

**ONLINE FIRST – ACCEPTED ARTICLES**

Accepted articles have been peer-reviewed, revised and accepted for publication by the *SMJ*. They have not been copyedited, and are posted online in manuscript form soon after article acceptance. Each article is subsequently enhanced by mandatory copyediting, proofreading and typesetting, and will be published in a regular print and online issue of the *SMJ*. Accepted articles are citable by their DOI upon publication.

**COVID-19: a missed opportunity for medical education**

Wai Jia Tam<sup>1,\*</sup>, MBBS, MPH, Dale Fisher<sup>1,2,\*</sup>, MBBS, FRACP

<sup>1</sup>Yong Loo Lin School of Medicine, National University of Singapore, <sup>2</sup>Division of Infectious Diseases, National University Hospital, Singapore

\*These two authors contributed equally as first authors in this work.

**Correspondence:** Dr Tam Wai Jia, Deputy Lead of Global Health and Community Service, Dean's Office, Yong Loo Lin School of Medicine, National University of Singapore, Level 11, NUHS Tower Block, 1E Kent Ridge Road, Singapore 119228. [waijia@nus.edu.sg](mailto:waijia@nus.edu.sg)

---

**Singapore Med J 2021, 1–11**

<https://doi.org/10.11622/smedj.2021133>

Published ahead of print: 3 October 2021

More information, including how to cite online first accepted articles, can be found at: <http://www.smj.org.sg/accepted-articles>

## **INTRODUCTION**

Infectious disease outbreaks represent unique learning opportunities. Nonetheless, views on how or whether medical students may take advantage of them vary widely.<sup>(1,2)</sup> While some schools strictly forbid any interaction between students and those infected with SARS-CoV-2, others have called upon them or even graduated them earlier to serve in the frontlines.<sup>(3,4)</sup> While a pandemic presents challenges to educational approaches, there are diverse learning opportunities available.

## **ADAPTING MEDICAL EDUCATION**

COVID-19 has disrupted traditional medical education. In April 2020, the Association of American Medical Colleges instructed medical schools to suspend student involvement in direct patient care activities.<sup>(2)</sup> Due to the initial incomplete understanding in terms of the routes of transmission, rapidly changing infection control policies and concerns of involving students with little clinical experience, Singapore acted similarly.<sup>(5)</sup> Medical students volunteering at Community Isolation Facilities were withdrawn and all teaching was converted online. In USA, Singapore, New Zealand, and countries with like policies, the focus remained for medical students to complete their traditional medical education without disruption.<sup>(2,6)</sup>

The risk of disruption to medical education was mitigated by technological solutions such as online lectures and real-time virtual experiences.<sup>(4,7-9)</sup> Nonetheless, medicine, a form of apprenticeship, has experiential learning as a core tenet.<sup>(10,11)</sup>

Innovation in medical student education would mean capitalising on the situation and enabling students to see and experience aspects of care not normally easily available. Thus, the opportunity to experience the frontline of a pandemic should be seen from a pedagogical perspective. Managing epidemiological data, delivering health communication, understanding logistical issues, and appreciating infection prevention and control from a community

perspective are multidimensional aspects of healthcare and global equity best learnt in real situations.

### **A UNIQUE EXPERIENTIAL EDUCATION**

Social constructivism states that students construct their knowledge through interacting with their environment and mediating their understanding through meaningful contexts.<sup>(12)</sup> Learning is multi-dimensional, situated, and cannot be dissociated from the context it occurs in.<sup>(12-14)</sup>

In Singapore, when the COVID-19 outbreak began transmitting rapidly through the migrant worker community, a rich learning opportunity presented.<sup>(5)</sup> All purpose-built dormitories were isolated to limit spread to the general Singaporean community, and provided with daily medical services. Many volunteers engaged in the dormitory response assisted in epidemiologic data management and general engagement with the migrant worker population. Medical students from Singapore and those returning from overseas universities were eager to help. However, it was felt that this was not advisable at that time. Unfortunately, this limited the students' capacity to understand the social determinants contributing to the vulnerability of migrant workers. The opportunity for first hand participation in risk communication and health engagement, epidemiology, case management, logistics, public health, and global equity issues was missed.

While pedagogical philosophy dictates that medical students be treated as an integral part of the healthcare team, it is true they are less experienced and not under the same obligations as healthcare workers.<sup>(4)</sup> It may also be argued that the educational and operational benefits do not outweigh the risk of exposure.<sup>(4)</sup> Nonetheless, by failing to advocate for policies that allow for experiential educational opportunities on-ground, we risk missing out on the biggest teaching opportunity COVID-19 has presented to this generation.

