

Symposium 9

Best Practices for building up a simulation center:

Ashokka Balakrishnan: Singapore

Ichiro Kaneko: Japan

Teerapat Yingchochareon: Thailand



"Personalizing Medical Education for a Healthier World"



Thai = Mother (Tamil)



Hospitality



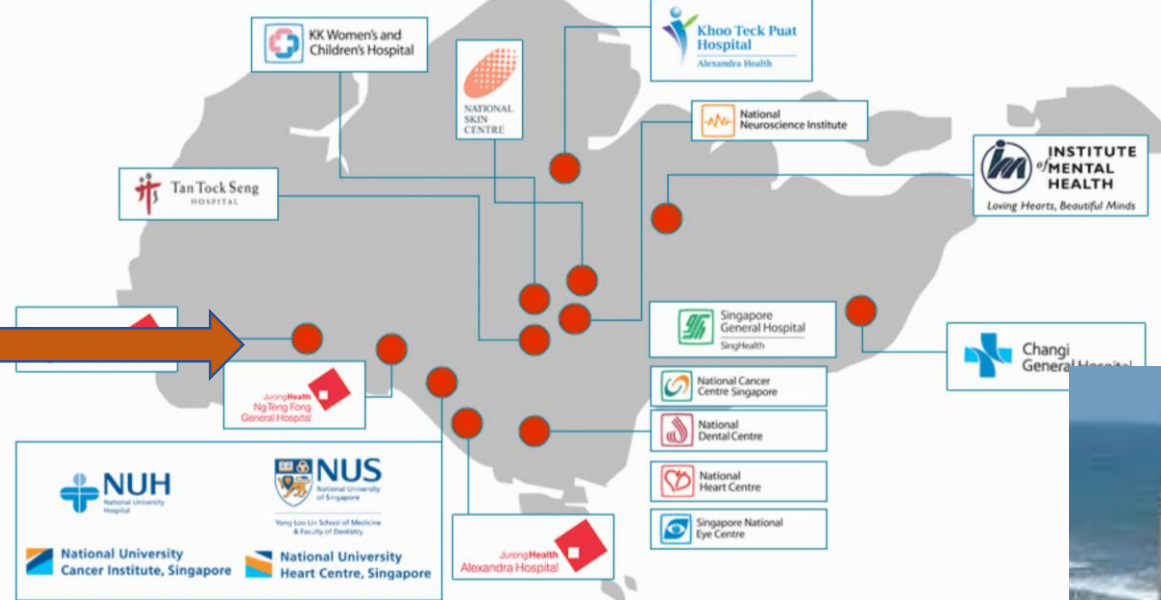
Overview of simulation-based education in Singapore context

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- Senior Consultant Anaesthesiologist, National University Hospital Singapore (NUHS)
- Simulation Program Director (Anaesthesia), NUH
- Clinical A/Prof , National University of Singapore (NUS)
- Associate, Centre For Medical Education (CenMED); NUS
- Course Director, MHPE-S Program, Academy Of Medicine, Singapore-Maastricht
- Vice-President, **Pan Asia Society of Simulation in Healthcare (PASSH)**





Matrimandir Auroville India



Simulation

Simulation = The artificial replication of sufficient components of a real-world situation to achieve certain goals (Gaba, 1997)

The 90sec evacuation drill that made the difference

'Miracle' escape for passengers after horrific runway crash at Tokyo airport

Five dead as hundreds evacuated from burning passenger jet after collision with coastguard plane at Haneda airport

● **Japan plane crash: a visual guide to the Tokyo airport collision**



Japan: plane engulfed in flames after colliding with coastguard aircraft - video



Dubai- Emirates Flight explosion.. Not one in the 300 on board passed away..

<https://edition.cnn.com/2016/08/04/middleeast/dubai-emirates-flight-video/index.html>



Systematic training
Absolute compliance
Transparency in reporting errors globally

Simulated crisis management training- annually certified - else grounded
Dubai Emirates simulation centre - 24 hours sessions

Redefining Simulation Based Education (SBE)

- **Simulation for milestones training (Eg. acute care)**

- Specific part task training
- Algorithms
- Full scale simulations

Skills



- **Simulation for practice readiness: cognitive deliberate practice**

- Virtual learning environments
- Game based learning



Drills



- **Simulation for collaborative practice & inter disciplinary training**

- Crisis Mgmt: OT, ED, ICU, Deliv Suite
- Team STEPPS course / Team training

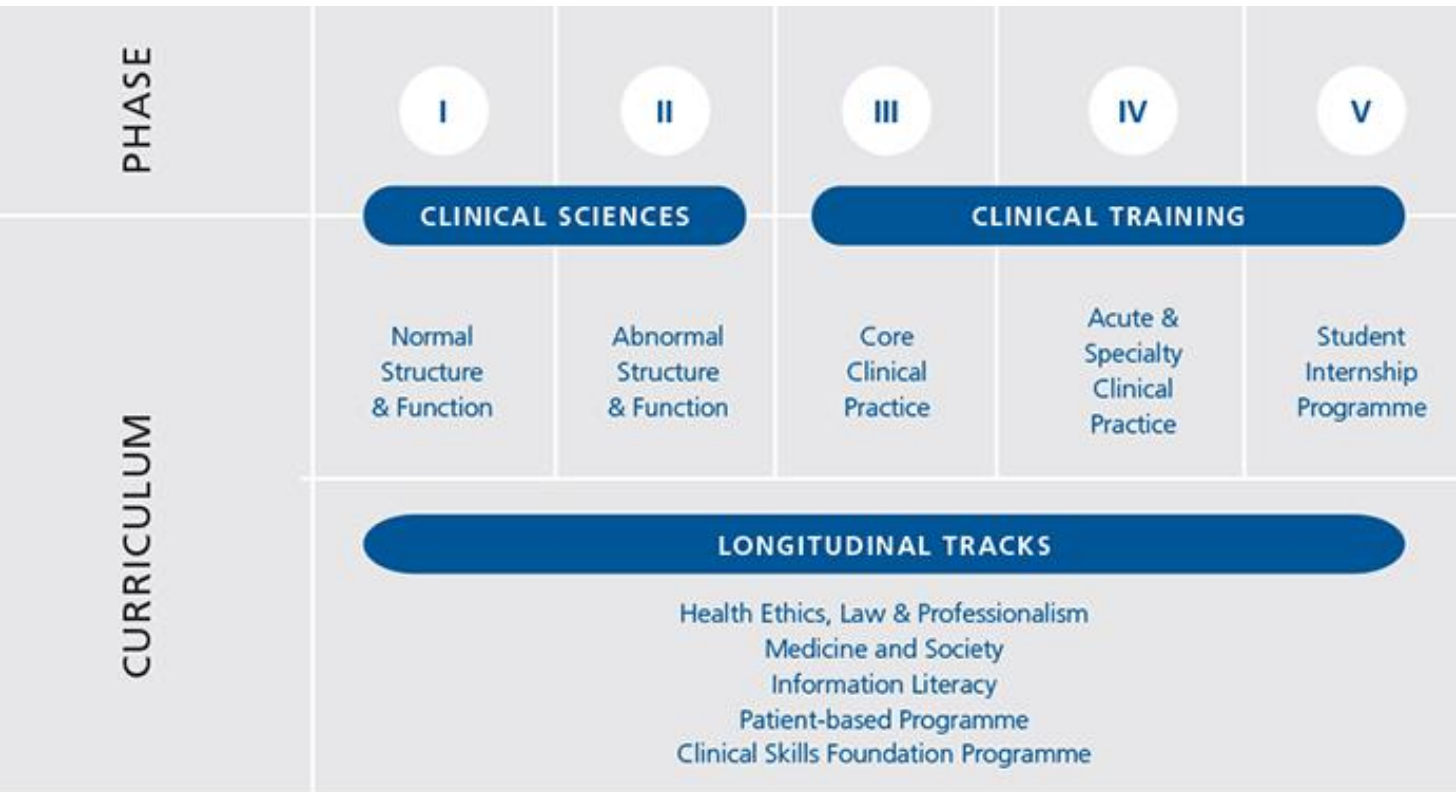
Kills





The Hogwarts of wizards

Medical education curricula- NUS



<https://medicine.nus.edu.sg/sites/vt/index.htm>

<http://www.nus.edu.sg/nusbulletin/yong-loo-lin-school-of-medicine/undergraduate-education/degree-requirements/bachelor-of-medicine-and-bachelor-of-surgery-m-b-b-s/>

