

ONLINE FIRST PUBLICATION

Online first papers have undergone full scientific review and copyediting, but have not been typeset or proofread. To cite this article, use the DOI number provided. Mandatory typesetting and proofreading will commence with regular print and online publication of the online first papers of the *SMJ*.

Emergency medicine residency training during COVID-19

Jen Heng Pek¹, MCEM, MMed, Jian Wen Matthew Low², MBBS(Hons), MRCEM,
Thian Phey Lau², MCEM, MMed, Han Nee Gan³, MBBS, MRCSEd,
Dong Haur Phua⁴, MMed, FAMS

¹Department of Emergency Medicine, Sengkang General Hospital, ²Department of
Emergency Medicine, National University Hospital, ³Accident and Emergency Department,
Changi General Hospital, ⁴Emergency Department, Tan Tock Seng Hospital, Singapore

Correspondence: Dr Pek Jen Heng, Consultant, Department of Emergency Medicine,
Sengkang General Hospital, 110 Sengkang East Way, Singapore 544886.
pek.jen.heng@singhealth.com.sg

Singapore Med J 2020, 1–14

<https://doi.org/10.11622/smedj.2020139>

Published ahead of print: 21 September 2020

Online version can be found at
<http://www.smj.org.sg/online-first>

INTRODUCTION

Coronavirus disease 2019 (COVID-19) was declared to be a pandemic by the World Health Organization on 11 March 2020.⁽¹⁾ In Singapore, the first imported case of COVID-19 was confirmed on 23 January 2020, and the first local transmission of COVID-19 was confirmed on 4 February 2020. Since then, there have been 55,747 cases of COVID-19 as of 16 August 2020. Among these, 3,767 (6.8%) cases are cared for in hospitals or community care facilities, 51,953 (93.2%) cases have been discharged and 27 (0.05%) cases have died.⁽²⁾

COVID-19 and healthcare workers in Singapore

Measures have been implemented to raise the staffing and capacity of the healthcare system in Singapore to deal with the COVID-19 outbreak. These include boosting manpower in emergency departments (EDs) by seconding staff from other departments, scaling down elective surgeries and non-urgent clinic visits, and cancelling leave of staff.

In response to the DORSCON (Disease Outbreak Response System Condition) orange status, the Ministry of Health issued movement restrictions for healthcare workers to minimise transmission risks among healthcare workers and between healthcare institutions in Singapore. Those working in public institutions can only move within the same healthcare campus, or between designated acute hospital and community hospital or acute hospital and medical centre pairings.

Emergency medicine residency training

Emergency medicine residency training was introduced in Singapore in 2010. Modelled after the residency system in United States, it aims to provide structured and formative postgraduate training for doctors in Singapore.⁽³⁾ The five-year programme, consisting of three years in junior residency and two years in senior residency, is offered by three sponsoring institutions

– National Healthcare Group, National University Health System and Singapore Health Services (Table I). Each sponsoring institution consists of a group of hospitals where residents undergo rotations of varying durations for learning and assessment. All three programmes are accredited by the Accreditation Council for Graduate Medical Education-International. The emergency medicine residency curriculum is covered at a five-hour national emergency medicine core conference that is held every two weeks for all residents. Additional education activities are organised by individual sponsoring institutions for their residents.

Table I. Overview of emergency medicine residency programmes in Singapore.