Sheltering medical students from the realities of a pandemic may seem prudent in the short run but could prove unwise long term. The prestige and honour conferred onto the pursuit of medicine, without sober dealings of the occupational risks involved, is contradictory. Today's medical students will be involved in tomorrow's pandemic but possibly without the practical experience, emotional preparedness and mental resilience they could be developing now, under the privilege of close supervision.

### **MORAL RIGOR**

In situations where personal choice and moral courage need to be exercised, it is arguable that community-based learning through service learning is essential. Involving students safely in frontline work like taking challenging medical histories in personal protective equipment (PPE) from migrant workers strengthens self-esteem by integrating cognitive, affective, attitudinal factors, that are essential in doctoring.<sup>(15-17)</sup> Acquisition of autonomy and responsibility is grounded in self-determination theory, where the satisfaction of competence, autonomy and relatedness increases intrinsic motivation.<sup>(18)</sup> The opportunity to access such experiences could have created the educational highlight of this generation's medical students.

### **CHALLENGES IN PRACTICE**

Learning about infectious disease and outbreak response is essential in medical education. Yet, facilitated supervised experiential learning during an outbreak is still uncommon. While medical schools have been keen to adapt their mode of teaching using technology, they have only done so typically with traditional content or by teaching COVID-19 related curricula online. Generally, schools have either not been enabled to create new content in new delivery modes or have not acted to adopt unique opportunities currently available. Educational barriers to practical implementation include the fear of disrupting existing curricula and clinical

rotations, difficulty in coordinating the timing of educational experiences, challenges of curating suitable educational opportunities for clinical and pre-clinical year students, and the lack of on-ground expertise by medical administrators and educators to construct learning that can be easily coordinated with response operations staff.<sup>(19)</sup> The fluidity of on-ground efforts also presents challenges to schools in reconciling learning requirements with opportunities, to ensure that quality of training is uncompromised by weak supervision or demands to practice outside one's competencies.<sup>(19)</sup> Operational staff who are under mental and physical strains may also be unwilling to undertake additional responsibilities to supervise medical students or assume responsibility for their safety.<sup>(20)</sup> Concerns of inexperience, community transmission and a risk aversion culture are all barriers to inviting students to the frontline.<sup>(20)</sup>

It can be argued that the individual risk of infection to a student does not justify the educational gain. Additionally, medical students could perpetuate transmission, consume much-needed PPE and place additional responsibilities on already-stretched frontline workers. Indeed, such medical student engagement should not be undertaken brazenly with any degree of chutzpah. Several practical ways to mitigate risks include training medical students in infection control measures.<sup>(20)</sup> Student involvement should be voluntary, not coerced.<sup>(3,7)</sup> Health insurance, parental consent, and appropriate training are essential.<sup>(7)</sup>

## **ENGAGING MEDICAL STUDENTS IN THE OUTBREAK RESPONSE**

There are many stakeholders in the subject of student involvement. Medical schools and their faculty, health ministries, hospitals, operational staff, students and their families need to understand the emphasis on their involvement as a pedagogic experience. A worthwhile contribution to the response is likely, albeit secondary. The benefits will be enhanced with clear objectives, structure and supervision. Core competencies can also be identified as the attachment progresses. Maximising learning and mitigating risks are key to obtaining the

necessary buy in. Strong top-down commitment to support student involvement by closely monitoring evolving infection control policies would pave the way for creating adaptable educational learning opportunities, online and experientially. Possibilities include creating COVID-19 specific elective terms or building a module into the curriculum. For instance, a blended learning format, comprising online webinars, panel interviews, case discussions and experiential activities like shadowing frontline workers, and supporting frontline patient care could be made possible. Table I details the obstacles and solutions to medical student involvement during an outbreak, while Table II illustrates an example of a one-week program curated for students during an outbreak. This program could be contextualized to aspects of outbreak response such as clinical care, epidemiology, infection prevention and control, or risk communication and community engagement (RCCE).

Given the unpredictability of outbreak situations, educators and administrators in medical schools should exercise flexibility to adjust subsequent rotations and adapt learning outcomes. A call for educators to step forward as supervisors in a short-term capacity to function as mentors to help students process their experiences through reflective exercises and provision of daily feedback, serves as a powerful learning experience. While a blanket authorization for all students to be involved may be unrealistic, a middle ground to involve students at a level they are comfortable with should be sought. Even observing policy discussions would expose medical students, who may fill tomorrow's public health leader positions, to precious insights into crisis management. Allowing students to play a part, however small, in outbreak responses affirms them as being part of the healthcare profession.

