomes for education and patient care will be improved through the creation of a “state-of-the-art”, comprehensive healthcare education, training and research facility: the Dr. Edwin Davis & Dorothy Balbach Davis Global Center for Advanced Interprofessional Learning (Davis Global Center). This facility is designed to accelerate the adoption of advanced simulation and contribute to the overarching vision for iEXCEL, which is to support the Triple Aim of Health Care: better quality, better health, lower costs (Berwick 2008).

Call to Action
Concerns for the current model for health professions education include: an outmoded system that remains heavily reliant on lectures; learning professional skills and procedures on real (and frequently very sick) patients in highly technical and fast-paced clinical settings; and an escalating hospital mortality rate due to what many consider to be avoidable medical errors. Meanwhile, as simulation technologies become increasingly sophisticated, the new generation of learners is demanding digital tools and self-directed and experiential learning opportunities - including the use of mobile platforms, interactive 3D, and Augmented and Virtual Reality (AR/VR).

Traditional real-time supervision and mentorship in the clinical settings by skilled and experienced clinicians has, and likely always will be, of critical importance. However, healthcare professionals at all levels of training are still predominantly learning to take care of patients in highly stressful “hands on” clinical environments, including learning how to develop professional skills and conduct procedures in the real world of medical care. Despite reduced opportunities to spend time with patients, reduced availability of busy faculty clinicians, duty hour restrictions resulting in reduced exposure to procedures, and over-crowded rotations at clinical training sites, future doctors, nurses, physician assistants and allied health professionals are expected to provide the highest quality of care at the lowest possible cost.

Jeffrey P. Gold, MD and Pamela J. Boyers, PhD profile the Interprofessional Experiential Center for Enduring Learning (iEXCEL™) at the University of Nebraska Medical Center (UNMC), which is a bold, interprofessional initiative purposefully designed to transform the current model of healthcare professions education.
professionals are expected to perform at “tournament level” when they graduate. Professional golfers or commercial airline pilots, for example, would not be expected to function under such circumstances without practicing until considered ready (competent) to function at routine as well as high-stakes events.

Adoption of Simulation in Healthcare
While most medical, nursing and allied health education involves simulation experiences, unlike aviation, the current rate of adoption of simulation in health care does not allow learners the opportunity to routinely practice the full range of skills and teamwork necessary to prepare for the safest possible care of patients. In addition, during a lifetime of modern practice, many new procedures, including those using new diagnostic and interventional technologies, the use of new surgical instrumentation, and the successful interface of human-machine interaction is still largely taught by the companies that develop the technologies or medical equipment. A comprehensive simulation center with well-trained faculty and staff can and should provide safe venues for practicing all procedural skills and for training with new equipment or technology. Medical simulation also creates opportunities to learn the “softer skills”, such as the development of interprofessional communication, critical thinking, diagnostic skills, clinical judgement and how to work effectively in healthcare teams.

Applying Lessons Learned
Poised to address the fact that medical errors are now a leading cause of death in the United States by revolutionizing healthcare education, the UNMC iEXCEL program, a center of excellence, is adopting lessons learned from other High Reliability Organizations (HROs), such as aviation, oil and gas, and the military. All HROs address quality and safety in their respective fields by reducing errors and improving efficiencies using a wide range of modeling, simulation and visualization technologies. HROs also demand the certification of operators prior to real world performance, and at regular intervals thereafter. For example, airline pilots absolutely do not fly a commercial airliner prior to being assessed as competent to do so. Aviation also found that assessing technical competency alone was not sufficient and moved to address the human factor element of safety by adding Crew Resource Management (CRM) to their training programs. Since a significant number of aviation catastrophes are due to poor communication (or to a crew member being unwilling to speak up at early signs of trouble), iEXCEL is applying this strategy to healthcare to help reduce medical errors. Hence, the high priority for iEXCEL is interprofessional collaboration, communication and team training.

An iEXCEL Competency-Based Training Model
Deep in the iEXCEL concept of an interprofessional, experiential, career-long learning model is the desire to create a discipline-shared, competency-based training and assessment model. The goal is for healthcare education at UNMC to move beyond a comparatively subjective evaluation of performance by creating valid and reliable methods of assessment that more accurately evaluate the performance of an individual or team. To support this endeavor, the Davis Global Center is fully equipped with cameras in the simulation spaces, including in the corridors, to capture and record all simulated activities. While the practice of simulation capture is common to many simulation centers, the use of this system to reliably analyze and assess performance while providing ongoing feedback to learners has yet to mature. Also desired is a competency-based approach with the capability of forecasting and analyzing performance to meet the demands of working in the modern healthcare system. The ideal competency assessment model in healthcare would include requiring and recording competencies from the time an individual enters the profession to the time they retire, and developing career-long, criteria-based learning models for each individual professional with relevant proficiency and experiences.

The Davis Global Center
When completed in the fall of 2018, iEXCEL will be housed in a new facility, the Dr. Edwin Davis & Dorothy Balbach Davis Global Center for Advanced Interprofessional Learning on the UNMC campus in Omaha, Nebraska. This new building has been purposefully designed to foster interprofessional collaboration and encourage the practice of procedures, hand-offs and transitions from one level of care to the next – including home and community care. For ease of access, this five-level facility is sited on the UNMC Omaha campus where faculty, staff, students and researchers from the university’s health professions colleges and Nebraska Medicine (NM), UNMC’s clinical partner, have the widest possible array of simulation technology available in a comprehensive range of realistic simulated healthcare environments. Simulation modalities available include: surgical simulation labs (fresh
Students from the University of Nebraska Medical Center’s Diagnostic Medical Sonography and Medical Nutrition Education programs collaborated to combine traditional learning with new technologies: a 2D interactive digital iWall, standardized patients and an ultrasound machine. This combination allowed students to engage in interprofessional teamwork while learning how each discipline addresses pregnant patients with normal and abnormal fetal growth patterns. Using actual patient case studies in a highly interactive exercise, the sonography students assisted the medical nutrition students in analyzing ultrasound growth reports. They used the interactive digital wall to view and manipulate real patient data and, for example, circled the measurements of interest and determined the type of intrauterine growth restriction (IUGR) present by drawing a fetus reflecting the type of IUGR. These skills are being applied in the Medical Center’s high-risk OB unit to enhance instruction and clinical care.

“The activity provided students with a collaborative and interactive learning experience which allowed them to work together to critically think through issues which they will encounter in the clinical practice,”

– Tanya Custer, MS, RT, UNMC

### Bringing Learning to Life

#### Case Study I

**Interprofessional Education: Visualization & Simulation**

The Davis Global Center is designed to maximize outreach capabilities, especially to the training sites and hospitals in the rural areas of Nebraska. A strong emphasis on the integration of technologies provides the capability of transferring media and data across distances, thereby enhancing the collaborative nature of the network and standardizing training across the state. This technological integration initiative will support telepresence and telementoring, and will allow expanded connectivity for telehealth in partnership with UNMC’s primary clinical partner, Nebraska Medicine. Currently, iEXCEL is deploying interactive digital touch screen walls and AR/VR technologies in a real-time role at other teaching sites in the rural areas of Nebraska.

Training outreach is also supported by deployable mobile simulation learning laboratories, Simulation in Motion (SIM-NE), a program created by UNMC and the Leona M. and Harry B. Helmsley Charitable Trust to conduct rural simulation training and disaster preparedness exercises for emergency medical services (EMS) providers and rural critical access hospitals. SIM-NE’s experiential training opportunities ensure consistent, quality-driven pre-hospital and hospital emergency training provided free of charge.

### iEXCEL: A Federal, State and City Enterprise

Committed to the vision to provide interprofessional and competency-based education using simulation, the State of Nebraska and the City of Omaha, with extraordinary support from private donations, have joined to invest in the creation of this new educational model, the need for which has been much discussed, including by many national accrediting bodies, but has yet to be fully realized.

### iEXCEL – Public-Private Partnerships

To stimulate economic growth for the State of Nebraska, the work accomplished in the Davis Global Center will promote and foster research and development through the establishment of public-private partnerships. A recent in-depth study conducted by economic impact consultants (Tripp Umbach) estimates the potential annual economic impact of iEXCEL to reach $40M for the State of Nebraska. Therefore, critical to the success of iEXCEL is the creation of strategic and synergistic relationships with academia, industry, government, military and the Nebraska community. Such collaboration results in mutual learning and grant opportunities, specialized training activities and expanded sources of revenue generation. This academic/business model also opens gateways for faculty and students to engage in innovation initiatives as well as entrepreneurial activities in an ethical, safe and structured environment.

**Architectural rendering of the Davis Global Center – currently under construction at the UNMC campus in Omaha, Nebraska.**

Image credit: UNMC.
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Collaboration with disciplines beyond healthcare including engineering, instructional design, and computer science also generates new opportunities for research and development. In cooperation with industry and military collaborators, iEXCEL is already working on the development of new training modules and 3D and VR content, and iEXCEL is exploring and assessing new learning methods. Revenue generated through Nebraska Medicine and UNMC received a $19.8 million federal grant as well as enduring annual operations support from the U.S. Department of Health and Human Services to create the Global Center for Health Security and Biopreparedness, which will be housed in the Davis Global Center enabling UNMC to teach federal health care personnel procedures in the treatment of highly infectious diseases.
Thus, in addition to serving as a hub for healthcare education as well as for the arena of producing content modules for training this emerging workforce in house an industry certificate program developers, the Davis Global Center will develop AR/VR technicians and software developers, and create 3D/VR/AR and holographic content. And create 3D/VR/AR technology proficient numbers of skilled workers who are already creating innovative content and enduring learning experiences.

Economic and Workforce Development

The Davis Global Center is projected to create over 300 jobs (Tripp Umbach, 2016); however, iEXCEL will also educate, train and contribute to a relatively nascent field that lacks sufficient numbers of skilled workers who can operate 3D/VR/AR technology and create 3D/VR/AR and holographic content.

Due to a global shortage of 3D/AR/VR technicians and software developers, the Davis Global Center will house an industry certificate program for training this emerging workforce in the arena of producing content modules for healthcare education as well as for a myriad of settings of clinical practice. Thus, in addition to serving as a hub that stimulates innovation in education, training and research, iEXCEL will be a catalyst for workforce development for Nebraska and nationwide.

Summary

In anticipation of the opening of the Davis Global Center, the prototype for iEXCEL is well underway. A team of iEXCEL staff currently serves many important roles, including supporting curriculum redesign, fostering the adoption of experiential learning, testing and trialing simulation technologies, training simulation and technology specialists, beginning the journey into visualization, engaging students with digital technologies, and contributing to the design and functionality of the Davis Global Center. Due to these initiatives, the UNMC/NM “early adopters” are already creating innovative content and enduring learning experiences.

About the Authors

Jeffrey P. Gold, M.D., is a nationally recognized leader and tireless advocate for transforming academic medicine and health care delivery. Based upon his medical and engineering background, he had a major dedication to advanced simulation and high technology blended education, now spanning several decades. A board-certified thoracic surgeon, Dr. Gold is the eighth chancellor of the University of Nebraska Medical Center and chairs the board of UNMC’s principal clinical care system partner, Nebraska Medicine. Dr. Gold is responsible for all aspects of UNMC campus administration, academic and clinical leadership. UNMC is known for prolific medical science research, cutting-edge education and a decade-plus building boom of state-of-the-art infrastructure, including the Fred & Pamela Buffett Cancer Center.

