NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

LEE KONG CHIAN SCHOOL OF MEDICINE

PROS AND CONS OF USING COST-EFFECTIVE EDUCATION STRATEGIES

Professor Jennifer Cleland

Where I am coming from

- Active in researching cost and value in health professions education

Society for Cost and Value in Health Professions Education

- Formerly Vice-Dean of Education for a medium-sized medical school, managing budget of around S$70 million annually

LKC Medicine Singapore

Education budgets are finite

- There is only one pot of money
- That pot might be getting smaller
- Every choice we make in health professions education has a cost
- How can educators and those managing education maximize the returns on investment (ROI) aka get the most out of the money available while ensuring quality?

Cleland, Foo, Ilic, Maloney, You. (2020). “You can’t always get what you want…” Economic thinking, constrained optimization and health professions education. Advances in Health Sciences Education; 25: 1163–1175.

An overarching model

Utility formula (Van der Vleuten, 1996)

R = Reliability
V = Validity
E = Educational impact
A = Acceptability
C = Cost

U = Utility
W = weight

$$U = R_{W_r} \times V_{W_v} \times E_{W_e} \times A_{W_a} \times C_{W_c}$$

van der Vleuten V. 1996. The assessment of professional competence: Developments, research and practical implications. Adv Health Sci Educ 1:41–67.

How to achieve the best ROI?

- Two basic strategies

- Revising
- Restructuring

Revising

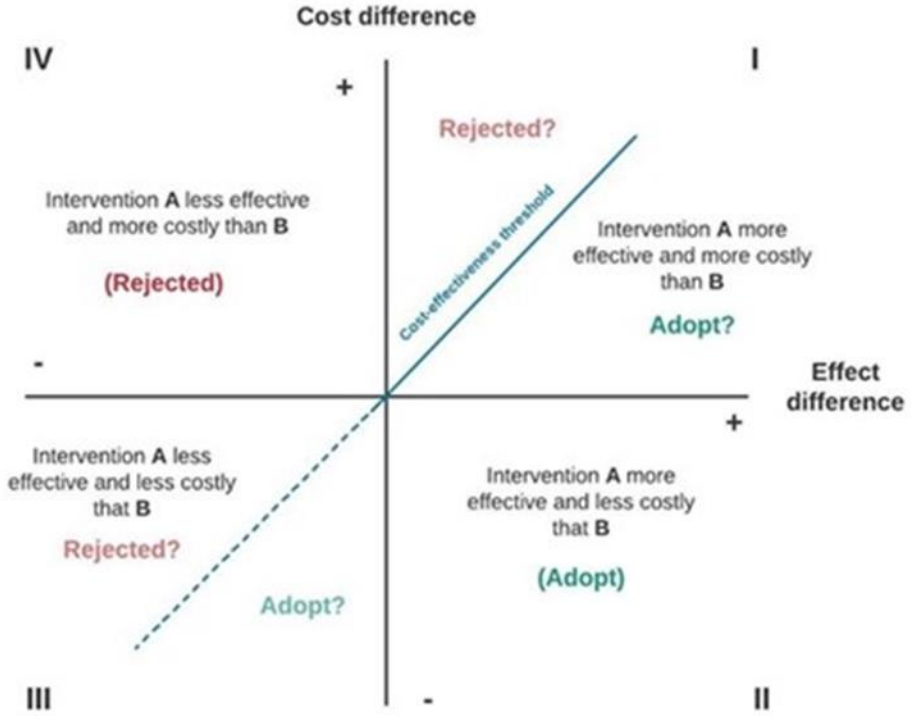
Doing what we already do, more efficiently

“…maximum educational value for a given spend”

Maloney et al. The Prato Statement on cost and value in professional and interprofessional education. J Interprof Care. 31(1):1-4.