Feature	National Healthcare Group	National University Health System	Singapore Health Services
Hospitals under sponsoring institution	<ul style="list-style-type: none"> • Khoo Teck Puat Hospital • Tan Tock Seng Hospital 	<ul style="list-style-type: none"> • National University Hospital* • Ng Teng Fong General Hospital 	<ul style="list-style-type: none"> • Changi General Hospital • KK Women's and Children's Hospital* • Sengkang General Hospital • Singapore General Hospital
Type of hospital	Tertiary hospitals, academic centres in an urban area	Tertiary hospitals, academic centres in an urban area	Tertiary hospitals, academic centres in an urban area
No. of beds	761–1,500	700–1,250	830–1,700
Annual attendance at ED	105,000–120,000	102,000–108,000	101,000–157,000
No. of residents	27	22	39

*Tertiary paediatric care consisting of paediatric EDs and paediatric inpatient units are available. ED: emergency department

As the demand for medical service peaks during this pandemic, the education and training needs of emergency medicine residents may consequentially take a backseat and be overlooked. In this report, we describe our experience with emergency medicine residency training during COVID-19 in Singapore. The unique educational opportunities, atypical barriers to training and resourceful strategies to overcome them are discussed. We advocate that learning can and should occur during the pandemic.

OPPORTUNITIES IN EMERGENCY MEDICINE RESIDENCY TRAINING

Learning can take place at every moment. Medical educators should identify unique prospects in this pandemic and present them as learning opportunities for emergency medicine residents.

Firstly, the topic of emerging infectious diseases is a core component of emergency medicine practice.⁽⁴⁾ The COVID-19 pandemic allows residents to gain firsthand experience in managing an emerging infectious disease as it evolves in real time from a novel infection to a pandemic. By being at the front line, residents are able to understand the roles that emergency medicine plays in the healthcare response to the pandemic.⁽⁵⁾ In particular, residents gain an enhanced awareness of systems-based practice as they witness the transformation of the nation's healthcare system to manage COVID-19 and interact with these transformed elements.⁽⁶⁾ For instance, primary care clinics in Singapore have been converted into Public Health Preparedness Clinics to provide subsidised treatment and medication during public health outbreaks.⁽²⁾ These clinics are familiar with the appropriate care protocols and risk-stratify patients, referring suspected cases to the ED for further testing. Consequentially, EDs have to deal with surges in attendance and need to expand their capacity to house and treat patients by adopting strategies such as creating alternate spaces for care and optimising manpower such as making roster changes and supplementing staff from inpatient teams.

This enhanced awareness of practices and systems established in response to a pandemic extends beyond EDs and healthcare institutions. It includes a greater appreciation of their roles in the nation's strategies to combat and contain the COVID-19 outbreak. Residents also gain a deeper understanding of medicolegal frameworks pertinent to emerging infectious disease, such as Singapore's Infectious Disease Act, the doctor's legal obligation to report positive cases to the Ministry of Health in a timely manner, and law enforcement and penalties

that were instituted to deter non-compliance with implemented strategies and flatten the pandemic curve.^(2,7)

Beyond acquiring up-to-date knowledge of COVID-19 and the latest disease-specific protocols for the purpose of patient management, working in a pandemic requires residents to be cognisant of their institution's infection control protocols. Residents must also reinforce their knowledge, skills and discipline regarding the use of personal protective equipment (PPE), which may have suboptimal compliance at baseline.⁽⁸⁾ Additional training is necessary for PPE such as powered air-purifying respirators that are less often encountered in usual day-to-day practice before the pandemic. Strict adherence to infection control protocols and proper use of PPE are paramount during the pandemic, as any non-compliance can put residents and those around them at risk for COVID-19.

The ethical considerations of care during a pandemic must also be emphasised to residents as they face a surge in attendance to EDs and an exponential increase in the number of patients with COVID-19. Healthcare resource may be stretched or lacking. Consequently, resource allocation and management decisions must be made for the greater good for public health rather than the individual concerned. In the COVID-19 pandemic, this may mean deciding which patient to intubate or move to the intensive care unit, as well as who to palliate and die in the ED.⁽⁹⁾ These decisions will occur frequently in a pandemic and represent a significant deviation from peacetime. Therefore, a clear ethical framework must be in place and disseminated to residents so that they understand the decision-making process and can accept the decisions that are made.⁽¹⁰⁾

Aside from fulfilling their clinical duties, residents can get involved in collaborations within or across departments and institutions. For instance, they can be part of the team responsible for crafting care pathways or clinical workflows for management of suspected patients with COVID-19 in the ED. In doing so, residents can exercise their leadership and

organisational skills. They can also develop their appreciation and understanding of the considerations and complexities in the design and implementation of clinical protocols at the administrative level. Most importantly, this is a rare opportunity for residents to be involved in an actual practical session of decision-making in response to a pandemic. They stand to gain invaluable experience to cope with the next emerging infectious disease or pandemic and also grow in their proficiency as an emergency physician.