Pamela J. Boyers, Ph.D., is the Associate Vice Chancellor for Clinical Simulation for Interprofessional and Experiential Center for Enduring Learning (iEXCEL) at the University of Nebraska Medical Center (UNMC). With significant experience in designing and operating medical simulation centers, Dr. Boyers is well-published and speaks nationally and internationally about the need to address the quality and safety of care through transforming the education of health care professionals. To help improve the outcomes of care, Dr. Boyers believes in working closely with industry collaborators as well the U.S. military in order to learn from their experiences, thus ensuring best practices related to the application of simulation technologies to improve the outcomes of training and patient care.

Case Study II

Interdisciplinary Education: Advanced Clinical Simulation

An interdisciplinary team of Nebraska Medicine faculty and staff incorporated a nationally recognized course to help standardize the approach of all disciplines for the insertion of a central line catheter. The overall goal was to enhance the quality and safety for this procedure and reduce the central line-associated bloodstream infection (CLABSI) rate. Using ultrasound machines, central line simulation models and central line kits, learners were trained in a standardized approach for central line insertion. Using simulation technology, they practiced and were assessed on the proper use of ultrasound and maintenance of sterile process throughout the procedure. Through this course and other focused initiatives, UNMC has experienced a dramatic reduction in the hospital acquired CLABSI rate.

“Far better is it to dare mighty things, to win glorious triumphs, even though checked by failure, than to rank with those poor spirits who neither enjoy much nor suffer much, because they live in that grey twilight that knows neither victory nor defeat.”

– Theodore Roosevelt

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2. Tripp Umbach Report on iEXCEL at the University of Nebraska Medical Center; 2016

Acknowledgement: Christopher J. Kratochvil, M.D., Associate Vice Chancellor for Clinical Research, University of Nebraska Medical Center.
Medical education and surgical residency programs are currently going through major changes. Reduced working hours, financial restrictions within the Canadian healthcare system and increasing patient knowledge are just a few of the many challenges influencing the way in which we educate our residents, as well as work and interact with them. Against this backdrop and given the current transition from an apprenticeship model to a competency-based model, program directors are called upon to rethink and redesign training curricula for today’s medical learners. As an associate professor of surgery at Western University in London, ON, Canada, and an orthopaedic surgeon at the Roth | McFarlane Hand and Upper Limb Centre, I was asked by our Program Director and Division Chair to design a simulation training curriculum for our orthopaedics residency program at Western University. This mandate involved creating a new curriculum that reflects the recent recommendations by the Royal College to incorporate competency-based training tools (including simulation) into the educational process, in keeping with the needs of our orthopaedics residents and our program. In this article, I will be focusing on my experience in developing the new simulation curriculum and exploring new opportunities with innovative simulation tools such as the Sim-Ortho™ VR training simulator developed by OSSimTech, a simulation company based in Montréal, QC, Canada.

Competency-based Curriculum & the Royal College

Generally speaking, the competency-based model of medical education focuses on the development of abilities as its core principle, while playing down the importance of time-based training and fostering a learner-focused approach. In other words, medical trainees are evaluated based on their objective acquisition of a set of key skills rather than on the amount of time spent in a given area. While competency-based education has been long used in different domains, it remains fairly new in graduate medical education in Canada.1,2

However, Canada is now following in the footsteps of other countries by making the transition to the new approach. For instance, in July 2009, the orthopaedic surgery program at the University of Toronto implemented an innovative competency-based curriculum to be delivered in parallel with standard orthopaedic training. The first cohort successfully graduated in 2013.

In addition, the Royal College of Physicians and Surgeons of Canada began implementing its competency-based curriculum as part of the new curricula. Dr. Marie-Ève LeBel describes changes in the Canadian surgical residency programs in her field of orthopaedics.
based curriculum, or “Competence by Design (CBD)” starting July 1, 2017. Anesthesiology and Otolaryngology will start their training under the new CBD approach. Moreover, the Accredited Council for Graduate Medical Education (ACGME) in the US already made the transition over the last ten years, setting outcome-based milestones for all residency programs by way of preparing future physicians for high-quality medical practice. It is expected that by 2022, all residency programs across Canada will have transitioned to the new competency-based curriculum. Next year, a specialty committee will begin to work in collaboration with the Royal College to prepare orthopaedic surgery for CBD. It will be formally introduced by 2020.

With the transition now underway, the Royal College has not yet provided the specifics of the new CBD model. Several questions remain regarding the details of the shift to this new approach here in Canada and the main resources – both human and technical – that will be required to 1) implement the CBD curriculum and to 2) thoroughly assess and evaluate our trainees. The Royal College has yet to issue specific information regarding design and implementation guidelines, procedural goals, assessment methods and curriculum evaluation. At the moment, training programs are required to determine and develop their own teaching tools and assessment methods when incorporating the new model. To assist in addressing this concern, simulation is proving to be an effective method to objectively train and assess the required interpersonal skills and technical abilities of our learners.

### Integration of Simulation

Earlier in my career, I completed a Master of Health Professions Education at the University of Illinois in Chicago, and during my graduate studies, my main research focus was in surgical simulation. At present, I am responsible for developing simulators and related equipment and for conducting education research. As a result, I was asked to design a procedural surgical simulation curriculum in orthopaedics at Western University. To carry out this mandate, I was required to review the medical education literature on the topic and was called upon to evaluate the different types of simulations available to train our residents. I went on to design the Western University orthopaedic simulation curriculum in keeping with Kern’s conceptual framework of curriculum development. This framework provides a six-step approach to creating a complete curriculum which are as follows: problem identification, needs assessment, goals and objectives, educational strategies, implementation, and program evaluation and feedback. Initially, the needs assessment was conducted through a survey administered to all our residents, the Program Director, all Clinical Teaching Unit (CTU) heads and the Division Chair. The goals of the curriculum were described and each objective was designed to be measurable and tailored to be specific to each CTU and reflect the needs of medical trainees and Program Director. The instructional methods were also tailored according to the objectives and each CTU. The final curriculum was reviewed and approved by the Program Director, CTU heads and Division Chief. The implementation of the curriculum is currently pending.

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**The Heart of Auscultation**
While the methodology used to develop a simulation curriculum may appear fairly straightforward at first glance, there are in fact a whole set of challenges to be addressed and overcome as part of the process. One such challenge is funding. While we can certainly expect a return on investment in the future, the advanced funding of equipment for surgical simulation remains a problem. Unfortunately, the cost of competency-based training is much greater than the cost of standard training. Moreover, the faculty time commitment to teach and assess performance when using simulation is also increased.\(^5\) We also observe additional barriers in terms of availability of human resources, technical support, space, access to laboratories and potential resistance from faculty. Nousiainen et al.\(^5\) documented and published their own experience in integrating simulation into their competency-based curriculum for orthopaedic residents at the University of Toronto. Their conclusion is positive as they report that “although the financial cost and time demands on faculty in running the simulation program in the new competency-based curriculum at the University of Toronto have been substantial, augmented learner and trainer satisfaction has been accompanied by direct evidence of improved and more efficient learning outcomes.”\(^5\)

To implement our simulation program at Western University, a variety of simulation equipment is required. This includes everything from low-fidelity equipment (PVC pipes with foam, training boxes, sawbones, etc.) to high-fidelity and virtual reality (VR) simulators, and cadavers. However, one of the biggest challenges is how to integrate these simulation tools into the training curriculum in a way that permits the objective assessment of trainee progress and technical skills. For this reason, we believe a wide range of low to high fidelity/virtual reality simulations can be pivotal to surgical training in providing evaluation opportunities.

The Sim-Ortho Experience

Among all the different surgical specialties, orthopaedics is not as widely advanced in terms of recourse to simulations when compared to other surgical disciplines, such as general surgery. In fact, orthopaedics has been trailing behind in developing a range of innovative training solutions, relying for the most part on Sawbones™, low-fidelity equipment and cadavers. This, however, may be associated with factors specific to the field, including the large number of orthopaedic subspecialties (each joint is a subspecialty) and types of procedures offered within a subspecialty (arthroscopic vs open, anterior vs posterior, standard vs minimally-invasive, to name a few). In response to such a need, a few companies have developed high-fidelity VR simulators, mostly targeted towards arthroscopy. While these simulators do provide great training opportunities, they only address a small portion of the various subspecialties in orthopaedics. Orthopaedic trauma, arthroplasty (upper and lower limbs), spine surgery and paediatric orthopaedics are vast domains that can certainly benefit from increased opportunities for surgical simulations other than using Sawbones.

Another field where a lot of research and development is required focuses on patient-specific simulations. The surgeons, trainees, and ultimately the patients, will benefit from pre-procedural simulations (based on patient-specific images or 3D-printed models) in order to be appropriately ready for challenging procedures or unusual situations to avoid and prevent intra-operative and post-operative complications.

We have recently started working with OSSimTech, a simulation company based in Montréal, QC, Canada, that developed the first VR simulator to allow teaching and practicing open procedures in orthopaedics, the Sim-Ortho™.\(^6\) The simulator is haptic-based and offers the major pillars of high-fidelity simulation in virtual reality; audio, visual and tactile feedback. The Sim-Ortho simulator assists orthopaedic residents in learning how to perform total knee arthroplasties and spinal surgery. The company is also developing modules for trauma surgery and the fundamentals of orthopaedic surgery based on the ABOS curriculum.\(^7\) The technology platform of OSSimTech was developed to provide practical training that mimics the real
open surgical environment. OSSimTech simulators combine in one device the visual display of surgical sites in open surgeries and the use of haptic force feedback actuators that can be mounted on instruments for open surgery (screwdrivers, drills, saws, etc.).

We feel strongly about OSSimTech’s approach, in particular since it focuses on working directly with residency program stakeholders to identify training gaps and subsequently developing the proper and specific simulators to match their needs. The Sim-Ortho is designed to develop the residents’ psycho-motor skills as well as their general knowledge of procedures. Each module is developed to follow the trainees’ learning curve during their training. The difficulty level of each module increases throughout the curriculum as the resident’s abilities begin to increase and improve. The Sim-Ortho provides objective feedback on each task performed by the trainee. After each completed procedure, the user receives a feedback based on metrics developed on the feedback of expert surgeons. The metrics focus on outcome-based performance (optimizing the trainees’ performance for the patient’s benefits) and on avoiding errors (major blood loss, damaging tissue and joint/bony surfaces, etc.).

The ultimate objective of our partnership with OSSimTech is to have access to a turnkey solution that can easily be integrated into a competency-based curriculum (CanMeds and ACGME milestones) and provide objective feedback on trainee skills and knowledge in the major subspecialties of orthopaedics (hip, knee, spine, trauma). In addition, the possibility of designing and developing orthopaedic simulators for specific needs will allow researchers, like me, to study how trainees learn best certain procedures. Determining which type of simulations is best for which procedure at what training level is key to enhance and accelerate the training experience within a competency-based curriculum.

The Future of Medical Education
As training time in the operating room declines and residents get less exposure to a wide array of cases, surgical education requires the development of new tools that enhance the proficiency, skills and expertise of our physicians. Our trainees are subjected to the dual pressure of becoming the best possible surgeons in an environment where the resources allocated to attain this goal represent a challenge to overcome.

I strongly believe that simulation and innovation in medical education are ways to address the issue, which is why I urge the medical community to support such initiatives. While many challenges remain to be addressed in medical education and in terms of the new competency-based model, medical simulation will become a gold standard in surgical training. Surgical simulation will also provide our surgical and medical residents with top quality educational opportunities that will ultimately enable them to deliver better patient care for optimized outcomes and maximum patient safety.