Questions to ask

- What do things cost?
- What are the major costs in your health professions education programme?
- What can be changed?
- What is immutable?
- Balancing cost and value



The cost effectiveness plane

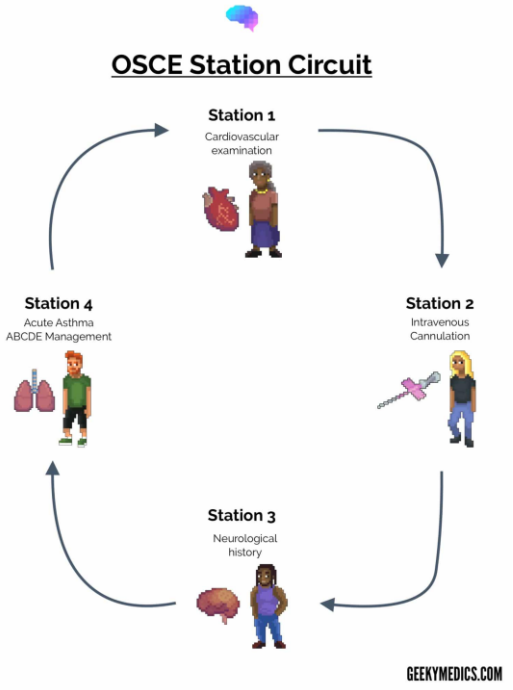
Questions to ask

- What do things cost?
- What are the major costs in your health professions education programme?
- What can be changed?
- What is immutable?

- Usually staff salaries are the biggest slice of a budget.
- Some things are immutable because of standards and regulations, but a lot of what we do, in medical education at least, is due to tradition.
- We are not good at change – but sometimes change is forced on us as per Covid-19.

Example: the cost of a clinical assessment

- A 15-station, high-stakes OSCE held over 2 days for 185 students
- Costed: staff time (faculty and admin), consumables, travel and accommodation, venue, patient, VP and SP costs, etc
- Total Cost – US$120, 000
- Per student – US$650
- Unaffordable!!!!



Brown, Ross, Cleland & Walsh. (2015). Money makes the (medical assessment) world go round: The cost of components of a summative final year Objective Structured Clinical Examination (OSCE). *Medical Teacher*, *37*(7), 653–659.

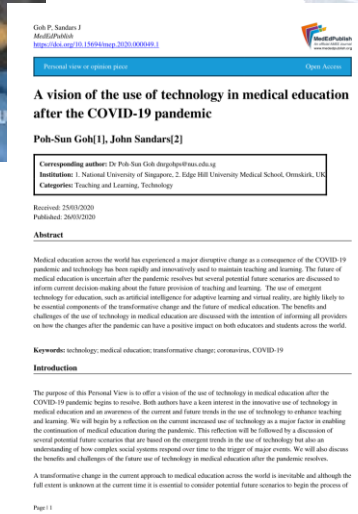
Streamlining – a sequential or screening OSCE

- A tool to strategically allocate assessment resources towards borderline students allowing robust progression decisions to be made for this group of students

- All students sit day one of an OSCE
- Candidates who do not achieve a clear pass sit day two (2 weeks gap)
- Care must be taken to blueprint Day 1 to course learning objectives
- Choosing the appropriate number of stations for Day 1 concerned the balance between
  - (a) test classification errors (are borderline and non-borderline students correctly classified) =
  - (b) the necessity to minimize the cost of delivery of the exam

Currie, Selvaraj, Cleland. (2015) 'Sequential testing in high stakes OSCE: Determining the number of screening tests', Medical Teacher. Oct 16, 1-7.
Mancusco, Strachan, Capey. (2019) Sequential testing in high stakes OSCE: a stratified cross-validation approach. MedEdPublish 8(2)

Supply, Demand and optimization



Goh P, Sandars J
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Personal view or opinion piece — Open Access

A vision of the use of technology in medical education after the COVID-19 pandemic

Poh-Sun Goh[1], John Sandars[2]

Correspondence author: Dr Poh-Sun Goh drgohps@nus.edu.sg
Institution: 1. National University of Singapore, 2. Edge Hill University Medical School, Ormskirk, UK
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Abstract

Medical education across the world has experienced a major disruptive change as a consequence of the COVID-19 pandemic and technology has been rapidly and innovatively used to maintain teaching and learning. The future of medical education is uncertain after the pandemic resolves but several potential future scenarios are discussed to inform current decision-making about the future provision of teaching and learning. The use of emergent technology for education, such as artificial intelligence for adaptive learning and virtual reality, are highly likely to be essential components of the transformative change and the future of medical education. The benefits and challenges of the use of technology in medical education are discussed with the intention of informing all providers on how the changes after the pandemic can have a positive impact on both educators and students across the world.