DENTAL



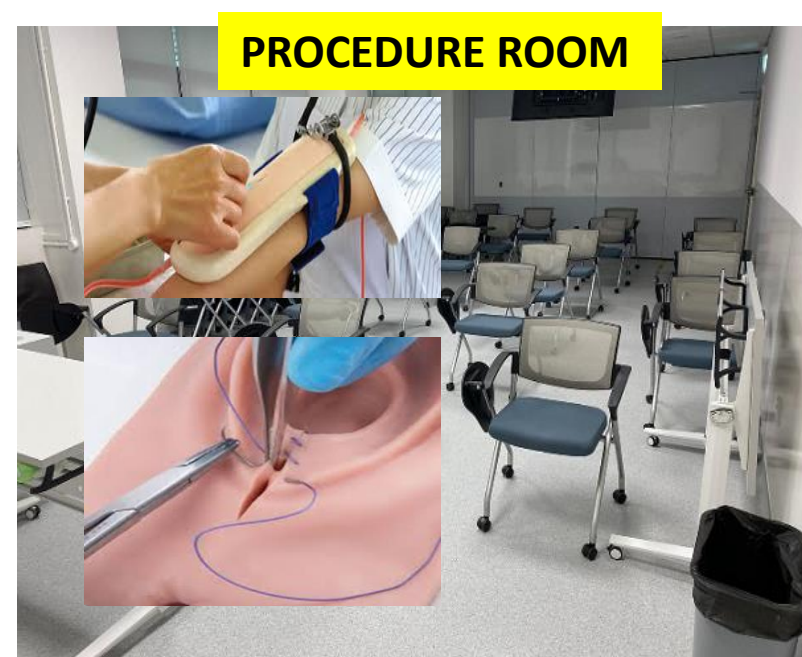
OT



ICU



PROCEDURE ROOM



EMERG ROOM



DELIV SUITE



PAEDS ACUTE CARE



UG Medicine Simulation based education

Phase I

1. Basic Cardiac Life Support (BCLS)
2. First Aid Course
3. Acute Cardiac & Respiratory Response
4. Harvey Cardio-Pulmonary Response
5. Ultrasound Simulation

Phase II

1. Clinical Skills Foundation Program

- >Physical Examination Skills using SPs
- >Comms with patients
- >Geriatric Assessment
- >Mental State Examination
- >Clinical Procedural Skills

2. Ultrasound Simulation

Phase III

1. BCLS Recertification & AED Certification
2. Family Medicine Motivational Interviewing, Comms Skills, Clinical Reasoning
3. Paediatric Simulation
4. Patient Safety Simulation
5. Ultrasound Simulation

Phase IV

1. O&G Simulation- Normal & Instrumental Delivery
2. Emergency Medicine Simulation
3. Anesthesia & Airway Simulation
4. TEE Simulation
5. Fundoscopy Simulation
6. Psychology Medicine Tutorial
7. Ultrasound Simulation

Phase V




Clinical Skills & Life Support

1. BCLS & AED Re-Certification
2. Advanced Cardiac Life Support Course
3. Basic & Advanced Clinical Procedural Simulation
4. Airway Management
5. Paediatric Simulation
6. Computer -based Simulation
7. TeamSTEPPS Patient Safety Simulation
8. Acute Clinical Crisis Simulation
9. Professionalism-in-Action

← INTEGRATIVE SIMULATION →



Models in sim centre functioning

Type of Sim centre model	Focus	Organisational Position	Management Support
Facility Management 	Supporting role & Management facility	Low	Moderate to High
Teaching & training Centre 	Faculty development	Reasonable	Moderate to High
Innovation centre 	Education, Training, Assessment, Medical rehearsal and Simulation-related research	High Level	High Level



J Emerg Trauma Shock. 2019 Oct-Dec; 12(4): 232–242.

PMCID: PMC68

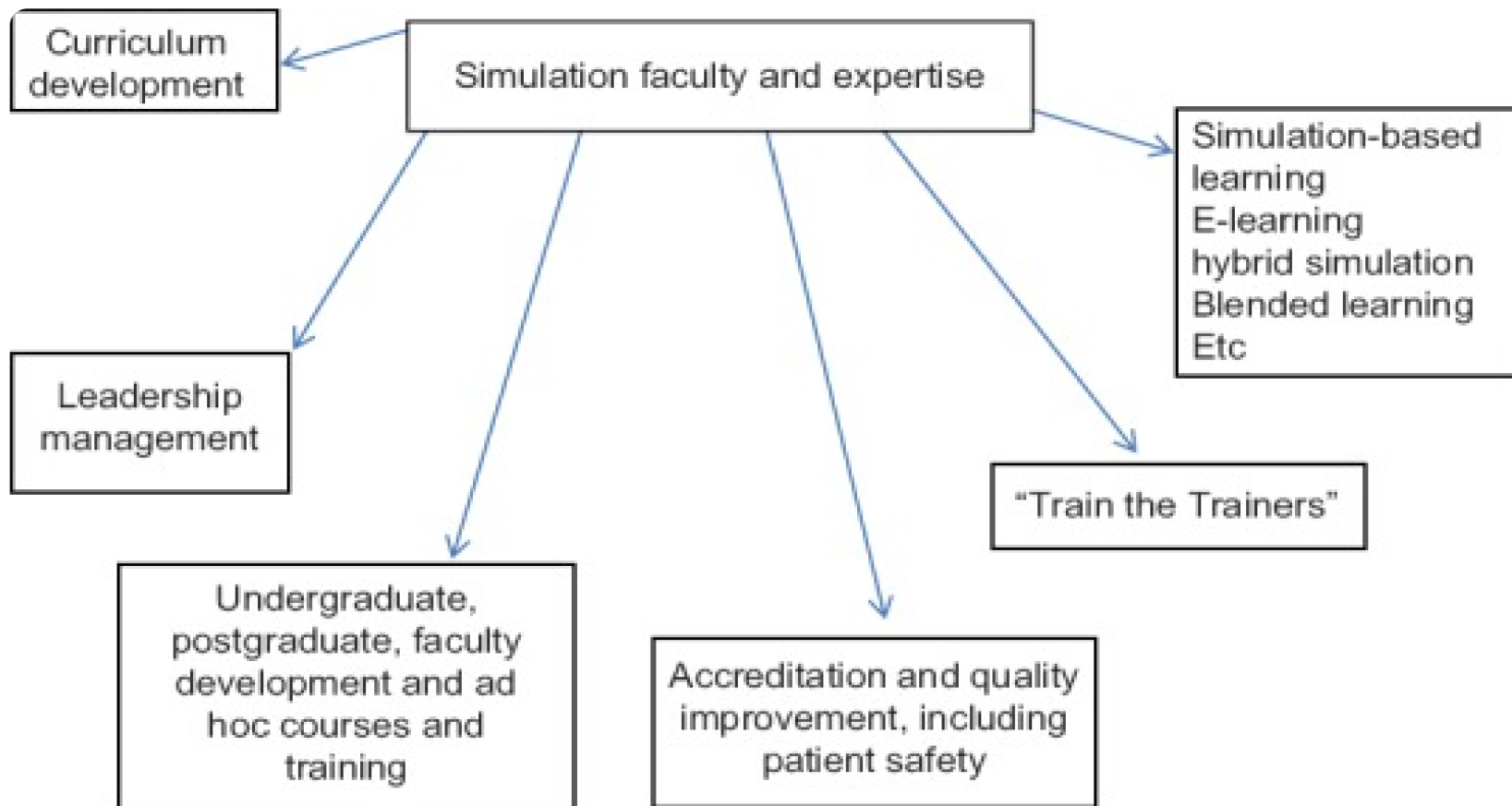
Published online 2019 Nov 18. doi: 10.4103/JETS.JETS_102_19:

PMID: [317](#)

10.4103/JETS.JETS_102_19

The 2019 WACEM Expert Document on the Framework for Setting up a Simulation Centre

[Fatimah Lateef](#),^{1,2,3,4} [Shanqing Yin](#),⁵ and [Madhavi Suppiah](#)⁶

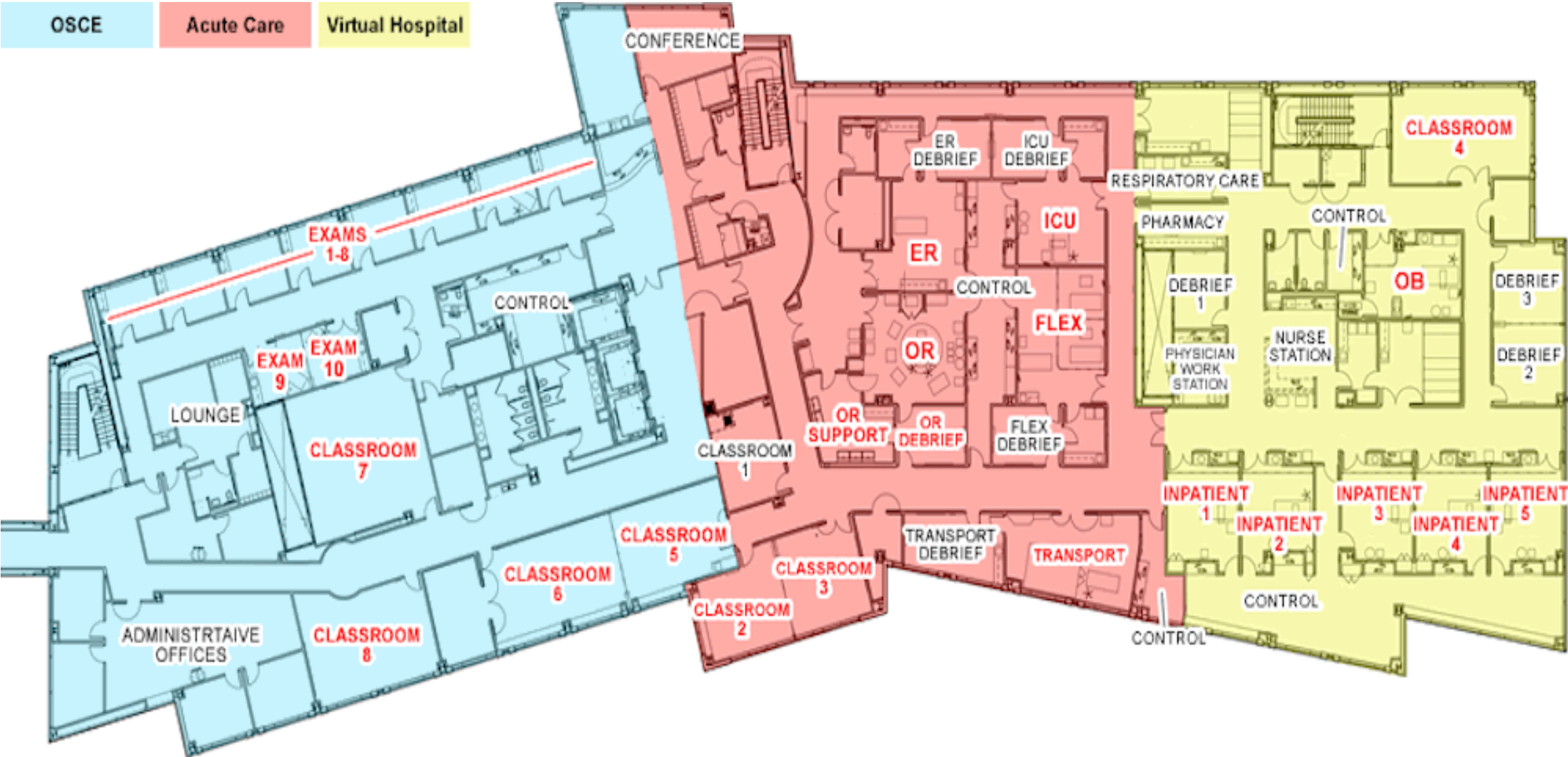


Professional

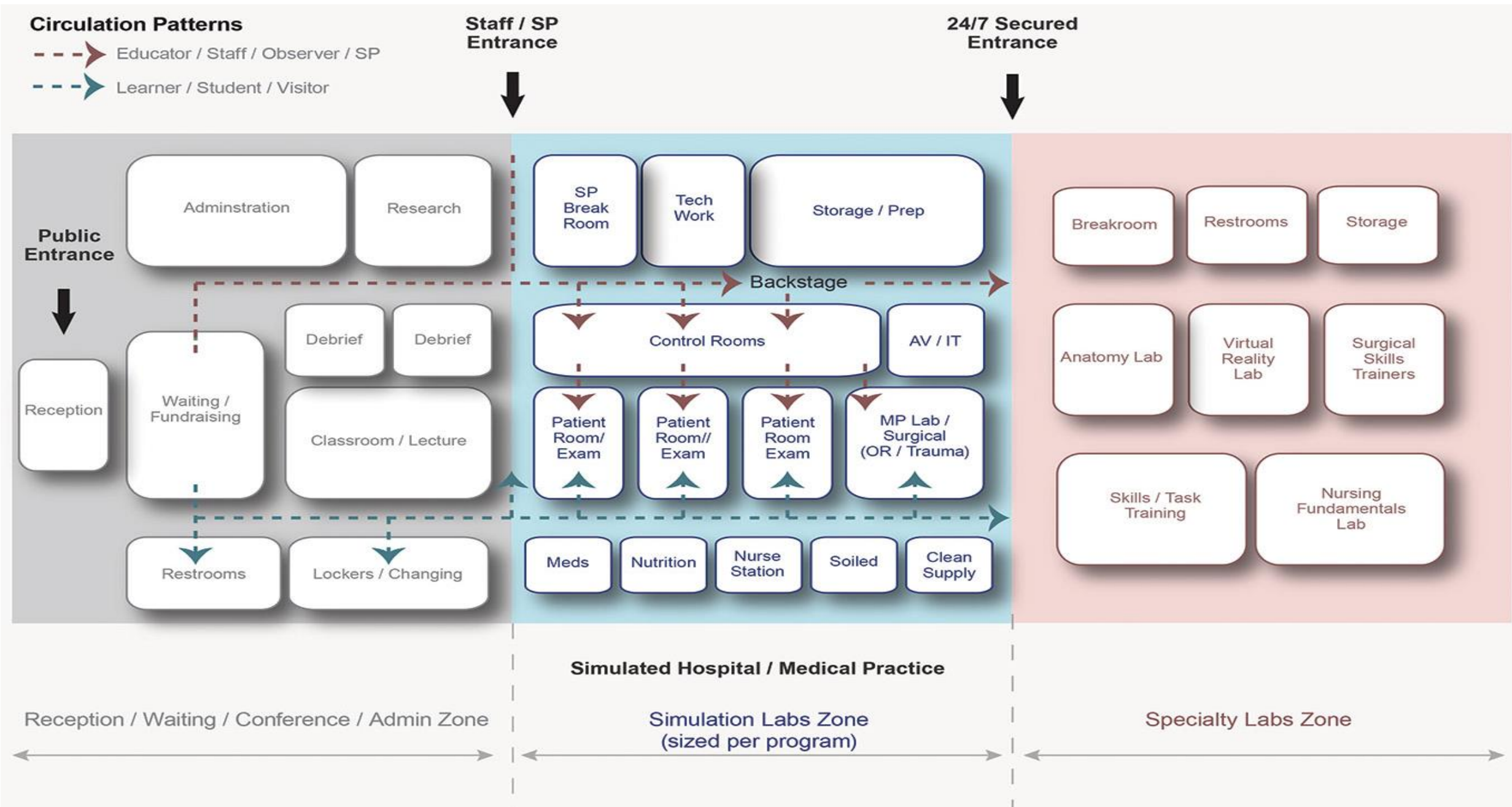
Operational

Administrative support

Structural sim centre models



<https://www.healthsimulation.com/34524/healthcare-simulation-center-floor-plans/>



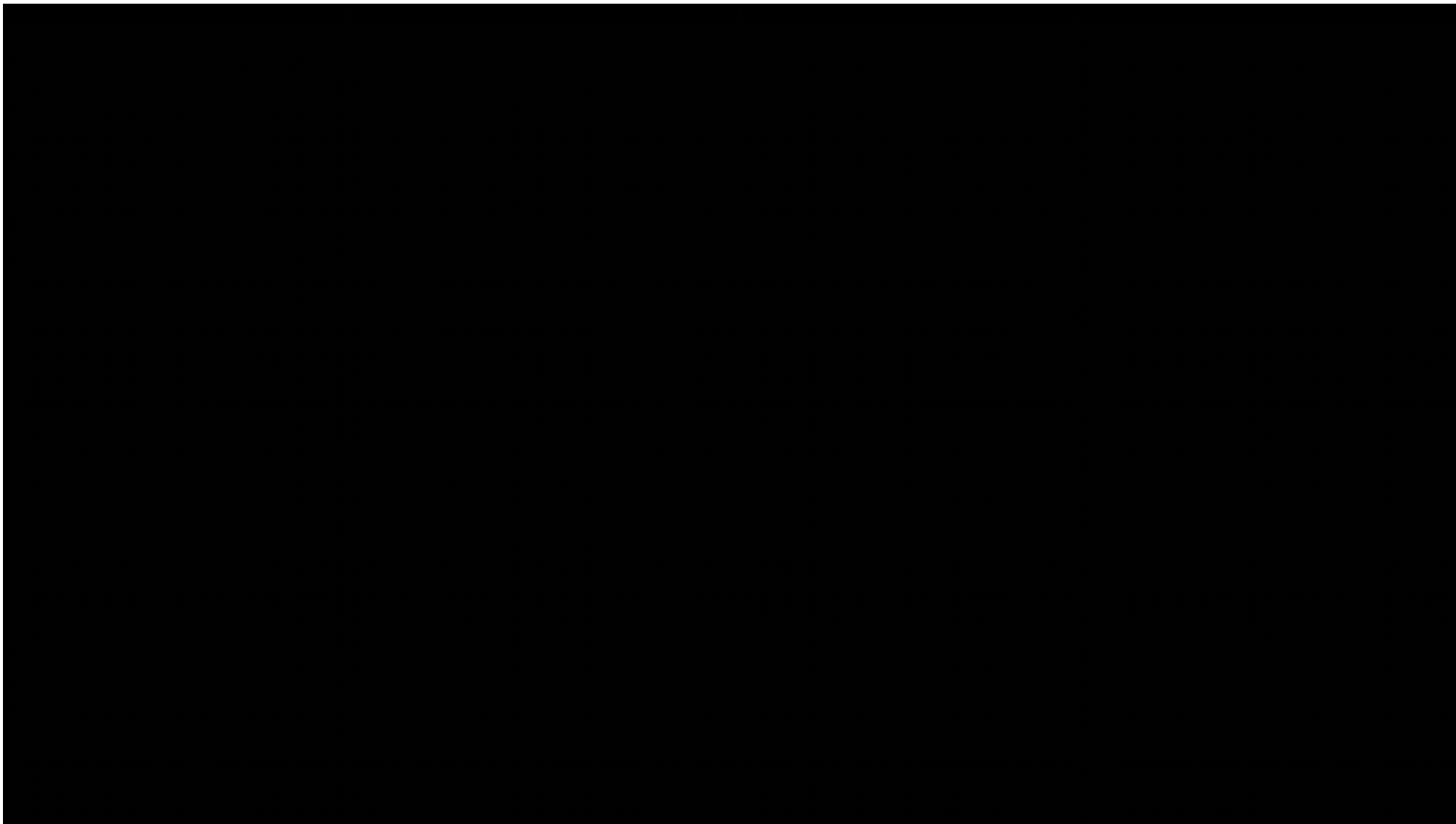


Table 2: Common challenges and solutions in establishing a simulation centre

Challenges	Solutions
<p>1 Educator needs</p> <p>Is there a need for simulation in the presence of large patient population?</p>	<ul style="list-style-type: none"> • Evidence of the benefit in the literature • Regulatory requirements • Benefit of repeated practice in the 'digital native' students
<p>2 Resource redirection from direct healthcare needs</p>	<ul style="list-style-type: none"> • Integrate simulation for organisational needs – quality improvement and research • Builds active healthcare team and sustains them
<p>3 Implementation of simulation at the level of department and organisation</p>	<ul style="list-style-type: none"> • Curriculum given by national regulatory body • Programme-based needs to be identified locally by educators • Organisational needs to be identified by the management
<p>4 Financial challenges</p>	<ul style="list-style-type: none"> • Need-based allocation • Use of economic measurements. Collaboration with governmental and private players • Structured procurement process • Use of cheaper props and locally made materials • Organisational buy-in