About the Author
Marie-Ève LeBel, M.D., MHPE, Orthopedic Surgeon, FRCSc Fellow, is an Associate Professor in the Department of Surgery, Division of Orthopaedic Surgery at the Schulich School of Medicine & Dentistry at Western University since 2006. She completed a Masters in Health Professions Education at the University of Illinois at Chicago with a special interest in surgical simulation in 2014. Dr LeBel is involved in research and development activities at the Canadian Surgical Technologies and Advanced Robotics (CSTAR) lab and the Surgical Mechatronics and Bioengineering Laboratories of the Roth | McParlane Hand & Upper Limb Centre. She regularly interacts with the engineers in both of those labs. She also interacts with researchers at the Centre for Education, Research & Innovation (CERI) on the campus. Dr. LeBel is developing surgical tools and physical simulators for the teaching of arthroscopy and performance evaluation of the orthopaedic residents. A few projects focus on glenoid reaming during total shoulder arthroplasties. Most of her research projects specifically focus on developing objective performance measures for arthroscopic skills learning involving eye-tracking, force sensors, electromyographic input and motion tracking.

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MTM: Please tell us about the Florida Hospital program and the opportunities it provides for better patient safety.

Anurag Singh: Florida Hospital is leveraging a deep understanding of the value simulation training has provided for improved passenger and crew safety for the airline industry and military troop preparedness. They are developing and piloting programs that apply these concepts to the goal of improving patient safety. Florida Hospital's simulation team leadership possess a deep and extensive knowledge of how to plan and execute scalable and highly effective simulation training programs across multiple (or joint) military sectors. Historically, impactful training across joint branch military teams can be challenging – not unlike the challenges in inter-disciplinary training for medical teams. Through applying their rich joint military training expertise, they are defining specific programmatic goals and formulating standard operating procedures – then mapping them to simulation training content, scenarios, and defining training tempos that will yield specific results. Florida Hospital is prepared to be a driving force in improving patient safety through impactful simulation training programs – including programs implemented even before a new hospital is opened for business.

MTM: What do you see as the role technology will play in future education and training of healthcare professionals?

AS: Medical education does not stop upon graduation or upon passing a board certification examination. The challenges facing all disciplines in healthcare require every clinician to persistently improve knowledge, training, and skill sets. As technology continues to revolutionize how medicine is practiced, training technology will be persistently injected into ongoing professional development programs. Clinicians today and in the future, are going to be faced with increasing challenges to master new technology and treat patients across both time and distance. Training tools must be available in real time and at their fingertips. Training on demand and training in place are no longer “nice to have” items – they are critical requirements. Technology will play a critical role in providing the right training – at the right time.

MTM: What impact does simulation and other teaching tools have on the training of healthcare professionals?

AS: Simulation and virtual training tools currently have a huge impact on the training of healthcare professionals. Undergraduate and GME programs already have widely embraced simulation training as a core component of curriculum. In fact, it is very challenging for any medical training program to compete for students without a robust medical simulation training program. As the focus on patient safety continues to accelerate – there will be an increased priority on simulation training as a critical tool to measure and evaluate entrustable professional activities or EPAs. Hospitals will no longer be willing to accept residents and new medical graduates that cannot show EPA readiness on day one. Tracking ongoing competencies over the course of an entire career will be a critical component in improving patient safety. Simulation is a critical tool in providing impactful hands-on training programs – and more important – measuring performance over time.

MTM: You have an exciting new program that can positively affect training outcomes please tell us about the program.

AS: Training has the most impact when it is tailored to the learner, can be reinforced, and delivered in incremental segments. Adult learning has a different dynamic from learning in traditional academic settings. For active clinicians, EMS understands that training must be easy to use and fit within already crowded schedules. A lot of our recent technical innovation has focused on where and how learning can migrate to the palm of the hand. One of our new innovations targets collaborative caring for a patient over time. Communication lapses across individual caregivers and patient care teams that operate in silos are a primary cause of ineffective patient treatment. Traditional medical training has long focused on treating the patient during a specific incident, versus developing and delivering an integrated patient care plan over time. Our newest technology solution is geared toward providing team-based training programs to focus on the whole patient over time.
on inter-professional education, or IPE. It is a collaborative web-based platform, delivered through any mobile device or tablet. The scenarios provide practice for a variety of different disciplines to develop and deliver integrated care plans over time and span multiple medical encounters. Participants can train together (synchronously) or as their schedule permits (asynchronously). The web-based platform supports live chat and video tele-conferencing for real time collaboration. A learner with only a five-minute window for training, can still participate and find value in their sessions. We feel this type of Inter Professional Education (IPE) training tool provides an interactive and robust learning environment that literally fits in the palm of the hand. If training opportunities are convenient, they are more likely to be frequently used. The more critical IPE concepts are reinforced through repetitive practice and they result in better training outcomes.

**MTM:** Please talk about the culture of ‘openness’ and the sharing of ‘data’ and ‘best practice’ and reporting requirements that would foster a ‘culture of safety’?

**AS:** One of the new buzzwords in medical training lately revolves around inter professional education. What does this really mean? How does it differ from TeamSTEPPS? How can this be applied to active practice? One of the technology tools intended to foster “openness”, “data sharing” and “best practice” for patient safety was supposed to be accomplished through the adoption of electronic medical records. What has this really yielded? Is there more data sharing or less? Talk to a doctor in active practice today and you will find out that what has actually happened is more time spent in following documentation protocols in the EMR that do not provide more actionable intelligence for their fellow practitioners. What is missing is the good, old fashioned – pick up the telephone – and collaborate culture that used to exist. Focusing on how and when to communicate, whether it is face to face, via telephone or electronically is key to providing a true interdisciplinary and strategic approach to developing individualized patient care plans that not only treat the immediate issue for the patient today – but take into consideration the entire continuum of patient care. Technology that promotes these concepts – not inhibits them – will be how we truly measure competency tracking and patient safety improvement over time.

**MTM:** In your opinion, how does the healthcare sector and industry ensure that new protocols, procedures and training are delivered more uniformly?

**AS:** Training programs need to be based on patient safety goals and an understanding of where and how patient safety gaps occur. For example, what are the “hot zones” in a hospital? If you consider patient workflows as an arterial system – where are there clogged arteries? It is not only a question of individual competency – it is a question of workflow management and team communication. New training protocols need to take these “clogged artery” scenarios into consideration. Similar to how our national responders plan for disaster preparedness – do our medical systems and individual hospitals train proactively for patient ebbs and flows? These are the frequently seen, seldom trained scenarios.
Second – how do healthcare systems ensure that every patient at every location is treated according to the same standard operating procedures? Building integrated simulation training programs – managed centrally, and that include integrated assessments of curriculum, learner performance as well as instructor performance will ensure that patient quality of care is standardized based on a standardized training program. If the same training is not in place at each location, then you can be assured that the same standard operating procedure will also not be followed – resulting in gaps and inconsistent patient care. All of these factors result in patient safety risk. Consistently delivered quality training programs are critical to mitigating risk for healthcare systems.

MTM: How do you think industry and healthcare practitioners can work together more effectively to achieve better outcomes?

AS: Industry and healthcare practitioners need to partner actively together in order to jointly develop highly effective training and implementation tools. Industry cannot “evolve in a vacuum”. We must persistently partner with our customers to make sure technology is built to the needs of our customer community. Virtually every aspect of every product in the EMS portfolio is built in partnership with our customer partners. We are experts in technology and custom development. But it is our customers who are the experts in healthcare. Combining forces and working together closely can be a powerful way for improving patient safety, and driving real results.

MTM: Do you think industry can help to establish standards across the healthcare sector? If so, how?

AS: Industry can partner with each other to ensure that standards of information sharing are created and jointly embraced. Data in silos serves no long-term purpose and does not advance patient safety. The pathway the electronic medical record companies have established encourages me. They realized that data provides for improved outcomes. Technology has had an enormous value in patient outcomes. For example – the Da Vinci surgical device began as a tool for virtualized medical practice. Its widespread adoption as a standardized operating tool has dramatically improved the recovery time for a myriad of surgical procedures. With widespread adoption of simulation training – we will continue to see specific patient safety improvements – particularly related to cases that may be rarely encountered, but carry a high mortality rate. Persistent training on these scenarios will create a better prepared clinical workforce – and yield better patient outcomes.

MTM: What impact has technology had on patient outcomes and what impact do you see for the future?

AS: Better training yields better outcomes in virtually every industry. The industries that have embraced simulation – particularly aerospace – have proved the dramatic value simulation provides for improved outcomes. Technology has had an enormous value in patient outcomes. For example – the Da Vinci surgical device began as a tool for virtualized medical practice. Its widespread adoption as a standardized operating tool has dramatically improved the recovery time for a myriad of surgical procedures. With widespread adoption of simulation training – we will continue to see specific patient safety improvements – particularly related to cases that may be rarely encountered, but carry a high mortality rate. Persistent training on these scenarios will create a better prepared clinical workforce – and yield better patient outcomes.

MTM: In your opinion, how does industry work with healthcare organizations to ensure that the training provided ensures competency?

AS: While industry partners with associations to map competency requirements for training tools – there is room for much improvement. The next step really needs to be how are these competencies being measured – and WHERE are they being measured beyond the academic level? Historically – the focus has been on competency measurement at the GME or undergraduate level. Post graduate and through active practice – competency focus is on specific capabilities – one example is ongoing Advanced Life Saving (ALS) certification. Where the measurement of competency level is not only at the academic level but THROUGHOUT the career of a practitioner.

MTM: What measurements need to be taken to prove not only knowledge but skills have been mastered?

AS: One of the key challenges to creating combined knowledge and skills assessments is identifying and measuring “gaps” in learning. If you think of training as a wheel, it is composed of didactic, lecture based learning, virtual or online learning, and laboratory, or hands-on simulation based clinical skills learning. Individuals absorb concepts differently across different learning modalities. Where a learner may score quite highly on an assessment following presentation of concepts delivered in a didactic format, that same learner may perform quite poorly in a hands-on, skills based simulation focused on the same material. Likewise, an individual may perform quite highly in an individual skills encounter, but perform poorly when tasked with a similar scenario in a team based environment. The first element for identifying and filling these “gaps” is to understand that learning is absorbed differently by individuals. Only when core concepts are presented and reinforced across all learning modalities do you create the opportunity for true mastery of the core concepts.

Likewise, it is not only about measuring the knowledge, it is about measuring the ability to apply the concepts to decision making in the real-world environment. While we discuss medical training, this applies across all learning concepts.

The second element involves tracking both knowledge and skill sets over time in a systematic way. In today’s medical education, skills are tracked over the duration of a student’s undergraduate and graduate education. Why should this concept not continue across the lifespan of a career, tying together all of their education? All learning degrades over time and all learning concepts require systematic and regular reinforcement. Applying key data driven and analytic concepts to ongoing professional education makes sense. If metrics can support understanding the time required for a specific degradation of a skill set – imagine the power of ongoing education that gets in FRONT of the training gap – making sure the gap is never created.
Many people are suffering from what I call the tyranny of apathy. Widespread apathy is one of the major issues facing the healthcare industry today. The healthcare industry cannot afford to be apathetic. Those who work within this complex and challenging industry have committed to serving the ill. Therefore, these individuals must consider the safety of patients as a priority and a core value. They should partner with other progressive organizations and work together to develop a culture in which the brilliance of action, out of kindness, is at the forefront and center of care. If we can achieve this type of culture, by transforming this industry into one defined by mindfulness, energy, love, and action, we can avoid over 200,000 people in our hospitals each year dying from preventable causes.

And this is where you come in. The Patient Safety Movement Foundation’s objective lies in the elimination of preventable deaths in U.S. hospitals by 2020. This objective is achieved through individuals who are committed to patient care and decide to be leaders in patient safety. If we can make each department in every hospital’s goal to target zero – and plan for it – we will achieve zero preventable deaths in the nation, and possibly worldwide. We believe that individuals and organizations who set the objective to reach zero preventable deaths and establish plans that include defined end dates, it will manifest a collective urgency for others to step up, advance patient safety goals, and break away from the fear of failure and apathetic attitudes that are plaguing our industry. We must advocate for a healthcare industry that understands patient safety to be a moral imperative.