Keywords: technology; medical education; transformative change; coronavirus, COVID-19

Introduction

The purpose of this Personal View is to offer a vision of the use of technology in medical education after the COVID-19 pandemic begins to resolve. Both authors have a keen interest in the innovative use of technology in medical education and an awareness of the current and future trends in the use of technology to enhance teaching and learning. We will begin by a reflection on the current increased use of technology as a major factor in enabling the continuation of medical education during the pandemic. This reflection will be followed by a discussion of several potential future scenarios that are based on the emergent trends in the use of technology but also an understanding of how complex social systems respond over time to the trigger of major events. We will also discuss the benefits and challenges of the future use of technology in medical education after the pandemic resolves.

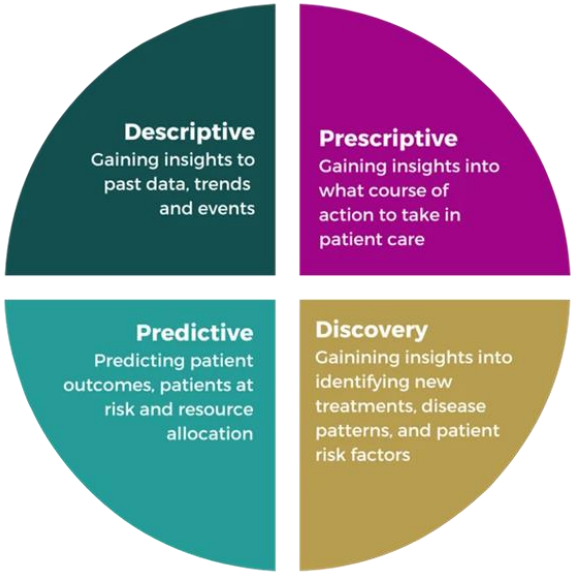
A transformative change in the current approach to medical education across the world is inevitable and although the full extent is unknown at the current time it is essential to consider potential future scenarios to begin the process of

Can we optimise the use of resources by using AI and educational technology?

Semi-automating time-consuming tasks

- **For learners**
- Data analytics as basis for individualised feedback, to tailor learning
- Flexible, easily accessible systems
- AI can summarise content, generate practice questions, offer instant tutoring (e.g., via a Bot)

- **For educators**
- Time can be used more efficiently – reviewing AI generated questions rather than writing them
- Helping with tasks such as curriculum and progression mapping



Ng et al. (2025). User-centred curriculum mapping: A human-AI hybrid approach. Medical Teacher, 1–3. https://doi.org/10.1080/0142159X.2025.2489085

Technology can address education issues and gaps

- Simulation
  - Haptic feedback without putting patients at risk
  - Practicing rare and complex procedures that learners might encounter infrequently in real-world settings
  - Emergency response training
- Remote and Collaborative Learning
  - Telemedicine Simulations: Students can practice remote patient interactions using VR platforms, ensuring they develop skills for modern telehealth practices.
  - Global Collaboration
- Augmenting Diagnostic Accuracy
  - Machine Learning Algorithms: AI models trained on vast datasets assist students by suggesting differential diagnoses and flagging potential errors
  - Radiology and Pathology AI Assistants: AI-driven imaging tools help trainees interpret X-rays, MRIs, and pathology slides, reducing diagnostic errors and enhancing learning

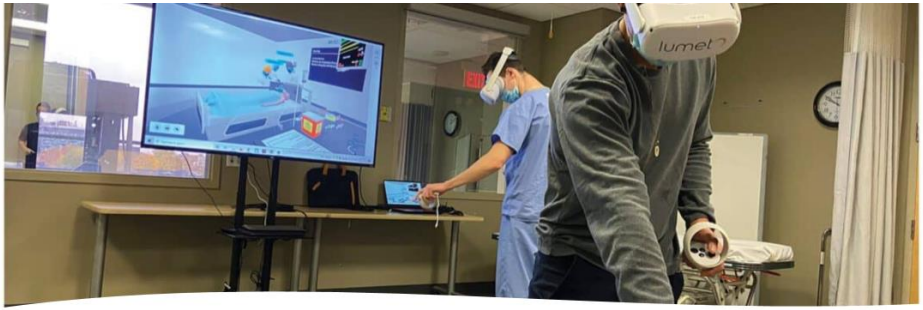
But be wary

- **What** and **how** we teach should be evidence-based, or grounded in learning science
- What is effective? What works? What works best?

- The evidence based for most new technologies in health professions education is weak
  - Many descriptive studies (“What we did”, “Learners liked it”)
  - Increasing numbers of justification studies (“Does it work?”, “How does it work in comparison to something else?”)
    - E.g., students learn just as well with x (digital technology) as they do with y (analogue/traditional)
    - Overall conclusion - technology-enhanced teaching is *not inferior* to teaching by conventional didactic methods
  - Very few clarification studies (“How does it work?”)

