

# The role of simulation in postgraduate clinical training

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# Outline

- What is simulation-based learning (SBL)
- Applications in postgraduate education (PGE)
- Challenges
- Way forward

# Definition

Simulation is an educational technique that uses surrogate model and environment to imitate real clinical event, process or system for the purpose of training, assessment and research



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What's new in medical school simulation?

# Simulation techniques 1



Role play



Standardized patients



Part-task trainers

# Simulation techniques 2



Surgical simulators

Virtual reality

Patient simulators

# 360 degrees panoramic projection



# Reasons for increasing use of simulation ...

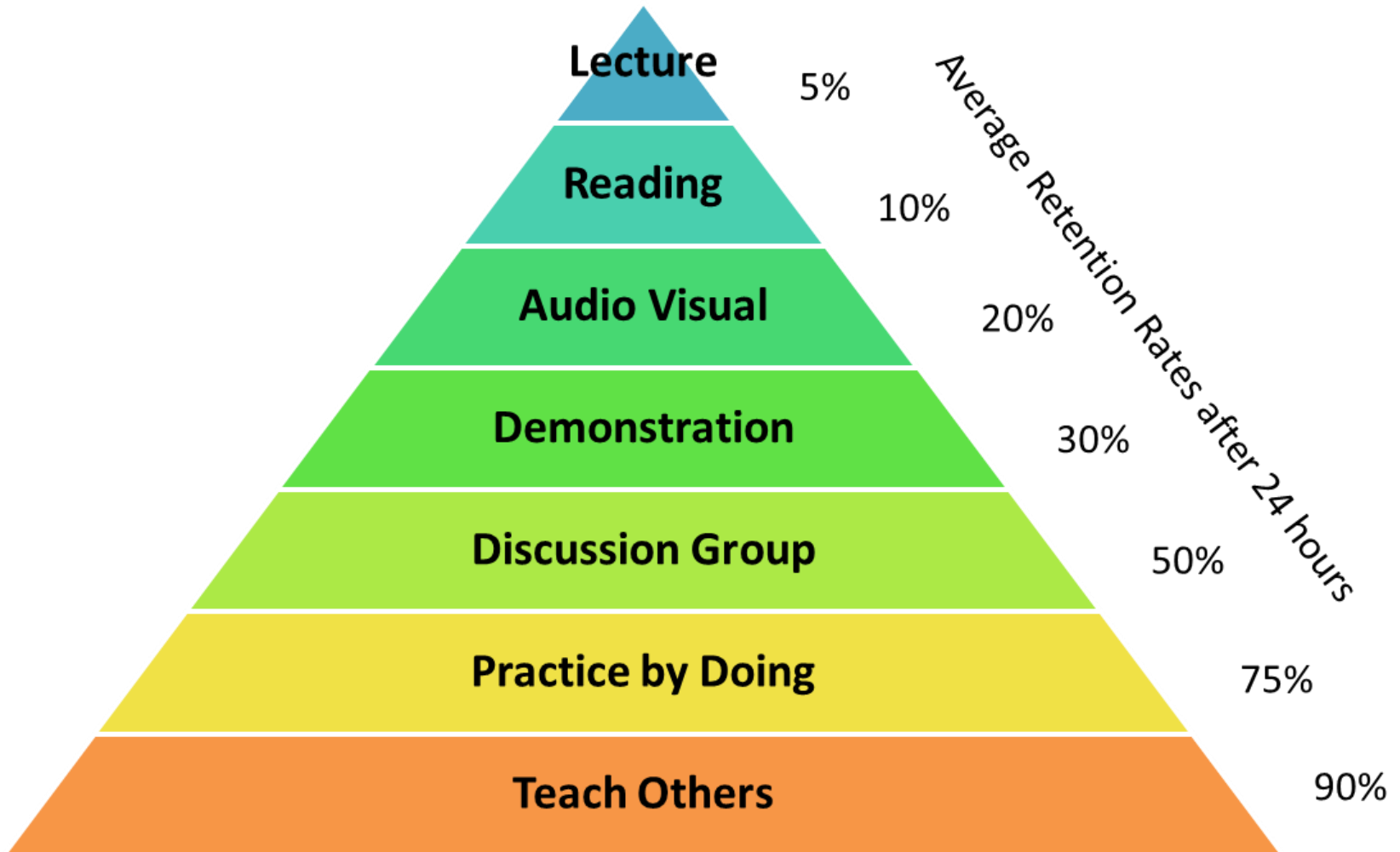
- Need for safe learning environment
- Growing focus on outcomes in education
- Advances in quality simulation technologies
  - computer sensors, immersive VR displays, haptic devices
  - more affordable and accessible
  - greater realism and reliability