If you work at a hospital, commit your department and your hospital to achieve zero preventable deaths. Look at the Actionable Patient Safety Solutions (“APSS”) we have defined and find out if you have them rolled out fully. If not, create a plan to bridge the gap.

If you work at a medical technology company, find out if your company has committed to promoting patient safety by signing the Patient Safety Movement’s public pledge to share data. If not, encourage your CEO to sign the pledge. You can get the pledge letter on our website at patientsafetymovement.org/commitments.

If you work at neither a hospital nor a medical technology company, you can still have an impact on the patient safety movement. I encourage you to take a look at our seven strategic goals and determine which one best suits you to help with.

- Unify the healthcare ecosystem (hospitals, healthcare technology companies, government, patient advocates, clinicians, engineers, etc.);
- Identify the challenges that are killing patients to create actionable solutions (Actionable Patient Safety Solution);
- Ask hospitals to implement Actionable Patient Safety Solutions (APSS);
- Promote transparency and aligned incentives;
- Ask healthcare technology companies to share the data their devices generate in order to create a Patient Data Super Highway to help identify at-risk patients;
- Promote patient dignity and love;
- Empower providers, patients and families through education of medical terminology and medical errors so they may better advocate for their loved ones.

Please do something. Take action out of kindness and rid the tyranny of apathy!
Before Jump Trading Simulation & Education Center opened its doors in 2013, as part of OSF Innovation and collaboration with the University of Illinois College of Medicine Peoria, its leader John Vozenilek, MD, Vice President and Chief Medical Officer for Simulation had a vision for advancing simulation beyond education. It was his belief that simulation could be used to not only raise the standard of care within OSF HealthCare and address critical programmatic and clinical needs; it could be expanded to observe, ideate, design, engineer and test new technologies and other solutions to ensure better care for all.

With this idea in mind, Vozenilek hired a small full-time staff of engineers. He brought in engineering interns from the University of Illinois, Bradley University, and a full-time engineer from Northwestern University to integrate the medical environment and work with clinicians to identify training gaps and research types of device prototypes needed to fill those gaps. He believed, while there were many opportunities to build medical devices that serve patient needs, there was also a need to innovate the way simulation education was made available to professionals who required realistic and practical training.

One of the first task trainers engineers successfully developed at Jump is called the “Winston” Cricothyrotomy trainer. Emergency surgical airway procedures are conventional but occur in high risk situations and at low frequency. In emergency situations where a patient’s breathing is obstructed, it is crucial for clinicians to be experienced and comfortable with this operation to prevent the occurrence of controllable complications. Vozenilek set the engineers on a path to build a very low cost, but highly realistic training device that was suitably complex to challenge even competent providers. Their design was wildly successful, partially due to the unprecedented access to 3-D printing, patient CT and MRI data for modeling, an anatomic lab for tissue comparison and immediate iteration following feedback from subject matter experts.

Many simulation task trainers have been created by other health care device companies to help learners better prepare for airway emergencies they may
encounter in the field. However, these devices typically cost thousands of dollars. Through the engineering internship program at Jump, a group of interns found that clinicians were in need of a cost-effective way to train on this procedure in a safe environment, allowing them to build confidence before they operate on real patients.

The group used its engineering and clinical collaboration skills, and the technologically advanced simulation resources available to them at Jump to develop the “Winston” Cricothyrotomy trainer. This uniquely designed device uses 3-D printing to demonstrate the proper cervical positioning of a patient and a porcine trachea to simulate the look and feel of a human trachea. The trainer realistically simulates a tracheotomy experience and helps learners determine the best methods to perform this operation using the proper technique to prevent tracheal ring fractures and other related issues. The Winston trainer better prepares clinicians to perform tracheotomies, lowering patients’ risk for complications.

Once the usefulness of the Winston trainer was determined, the interns presented their innovation at the annual International Meeting on Simulation in Healthcare (IMSH) in 2014. Faculty from Drexel University took notice of the innovative product at the conference and partnered with Jump Sim to further develop the device and spread its use to other facilities.

To advance the Winston trainer and set it apart from its competition, Drexel University added layers of subcutaneous tissue below the ‘skin’ of the model in hopes of increasing the difficulty and realism of the trainer. By conducting a research study with physicians who had knowledge of the actual procedure, Drexel confirmed the benefit of this addition. In their research study, the Drexel emergency department surveyed 20 emergency medicine faculty members operating on the Winston trainer. They found that 83% of the participants thought the trainer was “very realistic” in simulating surgical cricothyrotomy procedures. This adjustable layer of subcutaneous tissue acts as a layer of fat to simulate how a cricothyrotomy would feel if it was performed on a patient with a high body mass index (BMI). This addition of tissue to the trainer expands the learner’s ability to safely establish an emergency airway to a greater portion of the population by preparing them for the many different BMIs they could encounter.

In general, two of the main difficulties of developing medical trainers are making them as realistic as possible and adjustable for a range of patient types. When compared to other surgical airway trainers on the market, the Winston device particularly stands out. The realism of the porcine trachea along with the adjustability of the trainer to reproduce different types of patients gives it a leg up. In addition, the cricothyrotomy trainer Jump Sim engineers have developed can be assembled at a fraction of the cost.

The collaboration between two academic institutions to carry out improvements in training devices doesn’t happen every day. The fact that the device was easy and low-cost to produce, but highly suitable for training created a whole new access point for sharing ideas for improvements. In a way, the “crea-tive commons” approach to innovation tipped over the typical barriers to inter-institutional collaboration.

The idea for the Winston trainer among many others that could be used for medical education cemented the notion that pairing clinicians with engineers would result in innovative health care solutions. The experience gained from creating devices like the Winston trainer has turned the engineering internship at Jump into a premiere annual program attracting candidates from all over the country. The ability to build scale through collaboration tremendously advanced the potential impact.

Advancing the Engineering Internship at Jump

The full-time staff of Jump Sim engineers take on a number of projects to design, prototype and ultimately bring to market ideas for health care simulators and other devices. They initially go into the clinical environment to identify inefficient areas of training, conduct a market analysis of existing solutions and consult with subject matter experts to develop ideas for simulators.

As new cohorts of engineering interns cycle through Jump Sim during the summer, they have the opportunity to turn those ideas into functioning prototypes. Another team of interns is integrated into the clinical environment to observe and interview physicians, nurses, technologists and specialists throughout OSF to glean ideas for health care training solutions. This group is responsible for vetting their concepts, developing business cases in support of them and working with a “build team” to establish prototypes. More than 20 ideas for medical simulators and devices came from the 2016 group of engineering interns. Many of the proposed projects are further developed by full-time engineers.

The Engineering Internship Program at Jump gives students an opportunity to get extensive experience with product design. They are taught the importance of interviewing subject matter experts to identify key user requirements for a product and translate them into a functioning prototype. They utilize prototyping facilities and equipment to generate iterations for rapid review. Interns also receive insights into specific aspects of product and professional development from professionals with experience in this market.

The internship program along with the full-time engineering staff at Jump have made it possible to continually
develop solutions to improve health care training. For every project, Jump Sim documents the design, build, use and feedback so that it can easily become scalable and accessible to other simulation centers, including the international community.

With a broad inventory of different types of clinical simulation trainers, Jump Sim is working to develop a platform to move clinical education forward not just in Peoria, but across the world.

**Sharing Knowledge with the Masses**
In the spirit of that early collaborative work, the Jump engineering team will soon launch an open access, online community for medical simulation professionals focused on sharing detailed instructions for the creation of different types of clinical trainers. Currently, there is no online website dedicated to free sharing of “do it yourself” (DIY) instructions on how to produce and assemble different medical simulation trainers.

Jump Sim engineers are designing the website to build a community of potential collaborators who are interested in expanding the armamentarium of clinical education technologies. The aim is to maintain the high-quality and evidence-based analytical approach that Jump Sim applies to trainer development. With that, the open-access site will include detailed instructions and videos for 14 trainers developed by Jump Sim engineers. Those include the Winston, baby intraosseous infusion and catheter insertion trainers.

Simulation professionals across the country will be able to easily access detailed instructions and videos on how to build the trainers Jump Sim has developed. In turn, Jump Sim engineers are asking the simulation community to upload their own creations of training devices.

The expanding accessibility and nearly ubiquitous presence of 3-D printing has made it possible to share these concepts and disrupt traditional boundaries. Educators in austere environments can now download and print devices accompanied by instructions for use and with a high-performance standard training curriculum. For each posting, the Jump Sim online community of task trainers will include DIY instructions for construction, pictures to accompany each step of the assembly process, a video for visual aid and information on how to use the device.

Jump Sim engineers are producing the site to ensure authors submitting to the site retain their intellectual property through creative commons licensing; receive credit for their entries and prevent commercial production of these instructions. Engineers overseeing the DIY website will also test and post their findings on others’ creations. The overarching goal is that by sharing these trainers, the medical simulation community can come together to further the clinical education experience and improve the preparedness of doctors.

The open-access website is currently in the developmental phase. Jump Sim plans to launch it at the 2018 IMSH conference in Los Angeles.

**How You Can Help**
Jump Sim needs the help of the medical simulation community. The focus of the online community of DIY task trainers is to meet the needs and wants of every medical simulation professional. Jump Sim is requesting that readers of this publication go to the Medical Training Magazine website www.healthcarentrainingandeducation.com and fill out a short survey of features you would like from an online, open-access forum for medical simulation trainers.

The goal is to have instructions for the creation of 20 different simulators posted by the end of 2018. The site is an opportunity to bridge a major gap in medical simulation and with your help can greatly advance this work by making these innovative tools more accessible across the world.

**About Jump**
Jump Trading Simulation & Education Center is a collaboration between OSF HealthCare and the University of Illinois College of Medicine at Peoria. The center replicates a variety of patient care settings to ensure novice and seasoned clinicians can practice handling medical situations in a life-like environment. Boasting six floors and 168,000 square feet, the center is one of the largest of its kind and provides space for conferences, anatomic training, virtual reality and innovation. For more information, visit www.jumpsimulation.org.

**About the Author**
Brent Cross received his BS in Nuclear, Plasma and Radiological Engineering from the University of Illinois at Urbana/Champaign (UIUC) in 2013 with minors in Chemistry and Bioengineering. At UIUC, Brent was involved with multiple research groups studying novel imaging techniques and applications and served as the Director of Finance for TEDxUIUC. He then attended Brown University and completed an MS program in Biomedical Engineering. In conjunction with his MS program, Brent participated in a co-op experience with Sanofi-Genzyme Corporation’s Pre-clinical Bioimaging Research Group and a research apprenticeship at NASA Ames Research Center through the National Space Biomedical Research Institute. Brent came to Peoria after graduating from his MS program and began work as a Bioengineering Intern at Jump Trading Simulation and Education Center. His first project was to develop a trainer for minimally-invasive surgical simulation, incorporating realistic tactile feedback and anatomically accurate real-time imaging surrogates.
Pediatricians lead the charge in safety improvement through simulation & training at the 9th International Pediatric Simulation Symposia and Workshop in Boston, MA. Andy Smith reports.

The international pediatric simulation community convened in early June in Boston, an inspired choice given what was to come in outstanding keynotes from two CRICO leaders Drs Chris Chabris and Luke Sato. These two lead presentations, one on each day of the event, galvanized the attendees while the remainder of an excellent conference program emphasized how far ahead of the rest of the healthcare profession pediatrics is.

The program was deserving of a far larger audience but organizers were happy to hit capacity at more than 400 delegates from 25 countries plus exhibitors. Unlike most healthcare conferences the audience stayed together for much of the event, excepting breakouts. With the main conference rooms and exhibit space on the same floor and the remainder only one floor away, finding and accessing the appropriate content, not to mention the exhibit hall which hosted all breaks, was straightforward.