Considerations when integrating emerging technologies into health professions education

- How does the new tool fit with the rest of the curriculum and wider learning?
  - Adjunct or core?
  - What does it actually add!?
- How does it change things?
  - How students learn?
  - How students interact with each other, with trainers, with the wider team?
  - What they learn?



AR/VR as pre-simulation

- Is it necessary?
- Does adding in another layer of simulation improve patient safety and healthcare outcomes?
- What's the cost-benefit?

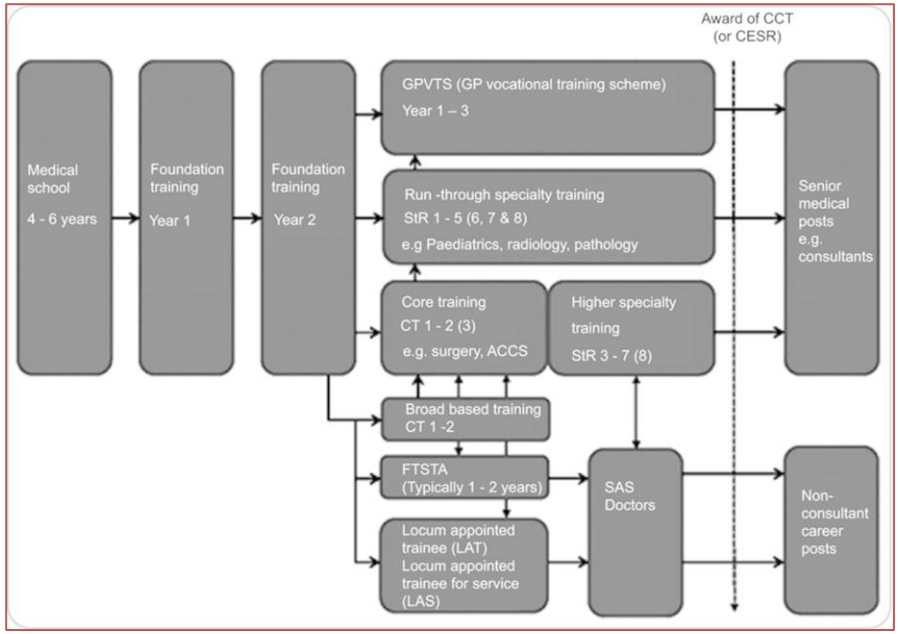
Restructuring

Doing things differently

Is there only one way of doing things?

Example

- Do all our UK doctors need a minimum of 9 years training (max 16 years)?
- Could the early stages of training be accelerated?
- Or can we be more radical?
- What do we need doctors for, and what care can be delivered by other groups?



Backwards chaining

- What are the pressing healthcare issues in our communities?
- What are the growing causes of morbidity and mortality in our communities?
- What kind of health workforce do we need to manage these issues?
- Design health professions education and a health workforce to focus on these issues

China's Barefoot Doctors

Health care by and for the people

BY PETER KONG-MING NEW AND MARY LOUIE NEW

Frenk et al. (2010). Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet 376(9756):1923-58. AND Frenk et al. (2022). Challenges and opportunities for educating health professionals after the COVID-19 pandemic. Lancet, 400 (10362): 1539 – 1556.

Context matters

- Some common issues globally (e.g., staffing remote and rural settings) but specific societal drivers and norms
- What will work in one place will not work in another
- Radical change needs all stakeholders on side, including learners
- Effective decision-making needs good quality evidence

All education change should be underpinned by a needs assessment

- What are the gaps and what are the priorities for change?
- What are the societal needs?
- What are the educational needs of learners?
- What are the learning objective or goals?
- How can these best be achieved?
- How can these be achieved at lowest cost?
- What's the sweet spot?

Conclusion: how can we balance cost and value in health professions education?

Revising

- Consider new ways of doing old things
- Consider small, sustainable changes – foster a culture of innovation

Restructuring

- Backwards chaining might mean radical change
- Beware simple solutions to complex problems

- If it were easy to balance cost and value in HPE, we'd have done it already
- But we do need to consider alternatives to how we do things
- And manage change

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THANK YOU

Contact Information

Jennifer.Cleland@ntu.edu.sg