# Advantages of simulation-based learning (SBL)

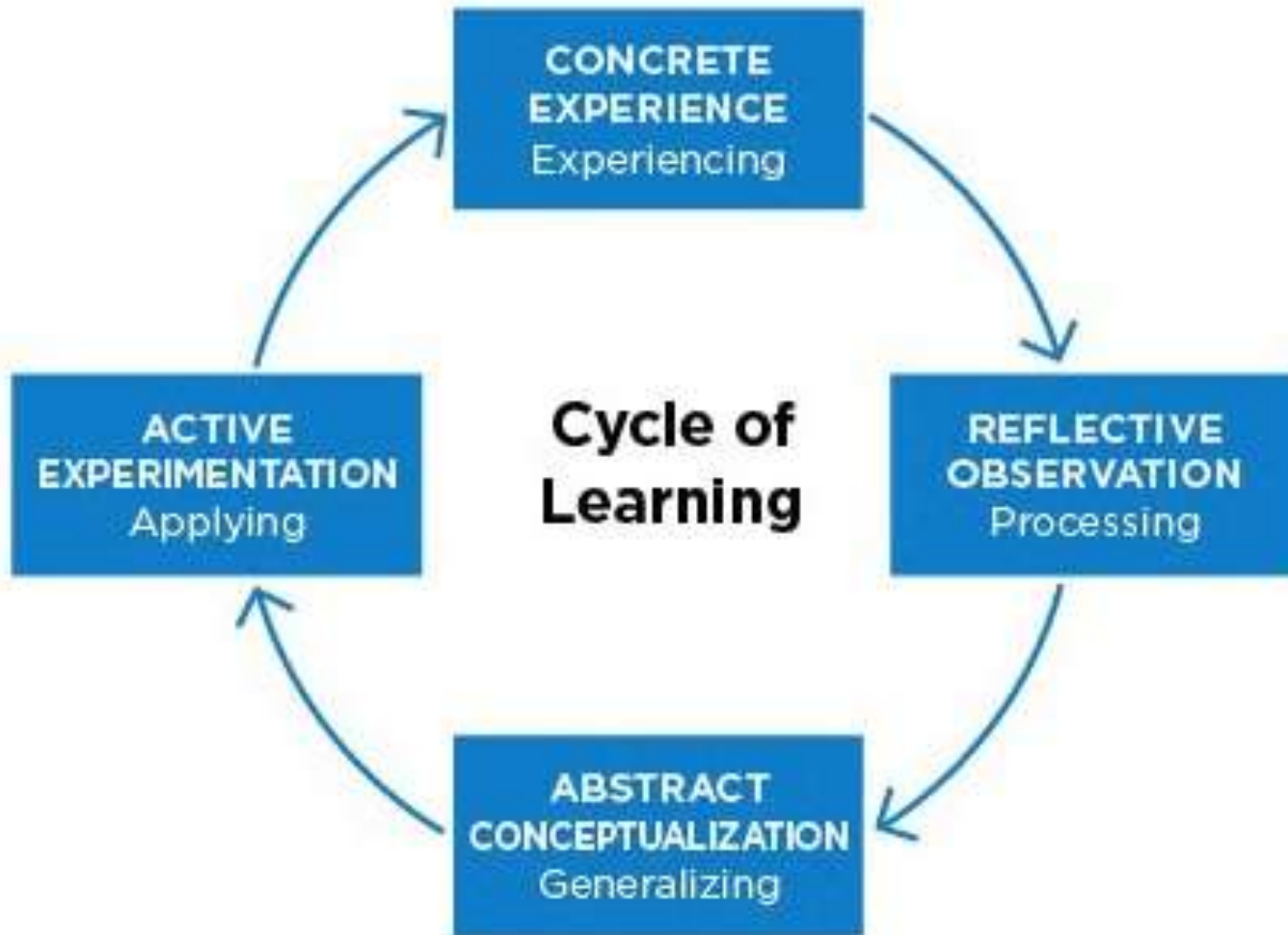
- Can simulate any clinical event, any time
- Wide variety of skills
- Errors without harm to patients
- Ability to vary difficulty & complexity
- Repeatedly practice to reach proficiency
- Save time
- Fun & effective

# The Learning Pyramid



*Source: National Training Laboratories, Bethel Maine*

# Kolb's Experiential Learning Cycle



# Common applications in PGE

Training

Assessment

Technical skills

Non-technical

Formative  
Summative  
MOC, CPD  
Credentialing  
Licensure

Clinical procedures

Equipment

Communication skills

Teamwork  
Leadership

Professionalism

# High stake assessment

- USMLE Step 2 and Step 3 assessments
- ECFMG's SP-based clinical skills assessment
- ABS - Fundamental of Laparoscopic surgery
- Israeli National Board Examination in Anaesthesiology
- Nursing licensure exam in Canada, Israel
- RCPSC – Internal medicine certification exam
- HKCA Simulation-based OSCE station in Final exam
- MOC Part-4 ABA, ABIM, ABFM
- ANZCA, RCA, HKCA CPD required for recertification
- FDA credentialing of carotid stenting procedure