This is perhaps not too surprising given the fragility of their small charges and the speed of action required, the distress caused to all involved on the loss of a young child and the cost of a bad outcome if error is involved. However, the community deserves recognition and support for its collaborative effort in moving the safety needle.

Space precludes coverage of all content but the Keynotes demand coverage as they are of value to all. Keynote 1 was presented by Chris Chabris SVP and CMO CRICO and Harvard Med. Dr. Chabris is a cognitive psychologist and cognitive neuroscientist and author of The Invisible Gorilla. Amongst many key comments was discussion of ‘post completion failure’ a phenomenon not limited to healthcare, similarly, ‘cognitive overload’, another point of Dr. Chabris’ presentation. He suggested two possible solutions to the latter problem, the first, division of labor through properly applied CRM operating procedures and the second, more experience which would offset lack of situational awareness, clearly a role for simulation training.

The second Keynote from Dr. Luke Sato, also an SVP and CMO at CRICO who has successfully used simulation based training to improve outcomes, lower malpractice suits and lower costs, and though not specifically stated, improved staff morale, the elusive quadruple aim in healthcare training.

As an insurer CRICO was aware of the main risk areas in medicine and also aware of the existing costs when the first simulation training program was rolled out in Anesthesia. To encourage participation CRICO offered small discounts to insurance premiums and having proven results is now offering a 45% discount in Anesthesia. Further programs for OB and Surgery have been rolled out and a 25% discount is now available to those participating in the OB training program. The surgery program is newly deployed and results are awaited.

Whilst the Anesthesia program was simulation based, the key in OB proved to be team training, especially CRM and the clear communication between all team members that it supports. Communication error is a common root cause of error in all high complexity, potentially high stress situations and is heavily penalized by malpractice juries. This too is the area of focus for the surgery program.

The Q&A session at the end of the formal presentation was also illuminating. Asked what the rest of the insurance industry has done Dr. Sato commented that other companies may have realized that they can leverage their position but the Harvard CRICO system may still be unique.

Asked what was the tipping point that launched this ‘experiment,’ the existing costs were plain to see, so a possible chance to reduce them was taken, in other words it seemed sensible and likely to lead to some success. They are making the business case now, that one case can pay for the whole program.

For socialized medicine that does not have the Euro or Sterling driver it was suggested that those paying for care need to use the data available to them and act. As these systems largely employ their MD’s this should be far easier to accomplish. The conclusion was to look at starting on a small basis then build after showing the benefit.
Academic stakeholders, clinical partners, and faculty have a responsibility to protect the public as well as safeguard the profession of nursing by ensuring that nurses joining the profession are competent to practice. However, objectively evaluating students’ clinical competency presents challenges for a nurse educator or clinical instructor whether it is in a school’s simulation laboratory or in the clinical setting.

The literature is replete with articles and evidence-based findings that support the use of simulation and its effectiveness for clinical learning. Leaders in simulation such as Dr. Chris Tanner, Dr. Suzan Kardong-Edgren, Dr. Thomas Doyle, Dr. Pamela Jeffries and Dr. Sharon Decker have written numerous articles about the value of simulation as a learning tool to facilitate clinical skills and critical thinking. All agree however, that there are no psychometrically sound performance assessments to objectively measure a student’s performance in simulation.

Performance assessment in simulation is a valuable prerequisite for, but cannot replace, supervised practice and assessment in the clinical setting.

According to research published by Oermann, Yarbrough, Ard, Saewert and Charasika in 2009, 1,573 nursing programs surveyed found: 1) most nursing programs (98%) used a clinical evaluation form (CEF); 2) the predominant clinical evaluation method was observation of student performance (93%); 3) the same CEF was used in all courses but were modified to reflect unique aspects of each course (70%); and, 4) most clinical courses’ grading process was pass/fail (83%).

Regardless of setting, a performance assessment involves an additional variable of instructors, beyond the variables of students and items, which complicates the measurement process. Performance assessments offered by the simulation industry or espoused in the literature to measure a student’s clinical competency do not model all variables of the performance assessment and do not account for their effects on students’ scores. The construct validation of a performance assessment designed for objectively evaluating students’ clinical competency presents a number of problems and there has been little effort in this area to determine solutions.

At Objectivity Plus, our aim was to develop a performance assessment, Quantum, to examine possible sources of error that reduce the validity of test scores and adhere to measurement best practices (American Educational Research Association [AERA],

Bridging Data from the Simulation Laboratory to the Clinical Setting

Left
Close up of the Quantum performance assessment system in use during simulation.
Image credit: Objectivity Plus, LLC.

American Psychological Association [APA], and National Council on Measurement in Education [NCME], 2014). During test development, the logical analyses of test content and empirical confirmation of the variables were merged to defend the validity of test score interpretations (AERA, APA, & NCME, 2014). Iterative procedures were employed for validation and both classical test theory and Rasch analyses were combined to document the psychometric qualities of Quantum. Quantum is comprised of several standardized clinical scenarios for use in the simulation laboratory that each student must successfully complete in order to demonstrate competence in key areas.

In terms of objective performance measures and scoring, Quantum is a performance assessment breakthrough that can be adopted to measure and improve competency since the resulting student scores are objective because they have been freed of the differences due to variations in instructors and items. For example, in Quantum the difficulty of the task performed and characteristics of instructors (e.g., the severity of particular instructor, their consistency, the way they interpret the rating guidelines) are crucial in determining the pattern of scores allocated to students in a performance task, and these sources of variation are modelled in order to provide fair and objective student measures. Quantum provides definitive feedback on current student performance which is a crucial part of the debriefing process. Moreover, students receive customized remediation to maximize time spent on shortcomings and skip topics that the students have mastered.

Measuring student nurse performance in a simulation laboratory and linking that performance to the clinical setting is a challenging task for nurse educators. The purpose of this article was to provide academic stakeholders, clinical partners, and faculty with evidence that learning from the simulation laboratory is transferred to the clinical setting. Without this documentation, the notion that simulation assists students to acquire competencies and then transfer them...
to the clinical setting with high reliability is merely anecdotal (Rutherford-Hemming, 2012).

The theoretical perspective guiding this article was the transfer of learning in a situative approach (Greeno, Smith & Moore, 1993). Greeno and colleagues defined transfer as the extent to which participating in an activity in one situation influences one’s ability to participate in another activity in a different situation. For example, the design of innovative curricular materials and pedagogical approaches (e.g. simulation laboratory) is often aimed at helping students develop robust understandings that will generalize to decision-making and problem solving in other situations (e.g. clinical setting).

This article used a descriptive research design with random data. When developing psychometric models, using collected or real data were not possible, so it was necessary to use random data to ensure that all variables and data fields were occupied so that the mathematical structure chosen closely approximated reality. Random data sets were created by the authors based on instructors assessing students’ performances at two points in this study. Time 1 assesses response to a change in the human patient simulator’s (client’s) condition in the school’s simulation laboratory. Time 2 assesses ability to solve clinical problems by setting client care priorities in the clinical setting. The algorithms studied bridged the data between the simulation laboratory and clinical setting.

**Method**

Using Quantum’s proprietary measurement models, each instructor’s severity level was derived from Time 1 data. Next, each instructor’s severity level was linked to Time 2 data for the CEF in the data analyses. Quantum’s capability to provide complex statistical calculations to link instructor severity from the simulation laboratory to the clinical setting is a key component to deriving objective and reliable student measures from which valid inferences about the student’s performance can be drawn.

Quantum ensured data connectivity from the simulation setting to the clinical setting by selecting a subset of instructors because it was more practical, required fewer overall ratings to be made, and inter-rater reliability estimates for the subset of subjects may be used to generalize to the full sample in this partially crossed design.

Several types of algorithms exist that can be used for optimizing student measures. Two such algorithms were studied in this article - Partial Credit Model (PCM) and Rating Scale Model (RSM). The PCM algorithm investigates whether some raters were using the rating scale in a way that differs from the other raters (Wright & Masters, 1982). The RSM algorithm means that any rater can rate any student on any item using a common rating scale and each rating given that same weight of 1 (Linacre, 1990). Both statistical approaches were used and data analyses compared.

**Sample**

In this article, the researchers used Excel 2013 using a random function to generate random data sets for Time 1 and Time 2. This function has a uniform distribution, that is any value between the minimum and maximum values will have the same probability of being chosen.

Time 1 data depicts a partially crossed design of four instructors, eight students, and 110 evaluation criteria containing 3,520 data points. Time 1 random data depicts Quantum’s Medical Surgical clinical scenario. This data depicts an instructor directly observing a student’s performance in the simulation laboratory. For the purpose of measuring student performance and documenting clinical competence, the evaluation criteria on the Medical Surgical rating sheet was divided into five subdomains: Patient Safety, Communication, Assessment, Intervention, and Documentation.

Time 2 data depicts a subset of two of the four instructors, eight students, and five evaluation criteria resulting in 80 data points. Time 2 random data were generated based on Austin Community College’s nursing program’s CEF. This CEF is used to evaluate the clinical competency of a student nurse with a client in the clinical setting during mid-terms, final evaluations, and upon completion.
of a specified clinical rotation. The CEF lists specific criterion behaviors considered critical in meeting the course objectives by the student nurse. Five critical behaviors represented the evaluation criteria an instructor used when directly observing a student nurse with a client in the clinical setting.

**Results**

Each algorithm provided a distinctive approach to exploring a solution space, and each has parameters that were compared. There was strong evidence for using RSM because: 1) the CEF items share the same rating scale; 2) the RSM did not have a problem with the size of the datasets used for estimation; and 3) when comparing item difficulties and student abilities there was no meaningful differences between the RSM and PCM.

RSM was applied to measure each student’s ability in the clinical setting using instructors’ known severity level estimates derived from the simulation laboratory. Next, an instructor with a known severity level estimate was replaced with an instructor with an unknown severity level estimate. This resulted in a 0.27 logit or 14 point scaled score difference. Meaning, on a 0-100% scale, this is the difference between a student receiving a grade of 66% versus a 70%. Thus, instructors with known severity level estimates produced higher student outcomes in the clinical setting versus instructors with unknown severity levels estimates.

In addition, equivalence and internal consistency reliability estimates were calculated from the data generated by CEF. Inter-rater reliability and Cronbach’s Alpha reliability estimates were 0.99 and 0.68, respectively.

**Conclusion**

This area of study is very unique. Few researchers have considered investigating instructors’ severity level estimates and their impact on a student’s grade in a clinical course.

Students fall into two clusters - those who are observed in the simulation laboratory and in the clinical setting by instructors with known severity level estimates, and those who are observed in the same settings but by instructors with unknown severity level estimates. There is a positive effect on grades in the first cluster (with known instructor severity) but the grades in the second cluster (unknown instructor severity) suffered the most.

The students in the second cluster received a lower grade than their peers (66% cf. 70%) since the difficulty of the task performed on the CEF and characteristics of instructors were not modelled and their effects on students’ scores were not accounted for. As a result, the performance assessment setting for the second cluster improperly influenced the student outcomes, with possibly serious consequences.

This article provides evidence to academic stakeholders that when students are observed by instructors with known severity level estimates there is a tangible effect on graded performances. Academic stakeholders may consider policy change given the negative impact an instructor with unknown severity level can have on students’ grades. One recommended policy change is that all instructors involved in clinical evaluation participate in Quantum before the semester as part of professional development so that a severity level estimate can be calculated (M.A. Donius, personal communication, March 31, 2017).