Perhaps the most profound learning opportunity for residents during this pandemic is forming and shaping their professional identity by observing senior clinicians.⁽¹¹⁾ During these extraordinary times, residents are likely to look to their role models, observing their responses and absorbing the values implicitly expressed in their choices and actions. The COVID-19 pandemic allows senior clinicians to demonstrate how they inspire solidarity and teamwork in order to achieve departmental resilience. In contrast, modifications in clinical practice, changes in work environment and adjustments to the shift roster challenge their individual resilience, providing residents an opportunity to grow, overcome and build self-efficacy.

Nonetheless, even while the aforementioned opportunities for learning allow residents to enhance their knowledge, improve their skills and develop their attitudes, the durability of these learning moments is uncertain. The ideal outcome is the formation of a deep collective memory in these residents so that when they become leaders and senior clinicians, they will drive pandemic preparedness between outbreaks, thus producing an expeditious, effective and improved response to the next pandemic.

CHALLENGES TO EMERGENCY MEDICINE RESIDENCY TRAINING

Conversely, the COVID-19 pandemic also brings about challenges to emergency medicine resident training, causing major disruptions to pre-planned learning activities for the residents.

The greatest challenge is the lack of time and learning activities for residents. The demand to meet service needs is a priority, as waves of patients present to the EDs during the pandemic. As a result, protected training time is frozen or reduced to ensure that residents are available to augment manpower on the front line. In addition, the limitation on movement of healthcare workers between institutions and enforcement of social distancing have led to the cancellation of all in-person and large group teaching sessions, such as emergency medicine core conferences and simulation trainings. Major international and local scientific conferences such as the International Conference on Emergency Medicine in Buenos Aires, Argentina, and the Annual Scientific Assembly of the Society for Emergency Medicine in Singapore have also been called off. These have vastly reduced the number of traditional learning activities for residents.

While firsthand experience in managing an emerging infectious disease and pandemic is an invaluable lesson for emergency medicine residents, not all residents are scheduled to work in the ED during this period. Residents may be on off-service rotations to gain clinical exposure and experience in specialties such as anaesthesia and orthopaedics, which are relevant to the practice of emergency medicine. Hence, they may not get to learn the aforementioned lessons related to emergency medicine and the COVID-19 pandemic.

Training outcomes and schedules are also inevitably disrupted by the pandemic. Residents who are posted to off-service rotations may not meet their learning objectives when elective surgeries and non-urgent clinic appointments are rescheduled. The reduction in clinical load means a loss of clinical material for learning, which can adversely affect their training. Furthermore, the movement restrictions for healthcare workers disrupt rotation schedules that were meticulously planned and timed to meet training needs and progression requirements, and can delay the progression or completion of training. In the same vein, formative and summative

assessments, as well as board exams for specialist accreditation, may be interrupted in the current situation.

Physical and mental exhaustion while performing their duties of care can lead to burnout among residents.⁽¹²⁾ Contributory factors include lack of time, loss of control, difficult situations, work plan and organisation disruption, as well as conflict in interpersonal relationships.⁽¹³⁾ All these factors are amplified during a pandemic. In addition, residents need to reconcile their ethical obligations of duty with the threat of contracting the disease. As a result, residents may be overwhelmed and burnout is more likely to ensue, negatively impacting work performance as well as learning in this difficult time.