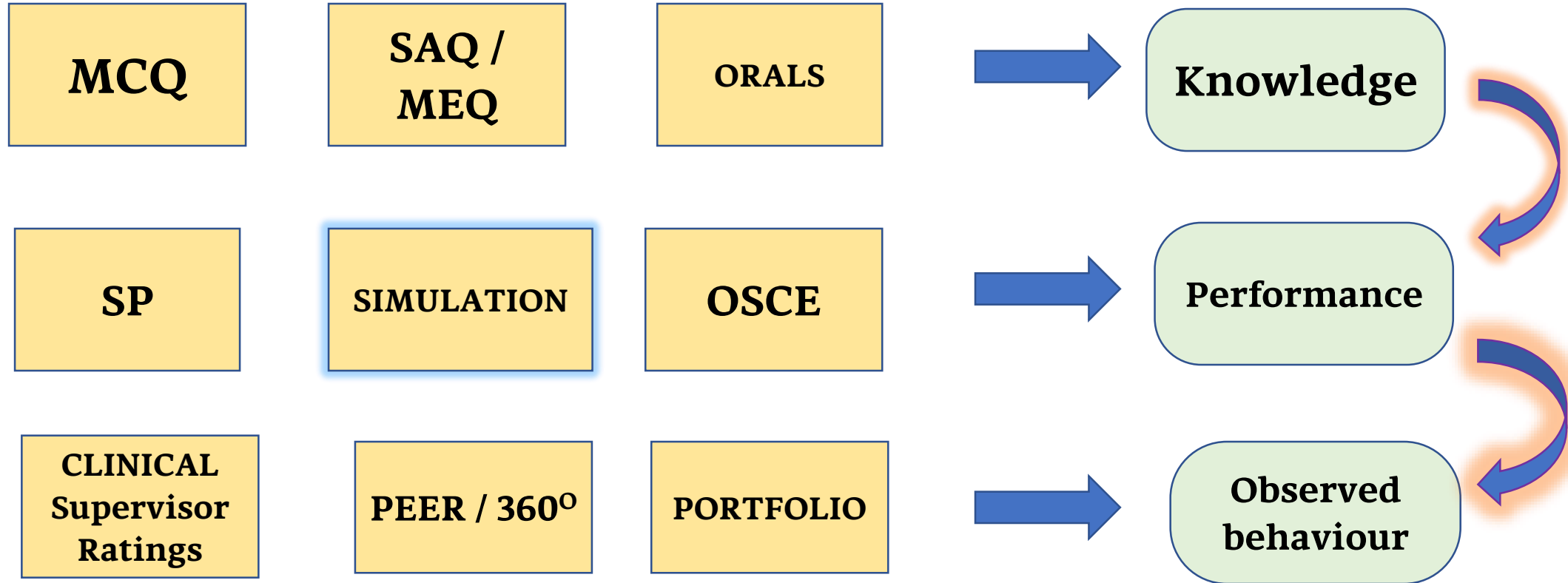
- 5 Faculty resources
 - Start with a small team
 - Need-based allocation (teaching/facility management/innovation centre)
 - Integrate with the existing curriculum
- 6 Time constraint
 - Organisational buy-in
 - Integrate with curriculum
 - Analyse needs and benefits
- 7 Space constraints
 - Regulatory body guidelines
 - Design should be flexible
 - Should meet the needs
- 8 Absence of expertise
 - Faculty development programmes
 - Plan for accreditation
 - Collaboration with national/international bodies



Curricular intent	Teaching methods	Features
Knowledge & analytical thinking	PBL & Small group teaching	Flipped class-room model
Skills - motor	Part task simulation	Template based deliberate practice
Communication	SP simulation	Range of emotions
Critical decision making	Full scale simulation	Scenario triggered analytical thinking
Acute care aptitude	Intermediate & HFS	Cognitive aid-based teaching
Team training	Mixed simulations	Team Conduct >> acute care content
Cognitive dexterity	Virtual / game-based simulation	Own paced offline learning

Assessment spectrum & Simulation

“use of multiple methods of assessment can overcome many of the limitations of individual assessment formats”



Simulation of Cardiopulmonary Bypass Management: An Approach to Resident Training

Rex J. Morais, FFARCSI,* Balakrishnan Ashokka, FANZCA,† Chiang Siau, MMed,† and Lian Kah Ti, MMed†



Programing asystolic states for advanced simulations : physiological model?

Cardiac bypass team training set up



Fig 2. Actual layout of the CAST operating room. (Color version of figure is available online.)

Fed



Played



“stayed connected”



Pre recorded Lecture videos

But be “present” for discussions

Self-directed learning

Faculty scaffolding

Engagement is the key



Learners confused on Digital platform usage



Differentiated digital usage

Gamification



HEALING 2.0

An iOS-based application aimed to create awareness of healthcare costs.

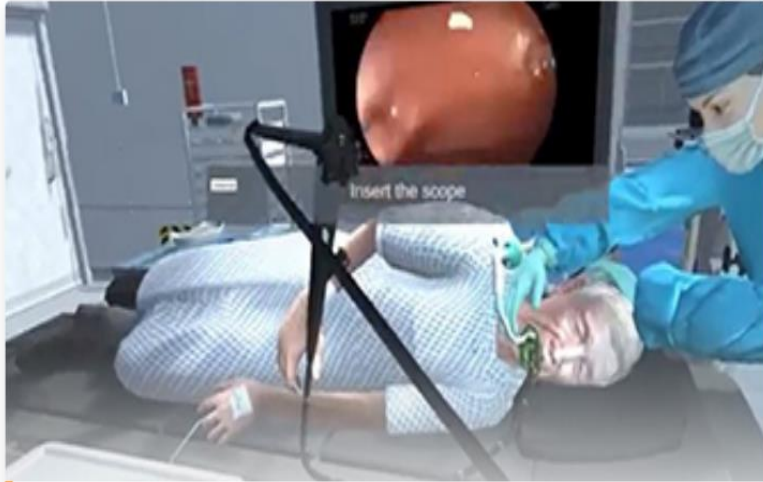


PRESCRIBE

An interactive iPad game to teach safe prescription to medical and nursing students.

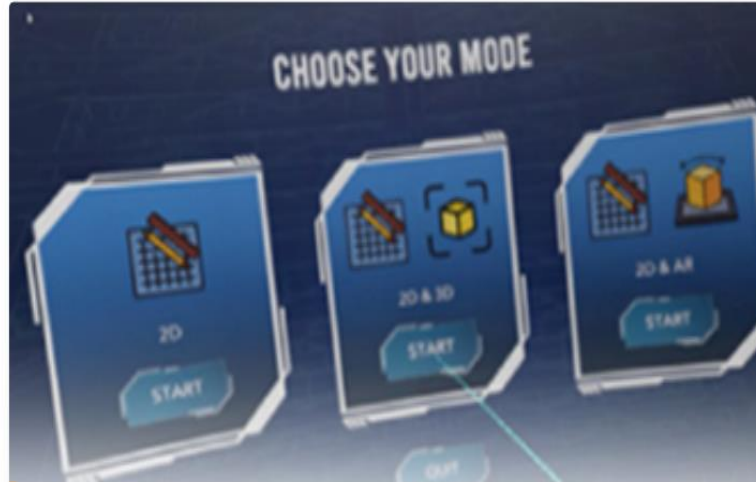
<https://medicine.nus.edu.sg/medical-education-technology-enterprise/#MR>

Virtual Reality



PASS-IT (Patient Safety As Inter-Professional Training) 2.0

PASS-IT employs VR technology to conduct patient safety teaching at NUSMed by allowing students to immerse into the operating theatre scenario.