By bridging instructor severity levels derived from Quantum in the simulation laboratory, RSM proves to be the better psychometric approach since it accounts for variation among instructors to produce fair and objective student grades in the clinical setting. Using this psychometric approach, evidence can be generated to answer the question, “How do we know that student’s performance in simulated environment carry over to the clinical setting?”

This level of evaluation was previously challenging and time consuming without a performance assessment test. If we are truly changing the way we teach to be learner centered, we have an ethical obligation to use a performance assessment that produces valid student learning outcome data through scientific evidence that accounts for rater bias and produces error-adjusted student scores.

In academic learning centers, Inter-Professional Education (IPE) demands all health care providers working together and requires collaboration between various facilitators across multiple disciplines. This year we are collaborating with academia and visionaries to improve patient safety given the gaps in inter-professional communication which account for a large percentage of medical errors.

**REFERENCES**


INACSL 2017

The International Nursing Association for Clinical Simulation and Learning is the global leader in transforming practice to improve patient safety through excellence in healthcare simulation.

Their annual conference was held June 21-24, 2017 in Washington, DC with approximately 800 attendees from around the world. This year’s theme was Simulation 2.0 Designing the Future.

Pre-conference workshops were held on June 20-21 with the full conference opening on the 22nd. The pre-workshops had two tours, one to George Washington School of Nursing as well as one to Montgomery College. Sessions on technology, debriefing, table top exercises, video recording, and research were all part of the pre-conference schedule.

Updates and editions to the INACSL standards; evaluation of performance; debriefing; assessment; Team STEPPS, Smartphones, Clinical Reasoning and Operations were all topics covered during the sessions.

The first keynote, Daniel J. Pesut, PhD, RN, PMHCNS-BC, FAAN Professor of Nursing and Director, Katharine J. Densford International Center for Nursing Leadership, talked about changing how we think, how we interact with others and how we look at information. He asked us to visualize the future and look at things not as a manager but as a leader, not just to institute change but to provide a vision and develop vision based scenarios that would stimulate strategic thinking. He recommended many books for participants to read that will change the way we gather and distribute information.

During his plenary session, he used a number of video presentations and books to stimulate attendees; to include Leaders Make the Future by Bob Hanson and the Adaptable Mind, a project by Mary Beth Heffernen that dealt with the ebola crisis in Africa. Pesut is a master teacher and best known for his ability to inspire and care for people as they develop creative ideas and design innovative practices.

Pamela Randolph, RN, MS, FRE PKR, the second plenary speaker talked about her experience as a Board Member and President of the Arizona State Board of Nursing and as Vice President of the Arizona Medical Board. For 16 years, she worked at the Arizona State Board of Nursing, as an Education Consultant then as Associate Director of Education and Evidence-Based Regulation. She was instrumental in developing and testing a nursing competency measurement using simulation. She discussed the pitfalls of measuring the wrong thing or believing you were getting a correct assessment of something when you were not. For example, in some of the programs she visited they thought they were conducting simulation but were doing skills testing. She said the Arizona board was skeptical and confused on what simulation would provide. However, when they needed high stakes testing for competency for nurses referred for more training, it forced the Board to look at simulation in a totally different way. She then developed a test for nursing competency. She said you have to have deliberate practice which has to be coached and practiced to achieve competency. They also developed a standardized definition of what simulation means and adopted it. She believes that regulatory boards and accrediting agencies will require simulation because simulation, when done correctly makes safer nurses.

The third plenary speaker was Susanna R. Cohen, DNP, CNM University of Utah who is the recipient of the INACSL Hayden Vanguard Lectureship, sponsored by CAE Healthcare. Recipients of this lectureship have contributed to the discipline and moved simulation forward in a meaningful way through research, program innovation, evaluation, or a similar scholarly product. Susanna is a Certified Nurse Midwife, and co-founder of PRONTO International. She talked about PRONTO training in Guatemala, India, Kenya and Mexico and had participants transport themselves via magic as in the Mary Pope Osborne’s Magic Treehouse series to each of the lands to talk about what was accomplished through the PRONTO training. The PRONTO training programs have reduced the risk of neonatal mortality by 40% in the countries where the program has been implemented.

MTM had the opportunity to talk with Teresa Gore, PhD, DNP, FNP-BC, NP-C, CHSE-A INACSL, outgoing president and Kristina Thomas-Dreifuerst, PhD, RN, CNE, ANEF INACSL, who became president at the conference end. When asked about her time as president and what she thought were the most important aspects of her presidency Teresa said the Board accomplishments, not just hers, included the affiliations with other organizations to include agreements with SSIH, Sim-Ghost,
ASPE, NLN and SESAM and the collaboration efforts with SSH and INACSL to develop, implement and revise the INACSL Standards for 2017.

The INACSL-CAE fellowship co-developed by INACSL and CAE Healthcare Academy offers global participants the opportunity to design, facilitate and debrief a Simulated Clinical Experience™ (SCE) using the INACSL Standards of Best Practice for use in all areas of healthcare simulation. She was also very proud of the fact they had trademarked the course. Under her leadership she helped members grow the Journal, Clinical Simulation in Nursing (CSN), a valuable resource for the growing body of evidence for simulation. CSN received an impact factor of 1.380 in July 2016 and manuscripts have increased by 45.5%. They now have a new editor and associate and assistant editors. Teresa and others revised and redesigned the website and the first research fellowship recipient graduated.

Personally, she felt she had grown as a leader and as a simulation instructor doing better facilitation and debriefing as well as better simulations from ideas she was exposed to through INACSL. She has an increased passion for simulation and has made lifelong friends through her presidency.

Kris said Teresa made it possible to have a seamless transition and said the organization is in a very good place. Kris wants to continue to pay attention to the individual experiences of the members. She will continue with the design of the new website and wants to make the CAE-INACSL Fellowship more accessible to international members to meet individual learning needs of participants. She would like to make members more aware of the focus on ROI and developing a strategic plan and identifying smart objectives in the organization of the Board for all work so it is traceable and interrelated through all committees. Kris’ focus on developing strong leaders within the organization and implementing a successful ascension plan gives committees and leaders the opportunity to plan and see entire picture to make the organization even more successful.
CAE Healthcare introduced CAE Juno, a new clinical skills manikin for nursing programs at the International Nursing Association for Clinical Simulation and Learning (INACSL) annual conference in June. As access to clinical practice hours with live patients continues to diminish, CAE Juno will deliver consistent and effective simulation-based training to prepare nursing students and interprofessional teams for today’s healthcare environments.

The U.S. National Council of State Boards of Nursing (NCSBN) released a multi-year study in 2014 on the effectiveness of simulation training in pre-licensure nursing programs. One of the study’s findings was that nursing students who spent up to 50 percent of clinical hours in high-quality simulation, using the INACSL Standards of Best Practice: Simulation and conducted by trained facilitators, were as well-prepared for professional practice as those whose experiences were drawn from traditional clinical practice. (Read more at https://www.ncsbn.org/685.htm.) CAE Juno is designed to help bridge that gap between classroom and hospital settings.

CAE Juno helps ensure nursing students master critical, fundamental clinical skills before they interact with real patients or participate in interprofessional team simulations, according to Dr. Robert Amyot, president of CAE Healthcare. The female simulator was designed with guidance from clinicians and healthcare educators to provide ease of set up, operation and maintenance within busy skills labs. She is fully wireless and tetherless, and can easily convert to a male manikin, which will save costs and space within simulation programs. With a new tablet-based software program and ten Simulated Clinical Experiences (SCEs) developed by the CAE Healthcare Academy, CAE Juno will include evidence-based learning content that instructors can immediately integrate into their nursing programs.

Simulation-based mastery learning (SBML) using Limbs & Things Endoscopy Training System is a good choice for novice learners preparing for the Fundamentals of Endoscopic Surgery (FES) exam, according to research conducted by a team led by Matthew Ritter, MD, FACS, associate professor and vice chair for Education at Uniformed Services University, and a Surgical Endoscopist. The team’s abstract, published in Surgical Endoscopy, shows residents can develop the technical skills required to pass the FES manual skills exam, saying that post-training performance is similar to a clinical experience of around 300 endoscopies. The study recommends the SBML curriculum for those looking for strategies to develop or remediate flexible endoscopy skills.

The Endoscopy Training System teaches the five essential skills needed to perform safe endoscopy – scope manipulation, tool targeting, retroflexion, loop management and mucosal inspection.

Starting in the 2017-2018 academic year, general surgery residents will be required to pass the manual FES exam. There is currently no standard training platform for the FES exam and failure rates have been estimated at up to 40%. So far, research shows 100% of residents who used the ETS System using Dr. Ritter’s curriculum passed the FES exam. Limbs & Things (in partnership with National Capital Region Simulation Consortium and the Uniformed Services University of the Health Sciences (USUHS), Walter Reed National Military Medical Center Department of Surgery and Kyoto Kagaku) posted a video on how the Endoscopy Training System platform works.
PATIENT SAFETY

Surgical Teams Need Emotional Intelligence, Adaptability to Prevent Adverse Events

Non-technical skills like emotional intelligence, mindfulness, adaptability and resourcefulness are critical traits surgeons and team leaders need to prevent adverse events. Workgroups at the National Surgical Patient Safety Summit (NSPSS) held in August, 2016. The goal of the event hosted by the American College of Surgeons and the American Academy of Orthopaedic Surgeons was to develop surgical care and education curricula standards, and to prioritize safety-research efforts.

The authors identified two main cognitive biases that often hinder error disclosure: 
- Fundamental Attribution Error (FAE), which is the tendency to overestimate one’s own role in a situation, and 
- Forecasting Error (FE), the tendency to overestimate impact and duration of negative consequences while underestimating the ability to recover from those circumstances.

The authors recommend implementing a professional approach will not only normalize error disclosures but will also help physicians and trainees practice among physicians and trainees.

Virtual reality (VR) can offer immersive and realistic technology to supplement traditional curricula, while also offering tremendous scalability at a lower cost than SPs.

Finally, the authors recommend implementing a professional standard for trainees, including a formal evaluation of the skills needed for error disclosure, and coping mechanisms. SPs have been proven to effectively mimic the psychosocial elements of error disclosure, including profound guilt, feelings of ineptitude, and fear of repercussions.

The authors say the primary change will need to be cultural at every level of medical practice, in order to successfully pivot away from the current stigma related to error disclosure.

“Administrators must make a shift from asking ‘who is at fault’ to asking ‘why’ and ‘how’ did a situation occur...” Vapiwala said. “This approach will not only normalize error disclosures but will also help us better understand why they happen so we can prevent more of them in the future.”

PATIENT SAFETY

Train Physicians to Admit Mistakes

A paper out of the Perelman School of Medicine at the University of Pennsylvania says better education and training that focuses on the psychological challenges that coincide with medical errors, and disclosure of those errors, is necessary to improve outcomes and reduce the number and severity of medical errors. In fact, a study by researchers at Johns Hopkins Medicine estimates that with more than 250,000 Americans dying each year from medical errors – it should rank as the third leading cause of death in the United States.

“We must transform the culture of error disclosure in the medical community from one that is often punitive to one that is restorative and supportive,” says Neha Vapiwala, MD, associate professor of Radiation Oncology and vice chair of Education at Perelman School of Medicine, who co-authored the paper with Jason Han, a fourth-year student at Perelman. “And to do that,” continues Vapiwala, “we must tend to the psychological challenges that medical professionals wrestle with when they face the possibility of disclosing an error.”

Initiatives such as the Disclosure, Apology, and Offer model have helped make moderate gains in creating a culture of transparency in health systems, but these efforts primarily focus on the legal and financial aspects of error disclosure and do not address other barriers, such as the fear, shame, and guilt that come with error disclosure.