## **CONCLUSION**

Medical schools worldwide are missing the opportunity to provide their students a unique learning experience. A welcoming stance to embrace medical students into a pandemic, with

appropriate training, precautions and supervision will change how physicians-in-training perceive their profession, and instil the intangibles that can only be wrought through crisis-fortitude, valour and good conscience. The COVID-19 outbreak presents an unrivalled opportunity for this.

To conclude, it behooves us all to be wary of attempts to overly protect medical students from the risks of a pandemic. Exercising flexibility, responsiveness and creativity to involve students is worthwhile. Committing to support our students' education and wishes to participate in the COVID-19 fight affirms values of compassion, integrity and altruism that we try so hard to teach in a classroom. While we recognize their limitations as students, we should acknowledge our responsibility to grow future public health leaders.

Let us not let COVID-19 be a missed opportunity for medical education worldwide.

## REFERENCES

1. General Medical Council, Medical Schools Council. Achieving good medical practice: guidance for medical students. Available at: [https://www.gmc-uk.org/-/media/documents/achieving-good-medical-practice-20200729\\_pdf-66086678.pdf](https://www.gmc-uk.org/-/media/documents/achieving-good-medical-practice-20200729_pdf-66086678.pdf). Accessed August 5, 2020.
2. Whelan A, Prescott J, Young G, Catanese VM. Guidance on medical students' clinical participation: effective immediately. In: Association of American Medical Colleges [online]. Available at: <https://lcme.org/wp-content/uploads/filebase/March-17-2020-Guidance-on-Medical-Students-Clinical-Participation.pdf>. Accessed August 5, 2020.
3. Medical Schools Council. Statement of expectation: medical student volunteers in the NHS. Available at: <https://www.medschools.ac.uk/media/2622/statement-of-expectation-medical-student-volunteers-in-the-nhs.pdf>. Accessed August 5, 2020.
4. Rose S. Medical student education in the time of COVID-19. JAMA 2020; 323:2131-2.

5. Lim MZ. Coronavirus: migrant workers important to S'pore economy, say business and trade groups in response to calls to limit numbers. The Straits Times 2020 May 27. Available at: <https://www.straitstimes.com/singapore/business-and-trade-groups-underline-importance-of-migrant-workers-to-singapore-economy>.
6. Harris K. Covid 19 coronavirus: med students working in the crisis could be off the cards. NZ Herald 2020 March 31. Available at: [https://www.nzherald.co.nz/nz/news/article.cfm?c\\_id=1&objectid=12320873](https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12320873).
7. Ahmed H, Allaf M, Elghazaly H. COVID-19 and medical education. Lancet Infect Dis 2020; 20:777-8.
8. Lim EC, Oh VM, Koh DR, Seet RC. The challenges of “continuing medical education” in a pandemic era. Ann Acad Med Singap 2009; 38:724-6.
9. COVID-19: Updates from Singapore 2020. In: Yong Loo Lin School of Medicine, National University of Singapore, Singapore [online]. Available at: <https://medicine.nus.edu.sg/cet/covid-19-updates-from-singapore/>. Accessed August 5, 2020.
10. Maudsley G, Strivens J. Promoting professional knowledge, experiential learning and critical thinking for medical students. Med Educ 2000; 34:535-44.
11. Ord J, Leather M. The substance beneath the labels of experiential learning: the importance of John Dewey for outdoor educators. J Outdoor Educ Env Educ 2011; 15:13-23.
12. Thomas A, Menon A, Boruff J, Rodriguez AM, Ahmed S. Applications of social constructivist learning theories in knowledge translation for healthcare professionals: a scoping review. Implement Sci 2014; 9:54.
13. Candarli D, Yuksel HG. Students' perceptions of video-conferencing in the classrooms in higher education. Procedia Soc Behav Sci 2012; 47:357-61.



14. Fitzgibbon P. Challenges of video-conferencing teaching and effective teaching methods. *Turkish Online J Educ Technol* 2003; 2:30-4.
15. Rosenberger C. Beyond empathy: developing critical consciousness through service learning. In: O'Grady CR, ed. *Integrating Service Learning and Multicultural Education in Colleges and Universities*. New Jersey, NJ: Lawrence Erlbaum Associates Publishers, 2000: 23-43.
16. Suarez D. The development of empathetic dispositions through global experiences. *Educ Horiz* 2003; 81:180-2.
17. Camerino O, Valero-Valenzuela A, Prat Q, Manzano Sánchez D, Castañer M. Optimizing education: a mixed methods approach oriented to teaching personal and social responsibility (TPSR). *Front Psychol* 2019; 10:1439.
18. Reeve J. A self-determination theory perspective on student engagement. In: Christenson SL, Reschly AL, Wylie C, eds. *Handbook of Research on Student Engagement*. Boston, MA: Springer, 2012: 149-72.
19. Pant J, Pant MK, Naithani M. Contribution and dilemmas of medical undergraduate students in combating disease outbreaks: COVID 19 and previous outbreaks. *Adv Med Educ Pract* 2020; 11:661-7.
20. Miller DG, Pierson L, Doernberg S. The role of medical students during the COVID-19 pandemic. *Ann Intern Med* 2020; 173:145-6.