A resident is not just a learner but also an educator involved in the teaching of medical students and other residents in training.⁽¹⁴⁾ This involvement increases their teaching portfolio and prepares them for a career in academic medicine. However, during this pandemic, the barring of medical students from clinical postings at the ED and suspension of learning activities for residents results in reduced opportunities and settings for teaching.⁽¹⁵⁾ Furthermore, a strained schedule and the lack of dedicated time further negates residents' involvement in teaching.

While these challenges seem insurmountable during COVID-19, they are not impossible to overcome. Ideally, medical educators should respond in a prompt and adaptive manner, to guide and empower residents during the pandemic.

ADAPTIONS BY RESIDENCY PROGRAMMES IN RESPONSE

With the disruptions in emergency medicine residency training, programme directors and faculty had to respond in a swift and flexible manner to realign learning outcomes as well as reschedule training activities and clinical rotations.

The initial few weeks saw many teaching sessions being postponed or cancelled. However, with time, faculty and residents were able to adopt various strategies to continue training. Despite the increase in ED patients, bedside teachings are still possible and continue to provide essential clinical learning for residents. Other forms of in-person sessions, when possible, have reduced class sizes to comply with guidelines on social and safe distancing. In situ simulations involving the use of low-fidelity mannequins have replaced sessions at the simulation centre. More commonly, however, teaching sessions are taking place virtually using online platforms. Learning materials such as annotated slides and pre-recorded didactic teachings are deposited in an online repository to which residents are given access. This allows them to engage in self-directed and asynchronous learning. Residents can also participate in faculty-facilitated discussion boards and video conferences at scheduled times for group learning. Despite these changes, efforts were made to ensure that the teaching content adheres to the planned curriculum for emergency medicine residency training. A special note is made of cancelled or postponed sessions so that make-up sessions can be arranged when normalcy resumes. Recognising the difficulty of planned residency teaching during the pandemic, fulfilment of the minimum training time as stipulated by residency regulations has been temporary suspended.

Efforts are also made to ensure that formative and summative assessments continue as planned for residents. While formative assessments such as workplace-based assessments are still in place with minimal disruptions, summative assessments have been affected to a greater extent with the cancellation of the annual in-training exam for residents in 2020. Fortunately, the national examination committees have announced the resumption of board exams for specialist accreditation, with modifications to the conduct and format of the exam during the pandemic. These include using mannequins and standardised patients instead of real patients

for the Objective Structured Clinical Examination and video conferencing instead of in-person for the *viva voce* exam.

As clinical rotations have been interrupted, multiple rounds of rearrangement have to be done in order to balance service and training requirements. Contingency rotation plans were also drawn up in anticipation of various time frames for resumption of rotations. The underlying principle for residency programmes is to minimise disruption to the residents' training. Key strategies included:

- Involve chiefs of services so that they are aware of any disruption in service requirements.
- Avoid rotation disruptions that are crucial for obtaining essential clinical experience (e.g. intensive care, trauma).
- Avoid rotation disruptions that may affect a resident's progression or credentialing for exam.
- Cut down elective and optional training so that time can be made available for make-up sessions of essential training.
- Use of alternative training sites as rotations between departments within a hospital are allowed but not rotations between hospitals.
- Appeal to regulators (e.g. Ministry of Health) to allow rotations that result in loss of essential clinical experience and cannot be made up to proceed.
- Appeal to regulators (e.g. Residency Advisory Committee) to allow dispensation of certain training requirements.

While residency programmes may subsequently receive citations arising from lack of training activities, inadequate training hours and unequal clinical experience, these requirements have been temporary suspended with permission from sponsoring institutions. Nonetheless, residency programmes are attempting to fulfil these requirements as best as the

situation allows and will aim to make good on these issues once the outbreak comes under control.