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- Fundamental Attribution Error (FAE), which is the tendency to overestimate one’s own role in a situation, and 
- Forecasting Error (FE), the tendency to overestimate impact and duration of negative consequences while underestimating the ability to recover from those circumstances.

For example, if an error led to a patient injury, the physician might initially state his own role in that error rather than examine any systematic reasons for why that error occurred. Secondly, he or she may then also overestimate the long-term consequences or recovery time for that patient, leading to feelings of both self-blame and exaggerated doom, both of which damage the physician-patient relationship and may impede a care provider from reporting the error.

The authors offer several strategies to overcome these patterns of thought, using elements of social psychology to transform the current culture of error disclosure. Recommendations include incorporating standardized patients (SPs), actors who simulate patients, not only to practice difficult patient encounters, but also to help model interactions with family members, peers and administrators to teach various behavior and coping mechanisms. SPs have been proven to effectively mimic the psychosocial elements of error disclosure, including profound guilt, feelings of ineptitude, and fear of repercussions.

Virtual reality (VR) can offer immersive and realistic technology to supplement traditional curricula, while also offering tremendous scalability at a lower cost than SPs.

Finally, the authors recommend implementing a professional standard for trainees, including a formal evaluation of the skills needed for error disclosure, and coping with medical errors. This standard would further normalize error disclosure and make it a common practice among physicians and trainees.

The authors say the primary change will need to be cultural at every level of medical practice, in order to successfully pivot away from the current stigma related to error disclosure.

“Administrators must make a shift from asking ‘who is at fault’ to asking ‘why’ and ‘how’ did a situation occur, creating a culture that embraces error disclosure and seeks to solve the systematic factors that lead to an error in the first place,” Vapiwala said. “This approach will not only normalize error disclosures but will also help us better understand why they happen so we can prevent more of them in the future.”
WORLD NEWS & ANALYSIS

SIMULATION & TRAINING CENTER NEWS

Darnall Army Medical Center and Texas A&M Partner on Medical Ed Opportunities

Carl R. Darnall Army Medical Center (CRDAMC) and Texas A&M University Health Science Center partnered to make CRDAMC a clinical education and training site for second-, third- and fourth-year Texas A&M College of Medicine students.

Texas A&M’s medical education model gives students the opportunity to complete rotations with key affiliates across the state in a variety of clinical settings ranging from rural and community clinics to specialty hospitals and major, urban health systems. The partnership with CRDAMC will diversify the college’s clinical offerings, giving students access to unique patient populations and pathologies.

The collaboration will also support the hospital’s medical readiness mission by providing leadership opportunities for medical personnel. “Readiness is our number one priority,” says Colonel Mark Thompson, CRDAMC commander. “The education opportunities are mutually beneficial. Not only does teaching medical students challenge our physicians to stay at the top of their game, being in a military medical environment allows medical students the chance to sharpen their critical thinking and communication skills.”

ACADEMIC TRAINING DEVELOPMENTS

Students, Designers and Developers Solving Medical Ed Challenges

Elsevier, an information analytics company specializing in science and health, along with the Association for Medical Education in Europe (AMEE), are hosting a 48-hour Medical Education Hackathon on August 25, ahead of AMEE’s annual conference in Helsinki, Finland. The event will bring medical students from across the world together with designers and developers to build solutions to solve challenges in medical education.

This event provides us with an opportunity to explore how technology can support and further medical education instead of surpassing it,” says Jan Herzhoff, Managing Director, Education, Elsevier. “We want to empower medical students to think beyond the challenges they face in medical education to the solutions that can transform the way medical educators teach and the way they learn.”

The International Federation of Medical Students’ Associations will run a competition to select two medical students from the conference’s student taskforce to take part in the hackathon as AMEE sponsored representatives.

NEW PRODUCTS, PROCEDURES AND POLICIES

Osso VR gets $2 Million to Increase VR Surgical Training Technology Production

Osso VR, a virtual reality surgical training technology company, raised $2M in a Series Seed financing led by SignalFire, with participation from Anorak Ventures.

Osso VR’s training platform is designed for surgeons, sales teams and other trainees to address gaps in medical training that the company says leads to increased complication rates for patients as newer and more complex technologies and procedures come to market. The platform addresses this critical deficiency in how providers learn to use complex medical devices by providing realistic, haptic-enhanced, interactions in an immersive training environment. Osso VR is device agnostic, and is compatible with Oculus Rift/Touch and HTC Vive hardware.

Osso VR’s surgical training technology provides on-demand, educational experiences that are repeatable, and measurable – and other trainees, such as sales representatives, can experience surgeon level access to the same training content. Through Osso VR’s analytics dashboards, trainees and administrators can receive feedback regarding their run-throughs and guidance to help them reach proficiency.
MedaPhor Group now has official reseller partner status to sell Airway Simulation Limited’s ORSIM bronchoscopy simulator across the UK, Europe and North America. The deal between the two companies allows MedaPhor to exclusively sell the simulator through its direct sales team in the UK and hold preferred supplier status selling directly in the United States and Canada. The Company will also sell directly on a non-exclusive basis in France, Germany and the Benelux.

The portable ORSIM bronchoscopy simulator helps teach bronchoscopy to staff and students in training centres and hospitals. With a range of high-definition virtual anatomy and pathology, users can develop the skills, dexterity and knowledge required to operate a fully functional bronchoscope within a self-directed, patient-free and tutor-free learning environment.

CAE Healthcare and the Northern Alberta Institute of Technology (NAIT) entered a simulation research partnership to improve healthcare education and patient safety, including support for NAIT’s simulation research initiatives. The partnership gives NAIT students and industry partners access to some of the most advanced medical simulation technology available. CAE Healthcare also certified NAIT a CAE Healthcare Centre of Excellence.

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NAIT’s School of Health and Life Science’s multi-disciplinary simulation centre is equipped with equipment and technology that enhances teaching and learning capabilities. This technology allows students to practice realistic scenarios in a controlled environment and be better prepared to work with real patients.

Operative Experience, a developer of high-fidelity human patient simulators, launched RealMom™, a full-body childbirth simulator designed to revolutionize the way clinicians and practitioners develop proficiency in labor and delivery procedures.

Leapfrogging today’s hard-plastic birthing manikins, the company says, “RealMom is the most natural and realistic childbirth simulator ever created,” featuring lifelike soft tissue, accurate internal anatomy and an active birth canal with human-like dilation and effacement. RealMom gives learners a “true-to-life” delivery room experience and a full spectrum of clinical scenarios from normal fetal delivery to more complicated procedures such as breech, shoulder dystocia, nuchal cord, cord prolapse, and assisted delivery with forceps and vacuum devices.

RealMom can be operated wirelessly using an iOS or Android tablet device and provides precise control of dilation and delivery progression as well as heart rate and tones, contractions, pulses, blood pressure and SPO2 levels. OEI says it’s incredibly realistic and reliable, with no complicated set-up or programming required of instructors and subsequently no simulator downtime.

RealMom offers the first complete and fully-integrated solution for labor and delivery skills training, according to Mick Navin, President and CEO of Operative Experience, who says, “We offer the entire continuum of care, from vaginal delivery through an active birth canal to emergency skin-to-skin C-section, postpartum hemorrhage control enabling practice including uterine artery repair, compression sutures and the Bakri balloon, and c-hyst when hemorrhage cannot be contained.”
Modern health care increasingly demands that people working at all levels of the industry – from community physicians to hospital CEOs – possess strong business-management skills to go along with their medical know-how.

By and large, however, they don’t, and to remedy that shortcoming, a “Management 101” course should be embedded into the curriculum of every medical school, say two Johns Hopkins University professors in the article, “Making Management Skills a Core Component of Medical Education,” that was published by Academic Medicine.

Many medical professionals have received some management or leadership training, but it has tended to come through a widely varied and unsystematic approach that has had little impact on broader practices and behaviors, explains co-author Christopher Myers, an assistant professor at the Johns Hopkins Carey Business School.

Myers and co-author Peter Pronovost, MD; a professor and the director of the Armstrong Institute for Patient Safety and Quality at Johns Hopkins, note many U.S. universities have introduced joint MD/MBA programs, though enrollment in these programs has lagged expectations.

According to the Association of American Medical Colleges Medical School Graduation Questionnaire, only 0.7 percent of 2016 medical school graduates completed an MD/MBA program. More than 90 percent earned a standard MD degree, which the authors point to as an indication of the need to include management skills in the “core” medical curriculum.

Often, the writers say, physicians are promoted to management positions based on their clinical or research prowess, resulting in a “double loss”: the removal of a skilled doctor from a clinical role and the installation of a manager who may be unprepared to lead.

Healthcare Learning Innovations launched Sentinel City® 3.0 Population Health Simulation – an educational simulation designed by nurse educators for use in community, public health or other nursing courses. The simulation provides practice experience and simulated clinical hours for students, and can help ease the burden of managing clinical hours. Version 3.0 significantly adds to the core functionality and in-sim capabilities with increased interactive elements and course-based activities. Sentinel City 3.0 includes:

- 17 complete assignments with AACN Essentials mapping and grading rubrics
- Integrated Family Support and Home Assessments with Final Care Plan
- Faculty dashboard monitoring student progress and time spent in the simulation
- 13 characters with detailed biographical information for individual case studies
- Interactive Mayor providing information on the city’s 8 community health subsystems

Faculty members at the University of Louisville School of Medicine are developing a program at universities across the United States to train educators how to teach interprofessional palliative care to those who care for cancer patients.

Palliative care is care given to improve the quality of life of patients who have a serious or life-threatening disease, such as cancer. Given in a team approach, according to the National Cancer Institute, the goal of palliative care is to prevent or treat, as early as possible, the symptoms and side effects of the disease and its treatment, in addition to the related psychological, social, and spiritual problems.

It requires patient-centered care from physicians, nurses, social workers and others to meet the complex needs of cancer patients. However, many institutions instruct health professional students in palliative care within each discipline, known as silos, rather than as an interprofessional team.

Now, the UofL is building on its interprofessional program used in education for palliative care to develop a curriculum for other universities that’s being funded by a $1.4 million award from the National Cancer Institute (NCI). UofL’s Interdisciplinary Curriculum in Oncology Palliative Care Education (iCOPE) began in 2010 with support from a grant from the NCI. More than 1,500 students in social work, medicine, nursing and chaplaincy at UofL have completed the training, which remains a required curricular component.

Through webinars, on-line training modules, a workshop, and mentoring through video conferences and one-on-one contact, UofL faculty will instruct 160 health educators from 35–50 other institutions over 10 months in developing curricula to teach oncology palliative care and teamwork to students across health disciplines. The program will include four-months of work at the home institution and a 2 ½-day face-to-face workshop, followed by six months of mentoring. Recruitment for learners in the program is expected to begin in early fall.

Faculty trained in this program will be able to overcome the effects of training in silos – within each discipline – and reinforce their students’ interprofessional skills by helping them understand the strengths, capabilities, skills, roles and cultures of the other professionals and instruct them in communication and collaboration among the team members.

UofL’s experienced interdisciplinary faculty, under the leadership of Pfeifer and Head, will serve as the core instructional team, guided by a committee of national experts and internal advisors. The iCOPE curriculum will be available to the trainees for use or modification as one approach to developing their own programs.
The Association of Standardized Patient Educators (ASPE) published the ASPE Standards of Best Practice (SOBP) to ensure the growth, integrity and safe application of SP-based education practices for those working with human role players (standardized patients) who interact with learners in a wide range of experiential learning and assessment contexts.

A publication landmark for SP professions and educators, according to Valerie Fulmer President-Elect of ASPE and Director of the Standardized Patient Program at the University of Pittsburgh School of Medicine, the standards identify five domains: safe work environment; case development; SP training for role portrayal, feedback, and completion of assessment instruments; program management, and professional development. The domains are divided into principles, which are explained by key practices that offer practical guidelines for desired outcomes and safe simulation practices.