**Table I: Obstacles faced by various stakeholders and proposed solutions to medical student involvement during an outbreak.**

<b>Primary stakeholder involved</b>	<b>Obstacles faced by stakeholders</b>	<b>Proposed solutions</b>
Medical school	Initial incomplete understanding of the routes of transmission, rapidly changing infection control policies and concerns of involving students with little clinical experience.	A specific commitment to monitor evolving policies and guidelines that affect the students.
	Educational faculty and administrative staff may be resistant to change.	Senior management to highlight the outbreak as a valuable educational opportunity.  A call for educators to act as short-term supervisors and mentor students to process their experiences through reflection and feedback.  Tangible rewards provided to educational and administrative staff.
	Educational barriers to practical implementation, such as difficulties in coordinating educational experiences of students.	Creation of COVID-19 specific elective terms or building a module into the curriculum.
	Fluidity of on-ground efforts may compromise quality of training, creating difficulties in reconciling learning requirements with opportunities.	Core competencies can be identified and allowed to evolve as the attachment progresses.  The Medical Education Board equivalent may accommodate changes in instructional methods as long as competency is uncompromised.
Parents of medical students	Parental objections for students under 21 years of age.	Ensuring uncoerced voluntary student involvement, health insurance, parental consent, and appropriate training are essential.
Frontline Workers	Mental and physical strains could reduce operational staff's willingness to undertake the additional responsibility of supervising medical students and ensuring their safety.	Provision of staff engagement, monetary reimbursements and staff recognition.
Ministry of Health	Concerns of inexperience, community transmission and a risk aversion culture.	Measures can be taken to monitor evolving infection control policies and ensure stringent guidelines and precautions for supporting student involvement.
	Concerns of medical students perpetuating transmission and consuming much-needed PPE.	Sufficient PPE stocks should be ensured and medical students should be mandatorily trained in infection control measures.

**Table II: An example of a week-long program curated for students in an outbreak response.**

	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>	<b>Day 5</b>
<b>Morning</b>	Introduction to program: Objectives and learning outcomes (online learning)	Travel to community site	Travel to community site	Videos of outbreak response* conducted in Singapore and abroad with facilitated analysis (online learning with facilitated group discussions)	Making a programme successful: leveraging and sustainability (online learning)
	Essentials of outbreak response and introduction to the core pillars of outbreak response (online learning)	Interviews with senior doctors and nurses working in the frontline (on-site learning)	Strengths and pitfalls for outbreak response* (on-site learning with facilitated group discussions)	Challenges and opportunities in stakeholder engagement (interactive panel interview)	Leadership and managing human resources in crises (online learning with case discussions)
		Tutorials with on-site supervisor (on-site learning)	Communication skills in an outbreak (on-site learning with case discussions)		
	Stories from the field: A panel interview with healthcare frontline workers (interactive panel interview)	Question and Answer with supervisor (on-site learning)	Pillars of an outbreak response* among vulnerable groups (on-site learning with project group work)	Perspectives and challenges faced by non-profit organizations (interactive panel interview)	Group discussions and presentations
PPE training (on-site training)					
<b>Lunch</b>					
<b>Afternoon</b>	Travel to community site	Undertake assigned activities (on-site learning)	Observation of activities (on-site learning)	Travel to community site	Travel to community site
	Briefing and introductions, tour at community site (on-site learning)				Conduct health engagement activity with community (on-site learning)

	Observation of activities (on-site learning)		Planning of outbreak response* activities (on-site learning with project group work)	Planning of outbreak response* activities (on-site learning with project group work)	
	Learning how to reflect and class discussion on lessons learnt (on-site learning)	Individual reflections and debrief with supervisor (on-site learning)	Facilitated reflections within project groups	Facilitated reflections within project groups	Final class reflections and submission of assignments

\*May be contextualized according to tutor’s area of expertise, such as in infection control or risk communication and community engagement (RCCE)