RESCUE (Response in Emergency Safety and Civil Structure Evaluation)

Using VR and MR, RESCUE immerses learners in a high-fidelity simulation of the actual environment.



Virtual Delivery Suite

A series of VR applications to simulate actual delivery to provide realistic training in comparison to the manikin simulation.

<https://medicine.nus.edu.sg/medical-education-technology-enterprise/#MR>

A BEME systematic review of teaching interventions to equip medical students and residents in early recognition and prompt escalation of acute clinical deteriorations: BEME Guide No. 62

Balakrishnan Ashokka^a , Chaoyan Dong^b , Lawrence Siu-Chun Law^a , Sok Ying Liaw^c ,
Fun Gee Chen^d  and Dujeeпа D. Samarasekera^e 

- 18 % (4/22) studies reported translational outcomes with reduction in long term (up to 3-6 years) patient morbidity & mortality with financial savings
- Interprofessional training with blended learning approaches were reported in 41% (9/22) studies
- Recent evidence (after 2012) demonstrated effectiveness of virtual environment and mobile game-based learning
- Lack of reported evidence in teaching interventions for individual learners' 'cognitive deliberate practice'



CREATIVE

Create Real-life Experience And Teamwork
In Virtual Environment implemented in
Phase IV curriculum.



Virtual Reality in Agitation Management (VRAM)

Using VR to provide an immersive
experience of managing agitation in clinical
settings via a blended learning approach.

Mixed Reality



Project Polaris

Co-developed by Microsoft, Polaris incorporates MR and focuses on enhancing how procedural skills are taught to students.

In-built structured individualised feedback & prompts



Project Delphinus

A virtual patient simulation and communication application to train and develop clinical soft skills.



Project Delphinus

A virtual patient simulation training on communication skills between inter-professionals.

<https://medicine.nus.edu.sg/medical-education-technology-enterprise/#MR>

Live tissue training and cadaver training



All-Creatures.org

Working for a Peaceful World for Humans, Animals and the Environment

U.S. Military Will Stop Using Live Animals in Medical Training ***An Animal Rights Article from All-Creatures.org***

FROM

[Their Turn](#)

December 2014

Victory: U.S. Military Surrenders to PETA

In a major victory for animals, the U.S. military will stop using live animals for various military training purposes as of January 1st. The new policy, which was instituted as a result of many years of advocacy by PETA and the Physicians Committee for Responsible Medicine (PCRM), will eliminate some of the worst abuses, from poisoning monkeys to study the impact of chemical weapons to forcing tubes down live the throats of live cats and ferrets as a component of pediatric training. Wherever possible, lifelike human simulators will be used.



3D printing and simulated training

Anaesthesia 2017, 72, 641-650

Chao et al. | 3D-printing and anaesthetic education



Figure 5 (a) Three-dimensional acrylonite butadiene styrene print of a thoracic spine segment. (b) Neuroaxial needling trainer. (c) Loss of resistance Tuohy needle (18-gauge) being used on the neuroaxial needling trainer. (d) Ultrasound scan to visualise the spinous processes of the neuroaxial needling trainer.

Chao, I., Young, J., Coles-Black, J., Chuen, J., Weinberg, L., & Rachbuch, C. (2017). The application of three-dimensional printing technology in anaesthesia: a systematic review. *Anaesthesia*, 72(5), 641-650.

3-D Printed Spine

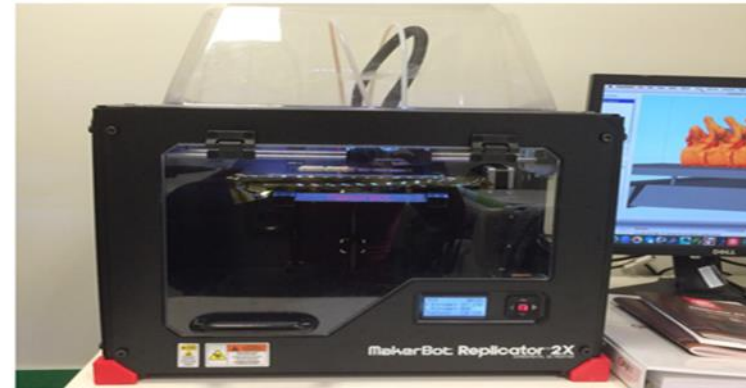


Figure 2 The three-dimensional printer used in our institution; MakerBot® Replicator 2X (MakerBot® Industries, Brooklyn, NY, USA).

3-D printed Airways



Figure 7 Three-dimensional acrylonite butadiene styrene print of the tracheobronchial tree.

Levels of educational effectiveness: Kirkpatrick's

Kirkpatrick levels	Chief focus	Feature
Level 1	Participation:	Covers learners' views on the learning experience, its organisation, presentation, content, teaching methods, and aspects of the instructional organisation, materials, quality of instruction
Level 2a	Modification of attitudes / perceptions	Outcomes relate to changes in the reciprocal attitudes or perceptions between participant groups towards the intervention / simulation
Level 2b	Modification of knowledge / skills:	For knowledge, this relates to the acquisition of concepts, procedures and principles; for skills this relates to the acquisition of thinking / problem-solving, psychomotor and social skills
Level 3	Behavioural change:	Documents the transfer of learning to the workplace or willingness of learners to apply new knowledge and skills
Level 4a	Change in organisational practice	Wider changes in the organisation or delivery of care, attributable to an educational programme
Level 4b	Benefits to patient / clients	Any improvement in the health and well-being of patients / clients as a direct result of an educational programme

ROI: Cost avoidance outcomes

Review of simulation-based educational modalities for achieving proficiency in regional anaesthesia