At a programmatic level, the standards give new SP programs a place to start and existing SP programs opportunities to grow, according to Fulmer. She says, professionally, they validate SP work by recognizing SP educators and SPs as major contributors to the simulation education field, and they provide guidance on constructing SP educator professional development programs. In daily practice, they provide support for the time that’s spent training SPs, the money spent on running SP programs, the efforts made to protect the psychological and physical safety of SPs. Significantly, they give permission to challenge activity requests that do not meet the standards.

ASPE is the international organization of simulation educators dedicated to:

- Promoting best practices in the application of SP methodology for education, assessment and research.
- Fostering the dissemination of research and scholarship in the field of SP methodology.
- Advancing the professional knowledge and skills of its members.
- Transforming professional performance through the power of human interaction.

Fulmer says, “We wanted to publish the SOBP in Advances in Simulation because it is an open access journal. No one needs a membership or a library affiliation to access them, so SP educators and SPs around the world can read them anytime, anywhere.”

The ASPE encourages educators to use them to support the work they do, and to share the standards’ link with their colleagues, chairs, deans, and SPs – and then report back to the ASPE with feedback on how you are using the standards, and how they affect your work.

3D Systems released its Simbionix SPINE Mentor, a hands-on simulator for neurosurgeons, anesthesiologists, orthopedic surgeons and pain management surgeons to train for and practice procedures for minimally invasive spine surgeries. The simulated experience provides a higher level of realism than cadaveric training; hones skills and instills more confidence prior to conducting surgery on real patients.

The SPINE Mentor simulator was designed to simulate a variety of spinal procedures such as lumbar puncture as well as the placement of catheters and wires. The system has a 3D-printed spine for accurate palpation, a computer/monitor, and a realistic puncture pad with different anatomical layers including the Ligamentum Flavum to practice needle penetration.

The realistic environment allows for tissue response, including the loss of resistance when entering the epidural space, and eliminates the need to practice with real fluoroscopy by simulating real-time fluoroscopic image displays for the entire spine. A virtual C-arm can be manipulated throughout the procedure, and dynamic haptics simulate anatomic obstacles for hands-on realism.

NEW PRODUCTS, PROCEDURES AND POLICIES

3D Systems Releases Simbionix SPINE Mentor Simulator for Spine Surgeries

The Association of Standardized Patient Educators Publishes Standards of Best Practice

The Association of Standardized Patient Educators (ASPE) published the ASPE Standards of Best Practice (SOBP) to ensure the growth, integrity and safe application of SP-based education practices for those working with human role players (standardized patients) who interact with learners in a wide range of experiential learning and assessment contexts.

A publication landmark for SP professions and educators, according to Valerie Fulmer President-Elect of ASPE and Director of the Standardized Patient Program at the University of Pittsburgh School of Medicine, the standards identify five domains: safe work environment; case development; SP training for role portrayal, feedback, and completion of assessment instruments; program management, and professional development. The domains are divided into principles, which are explained by key practices that offer practical guidelines for desired outcomes and safe simulation practices.

At a programmatic level, the standards give new SP programs a place to start and existing SP programs opportunities to grow, according to Fulmer. She says, professionally, they validate SP work by recognizing SP educators and SPs as major contributors to the simulation education field, and they provide guidance on constructing SP educator professional development programs. In daily practice, they provide support for the time that’s spent training SPs, the money spent on running SP programs, the efforts made to protect the psychological and physical safety of SPs. Significantly, they give permission to challenge activity requests that do not meet the standards.

ASPE is the international organization of simulation educators dedicated to:

- Promoting best practices in the application of SP methodology for education, assessment and research.
- Fostering the dissemination of research and scholarship in the field of SP methodology.
- Advancing the professional knowledge and skills of its members.
- Transforming professional performance through the power of human interaction.

Fulmer says, “We wanted to publish the SOBP in Advances in Simulation because it is an open access journal. No one needs a membership or a library affiliation to access them, so SP educators and SPs around the world can read them anytime, anywhere.”

The ASPE encourages educators to use them to support the work they do, and to share the standards’ link with their colleagues, chairs, deans, and SPs – and then report back to the ASPE with feedback on how you are using the standards, and how they affect your work.
The American Medical Association (AMA) and the Regenstrief Institute launched a new tool to help ensure medical students and trainees get real-world experience using electronic health records (EHR). Because most of today’s physicians graduate from medical school without comprehensive EHR training, the Indiana University School of Medicine (IU) and the Regenstrief Institute (an IU faculty-led support organization) created a training platform that uses real, de- and mis-identified patient data to let students virtually care for patients with multiple, complex health conditions.

With the Regenstrief EHR Clinical Learning Platform, students can navigate records, document encounters, and place orders in an application similar to the EHRs used in practice. It also provides an immersive way for educators to teach students how EHRs can be used to address important issues pertaining to population health, quality improvement, patient safety and social determinants of health. The platform offers tools for educators to create customized content specific to their curriculum goals and to evaluate students – and will be disseminated by the AMA and Regenstrief to medical schools across the country as part of the AMA’s Accelerating Change in Medical Education initiative.

By September 2017, Canada will have a new national simulation network. Two established networks, the Canadian Network for Simulation in Healthcare (CNSH) and SIM-one, have officially signed an integration agreement that will see the two networks unite to form a new, national-level network.

The agreement was signed by the Boards of Directors of both organizations. “We are combining the connections, passion, services, resources and events of these two networks to create a new, inclusive, impactful community for simulation in Canada,” said Timothy Willett, the network’s CEO. “We are coming together around a common vision: exceptional patient care and outcomes through simulation.”

The new network will emphasize inclusivity and community-building across Canada. Its mission will be to advocate and advance simulation for healthcare education, patient safety and quality improvement, by connecting all healthcare professions, providers, disciplines, and sectors.

The SIMnext and SimCore combined their products and technologies to create what they say is a revolutionary cloud-based platform for hospital performance improvement and simulation-based clinical education. SIMnext will be the exclusive distributor of this new platform that will host its Health Scholars, SIMnext Academy and serious gaming products. The new offering seamlessly links performance improvement, medical simulation and learning management for clinical education in one enterprise platform intended to increase patient safety and reduce the cost of care. It manages all activities for a medical simulation center such as scheduling, course design, management of learners, allocation of resources and execution of scenarios – and it serves as an advanced enterprise-level learning management system with special emphasis on nursing education and training. The platform provides data collection and analytical tools for clinical performance improvement such as clinical debriefs, analytics for identification of healthcare performance vulnerabilities, workflow management and patient safety organization (PSO) services.

Brian Gillett, SimCore’s CEO, says when used with the company’s courses, innovative vulnerability analytics and near miss detection, the platform lets institutions track the impact of simulation and training to maximize ROI (return on investment).
Medical Students Turn to Google, Medical Websites Before Textbooks

The next generation of physicians was raised with information at their fingertips, yet studying medicine in the age of Google Search comes with its own set of unique challenges. To uncover how the habits, preferences and tendencies of medical and pre-medical students were shaped by growing up in the digital era, the Merck Manuals surveyed 180 students at the American Medical Student Association (AMSA) Annual Convention.

The survey found 68 percent of students received their first cell phone by the time they were 14 years old. For many students, that’s before they enter high school, and online tools have become ingrained into their study habits. Nearly one in three (30 percent) said they go online or use a mobile device to search for medical information more than 20 times per day.

“We live in a high-speed world,” said David, a student at Hillsborough Community College in Florida. “In the time it takes me to walk through a library door, I could have already downloaded exactly what I needed on my phone.”

Students were also asked to rank their preferred sources of medical information. For their first choice, 47 percent picked Google and 32 percent chose a medical website – often those that appeared in the Google results. Only 7 percent turned to their textbook first. Yet students admit the internet can be a minefield when it comes to finding reliable information. Eighty-three percent said confirming the credibility of an online source is one of the primary obstacles they face while searching for medical information online. Other hurdles students say they encounter include pay walls (39 percent), the recent surge in fake news (32 percent), and an overabundance of ads (24 percent).

Nearly all students surveyed (99 percent) affirmed that growing up in the digital age has impacted their medical education. When asked how:

- 58 percent said they can more efficiently look up answers to questions;
- 19 percent said they can study anywhere, anytime;
- 13 percent believe they can more quickly adopt new technologies; and only
- 9 percent of students indicated technology is primarily a distraction.

Many students say they are actually using social media as a gateway to more visually compelling medical content. Forty-five percent of students said they have found YouTube a valuable resource for more visually compelling medical content.

PATIENT SAFETY

Standardized Assessment for UK Medical School Grads

A study done in the United Kingdom says the majority of final-year medical students in the UK are able to accurately prescribe medications, but a small proportion require further training or supervision before being able to prescribe independently. Prescribing Safety Assessment, an article published in British Journal of Clinical Pharmacology, describes a standardized assessment that ensures students who graduate from UK medical schools have achieved a minimum standard of knowledge and skill related to prescribing medications.

Prescription medicines are one of the most frequent interventions used by doctors to alleviate symptoms, treat illnesses and prevent future disease, the authors explain – and because newly-graduated doctors write a large proportion of prescriptions in hospitals, it is important to assess their competence at prescribing medications before graduation. But this is a complex skill to assess due to the large number of prescribing scenarios that might be tested, the variety of documentation used, and the challenge of marking large numbers of prescriptions in a standardized way.

Simon Maxwell, MD, PhD, of the University of Edinburgh and his colleagues from the British Pharmacological Society and the UK Medical Schools Council sought to tackle these issues by creating a national assessment that would identify graduates who need more training and supervision in prescribing, and in the future, might also highlight which training methods are most successful in developing competent practitioners.

Over a period of 5 years, the investigators developed the Prescribing Safety Assessment as a 2-hour, online competency assessment. With the development of an online delivery system and automated online marking of large numbers of prescriptions, the team was able to overcome the practical difficulties of assessing prescribing.

PATIENT SAFETY

Why Not Black Boxes in Surgery?

Richard Corder, at Wellesley Partners recently said “There are many industries that work in complex environments where the actions of one human can impact the life of another. Healthcare leaders need to acknowledge that we have much to learn from other industries. While we cannot mimic others entirely, the same general operating principles that are the foundation for other high reliability organizations (i.e. aviation, nuclear power) can work just as well to prevent harm from occurring in health systems.”

One example of a safe practice or technology across industries is the in-flight data recorder found on all commercial airliners. The in-flight data recorder on board the two Boeing 747s that crashed on the island of Tenerife in 1977 told about decisions and behaviors resulting in that game-changing airline disaster.

Now envision this: following a surgical procedure, regardless of the outcome, we have the opportunity to review every piece of data related to the procedure.”
NuVasive Unveils New Trauma Portfolio and VR Simulation

NuVasive launched its RELINE® Trauma portfolio, a trauma system that supports surgeons in the increasing transition from open to Maximum Access Surgery (MAS®) spine procedures.

The company says RELINE Trauma is the first system to give surgeons the flexibility to customize their approach intra-operatively, including traditional open, MAS or hybrid procedures, depending on the pathology and patient needs. It is integrated with the company’s Integrated Global Alignment® (iGA) platform and allows for controlled fracture correction throughout a procedure, with or without a rod present in the construct.

The system lets surgeons customize implant types and supports a multitude of techniques, depending on surgeon preference. It also enhances the surgeon’s ability to dial-in fracture correction through a dual rack system achieving independent lordosis restoration and parallel compression/distraction for ligamentotaxis. This enables procedures to be completed by one surgeon rather than two, helping reduce the total cost of the procedure.
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Find out how CAE Juno can redefine your expectations at caehealthcare.com/juno.