## A prospective comparison between written examination and either simulation-based or oral viva examination of intensive care trainees' procedural skills

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### SUMMARY

*....Correlation with written exam results was very low for simulation format assessments ( $r=0.08$ ) but moderate for oral viva format assessment ( $r=0.58$ ). Participants who passed a written exam based on management of a blocked tracheostomy scenario performed a number of dangerous errors when managing a simulated patient in that scenario.*

*The lack of correlation between exam formats supports multi-modal assessment, .....limited correlation between simulation and written exams may support the use of both formats as part of an integrated assessment strategy.*

# A Technical and Cognitive Skills Evaluation of Performance in Interventional Cardiology Procedures Using Medical Simulation

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**Introduction:** Interventional cardiology, with large numbers of complex procedures and potentially serious complications, stands out as an obvious discipline in which to apply simulation to help prevent medical errors. The objective of the study was to determine whether it is feasible to develop a valid and reliable evaluation approach using medical simulation to assess technical and cognitive skills of physicians performing coronary interventions.

**Methods:** Clinical case scenarios were developed by a committee of subject matter experts, who defined key decision nodes, such as stent positioning, and introduced unanticipated complications, such as coronary perforation. Subjects were 115 physicians from 10 U.S. healthcare institutions at three levels of expertise: novice, skilled, or expert. Subjects completed a questionnaire, one practice case and six test cases on a SimSuite simulator (Medical Simulation Corporation, Denver, CO), and an opinion

...use of high fidelity simulator incorporating situations with multiple events, immediate feedback,..... complement the results of traditional written examination of medical knowledge to provide a more comprehensive assessment of physician ability in interventional radiology.

written examinations of medical knowledge to provide a more comprehensive assessment of physician ability in interventional cardiology.  
(*Sim Healthcare* 5:65-74, 2010)

**Key Words:** Medical simulation, Medical assessment, Medical evaluation, High-fidelity simulation, Medical education, Educational testing and measurement.

# Competency

- Defined as knowledge, attributes, skills, behaviour and attitudes that enable an individual to perform specific set of tasks or objective to a given standard
- Paradigm shift to outcome-based education with requirement for assessment and demonstration of competence



# Simulation-based learning

- Traditional training and assessment focus on isolated skill
- May be good at technical skill but unable to apply effectively
  - ineffective communication skills
  - poor teamwork, leadership, decision making
  - attitude, professionalism
- Passing marks usually arbitrary – does not reflect competence
- Simulation allows repeated practice and evaluation until set proficiency level (experts' benchmark score) achieved

# Curriculum

- SBL is all about the curriculum, not the simulators
- Defined learning objectives
- Essential to deconstruct the task/event into individual steps/parts to be learned
- Scenario needs to bring out learning objectives
- For training – immediate feedback & debriefing
- For assessment – methodology & outcome measures must be defined and developed



Simulation most suited for  
competency-based education

# HKAM survey Jan-Feb 2016

- Use of medical simulation in local specialist training programmes
- Questionnaire sent to all 15 Colleges
- Results
  - Response rate 100%
  - Five Colleges not using medical simulation
  - Nine have mandatory sim courses for trainees
  - Six have non-mandatory courses
  - Five using simulation for Assessment

# Results 1: College NOT using SBL

| Colleges                                 | Reasons                                      | Future plan to use                          |
|--|--|---|
| Hong Kong College of Community Medicine  | No facility suitable for training programmes | No  |
| Hong Kong College of Pathologists        | Not relevant                                 | No  |
| College of Ophthalmologists of Hong Kong | Cost implication                             | Yes   |
| Hong Kong College of Psychiatrists       | No reason given                              | Yes<br>Already conducted pilot course (Apr) |
| Hong Kong College of Radiologists        | No reason given                              | Yes   |

## Results 2: College using Sim Assessment

| Colleges   | Assessment  |
|--|-------------|
| Hong Kong College of Anaesthesiologists          | Final OSCE  |
| College of Dental Surgeons of Hong Kong          | In-training |
| Hong Kong College of Family Physicians           | In-training |
| Hong Kong College of Obstetrics & Gynaecologists | Both        |
| Hong Kong College of Otorhinolaryngologists      | Both        |

- Although most HKAM Colleges have adopted SBL, many are not using simulation for assessment

# Challenges

- Inadequate expertise & resource
  - Faculty
  - Facility & equipment support
  - Scenario development & assessment tool
- Simulation technology not yet developed to standards to allow
  - consistency & reliability
  - easy integration
- Unclear predictive validity

# Way Forward

- Greater understanding of SBL utility
- Faculty development & credentialing
- Standardize simulation equipment & facility
- Curriculum design
- Appropriate assessment methodology
- Research



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# Summary

- Simulation is practical and useful in many aspects of postgraduate training & assessment
- Should be integrated into preexisting postgraduate curriculum
- Technological advances have facilitated realism, capability, access & validity
- Need to overcome challenges to enable greater acceptance

Thank you!