--Manuscript Draft--

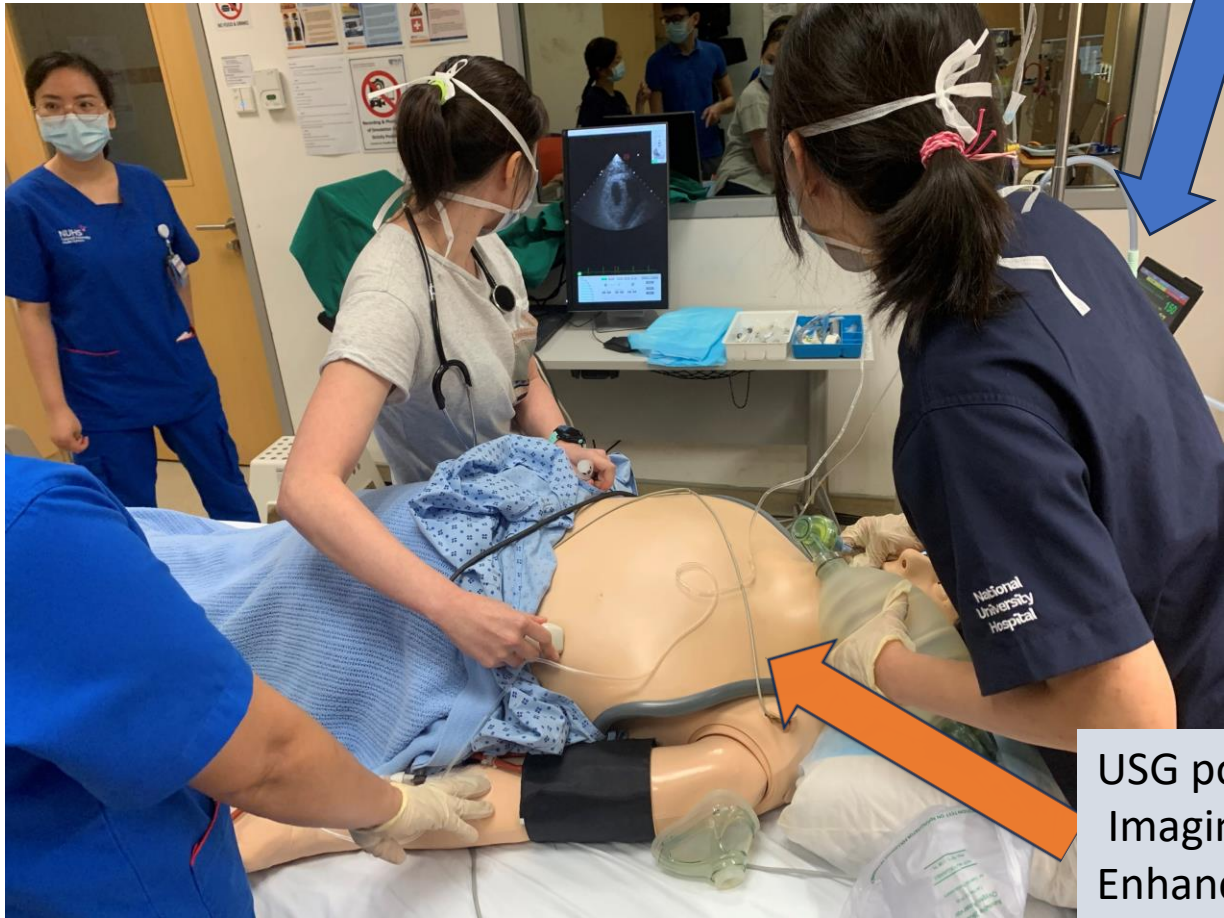
Balakrishnan Ashokka, Lawrence Siu-Chun Law, Archana Areti,
David Burckett-St.Laurent, Roman Oliver Zuercher, Ki-Jinn Chin, Reva Ramlogan

Unpublished Data –under review

- The systematic review showed translational higher-order outcomes measuring clinical effectiveness (>50% of studies)
- Limitations of standalone simulation platforms were improvised with combinations of various educational tools that provide 'hybrid simulations', enhancing the realism and educational benefits



ICU Ventilator



USG pocus
Imaging
Enhancement





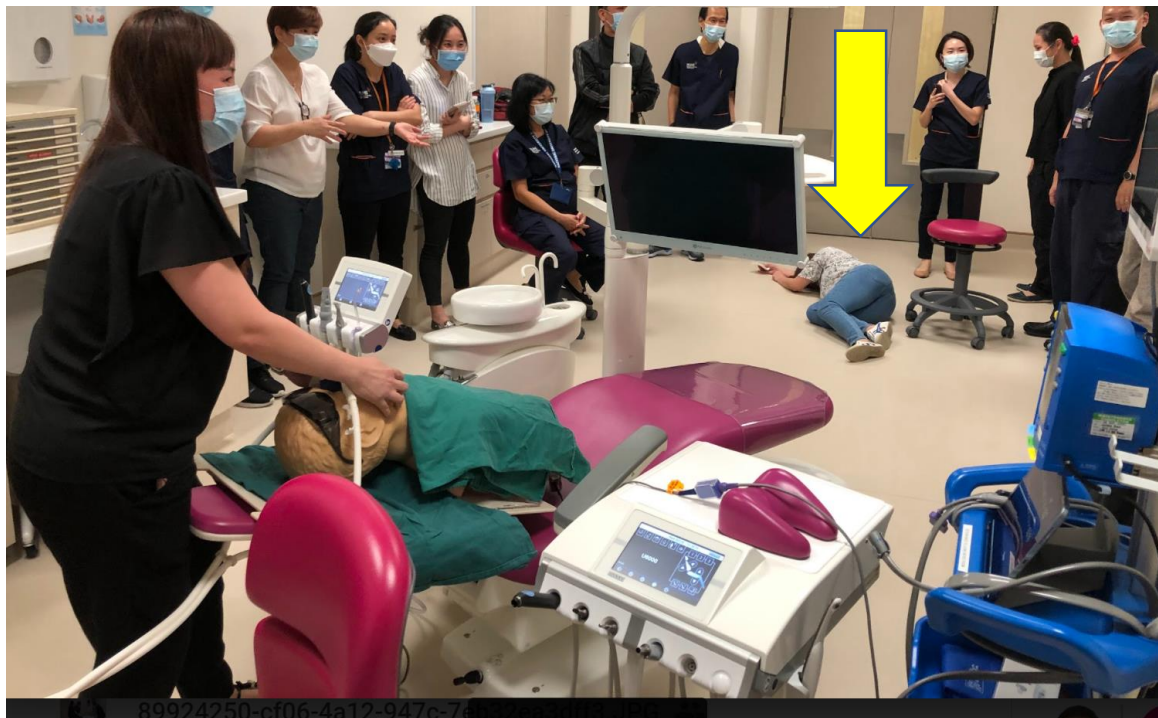
Standalone centre : 250 k to 1million USD

Annual maintenance: 15000 USD

Edler, A. A., Chen, M., Honkanen, A., Hackel, A., & Golianu, B. (2010). Affordable simulation for small-scale training and assessment. *Simulation in Healthcare*, 5(2), 112-115.

PASS: Paediatric anesthesia in situ simulation- portable

DENTAL ACUTE CARE SIMULATION



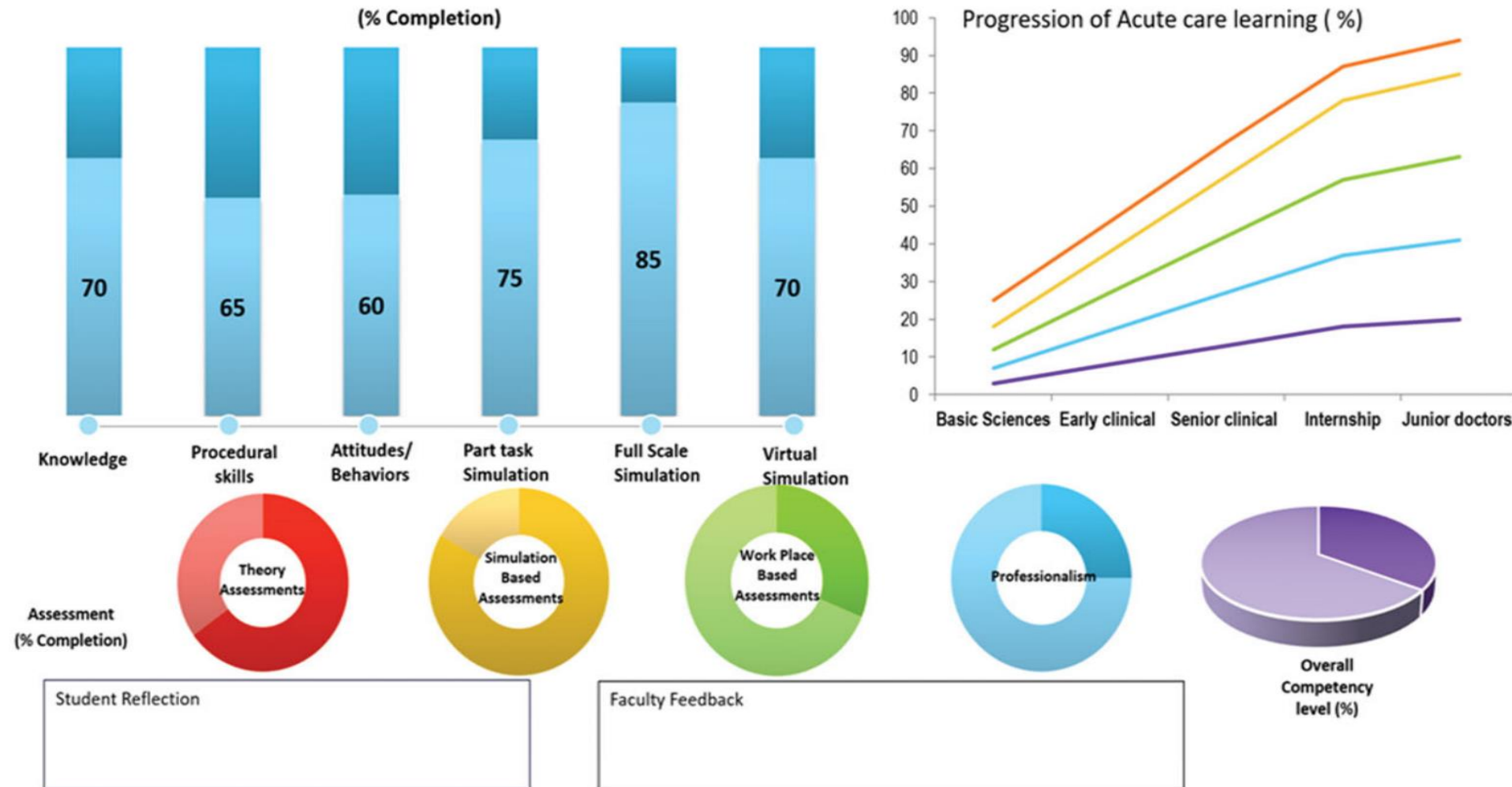
Child desaturates on NITROUS –DENTAL CHAIR



MOM FAINTS – needs EVAC – RESUS – TRANSFER



Acute Care Learning Dashboard



Balakrishnan Ashokka, Deanna Wai Ching Lee & Chaoyan Dong (2021): Twelve tips for developing a systematic acute care curriculum for medical students, Medical Teacher, DOI: 10.1080/0142159X.2021.1987405



Dimensions of simulation

Intent – Overall

Individual Training

Team- Drill

Team- IPE

Systems approach

Focus of session

Part task skills

Drills – protocols

Whole Task

Full patient experience

Communication

Interface

Screen based

Virtual

Wearable

Physical – Touch/Feel

Interaction Level

Static

Partly interactive

Fully interactive

Immersive

Patient

Manikin: Part / full

SP

Virtual

Animal

Cadaver

Hybrid



Beware of excessive flexion of torso
Vital electronics are in tummy



Unsafe CPR, Student mounting on arm
support of OT trolley to do CPR



Sim Centre Overview

- The full overview of sim set up – The multistorey layout
- A functional sim center :
 - Facility management
 - Training (UG, PG, IPE, Faculty)
 - Innovation centre
- Facilities and capabilities
- Working with the various stakeholders
- Research and progress

The pandemic has accelerated a victory lap for the crusade that Simulation based education had attempted for 3 decades

- High stake assessments
- Video remote debriefing
- Multi centre simultaneous team simulations
- Virtual inter professional Edu(IPE)

- EXAMINER COMFORT
- Case for reliability
- Public and regulations authority approvals

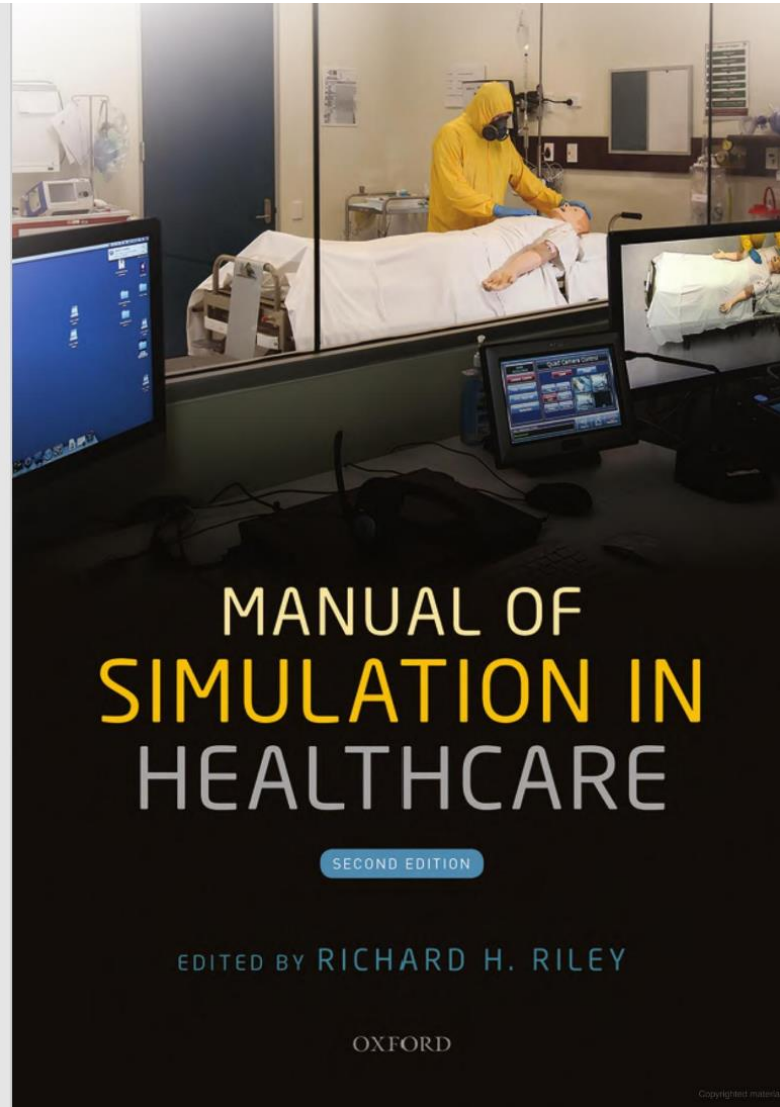


**If you sweat during peacetime
you bleed less during war...**

- Lets collaborate and share expertise
- Make Medical care as dependable as Aviation safety
- To be safe fall back option for patient and practice improvements when the need arises

Make your Mess your Message...





Simulation centre design

Ross Horley

Overview

- ◆ Key elements in the design of a simulation centre are building form, room usage (function), and technology.
- ◆ Important design criteria are space planning for traffic flow, adequate breakout spaces, storage, and entrance and exit design.
- ◆ Room usage includes mock operating theatre, control room, procedure rooms, debriefing rooms, wards, communications/standardized patients rooms, lecture theatres, external areas, breakout spaces, and catering areas.
- ◆ Technical aspects include a high level of lighting with flexible control, air-handling system with fresh-air cycle, access control security system, high level of sound insulation, digital high-definition audiovisual system permeating all training areas.
- ◆ The simulation centre needs to have sizable broadband connectivity to enable tele-education, video streaming, and videoconference applications.