Faculty of residency programmes must be cognisant of the strain on residents during the pandemic. Attention to residents' welfare is paramount to prevent burnout. To achieve this, two-way open communication with the residents is done on a regular basis. Timely updates about residency matters such as training requirements and expectations, as well as make-up sessions for any disruptions, are essential. One constant message is reassuring residents that the residency programme will support them so that their progression is not adversely affected. Resources are made available to allow residents to reach out for support or counselling when necessary. Reminders are also in place to encourage mindfulness in their practice.

Faculty development programmes have been curtailed during this period. Unlike disruptions to residents' training, which may critically disrupt progression and future manpower, interruption of faculty development has less of an impact. Faculty training and teaching time have also been frozen to meet service demand, as emergency physicians are required at the front line. Therefore, the faculty needed to dedicate time outside of clinical work to prepare learning materials for the residents. It is a mammoth task to develop learning materials for a different teaching platform in a relatively short time. Division of labour between faculty in the residency programmes and collaborative efforts between residency programmes would make this transition smoother for all – together, we can achieve more.

Administrative support for residency programmes is crucial during such a time. Staff at different institutions are split into teams and allowed to work from home, with their work schedules made available to faculty. Communication is in the form of video conferences, phone calls and email correspondences to minimise contact with faculty and residents working at the front line. Prompt and responsive administrative efforts behind the scenes are key drivers of our efforts to continue residency training during the pandemic.

While our residency programmes have adapted to allow training to continue during COVID-19, more time is required to determine the success of these measures and their effectiveness. A follow-up study could examine the perspectives of both residents and faculty on residency training during the pandemic, and evaluate the educational impact of the various teaching methods employed.

MEDICAL EDUCATION DURING PANDEMICS

To our knowledge, this is the first report about the impact of COVID-19 on emergency medicine residency training in Singapore. We hope to encourage and empower medical educators to seek out educational opportunities while adopting innovative strategies to overcome existing barriers to training. Although it may be more challenging, education and training of emergency medicine residents can still happen during this pandemic, but rethinking of education methods and pedagogy is necessary.

As medical educators, we have a duty to educate and train the next generation of emergency physicians. However, when pandemics occur, the urgent need to provide and augment medical services for patients may be in direct conflict with the need for education and training.⁽¹⁶⁾ This is similar to 2003 when the medical education of doctors was curtailed during the SARS outbreak.^(17,18) Both faculty and residents may be overwhelmed with clinical duties, leaving them less time for education and training-related activities. Furthermore, measures to counteract outbreaks such as social distancing and minimising interactions between healthcare workers of different institutions may prevent faculty and learners from gathering in a physical space. The use of audio or video recordings, webcasting and online chatrooms has been adopted to facilitate education and learning.⁽¹⁹⁾ However, these technology-based solutions can be resource- and manpower-intensive, deterring their use.⁽²⁰⁾ Materials often need to be created or modified to suit the alternative media for teaching. Appropriate hosting or storage platforms

may also be needed to provide a virtual space for learning, incurring payment or subscription fees. Fortunately, with the development of technology and greater accessibility of the Internet, sharing of information has become much easier. Educators can tap on available resources such as the MedEdPORTAL to select material that meets their needs and modify them instead of creating new material from scratch.⁽²¹⁾ In the face of pandemics, educators need to embrace innovations and be resourceful as they continue their efforts to educate residents.

Preparedness is the key to success, in healthcare as in business. Business continuity planning creates a system of prevention and recovery from potential threats to a company's personnel and assets, so that the company can continue functioning and achieve sustainable development during major events such as mass casualty incidents, disasters and pandemics.⁽²²⁾ In healthcare, contingency planning for crisis is primarily focused on clinical services. This ensures that healthcare teams are prepared to cope with the surge of cases and medical care can be provided. But this 'business-as-usual' approach often does not involve medical education, and training activities are often put on hold – sometimes indefinitely. When operations and the educational mission of residency programmes are disrupted, medical educators need to determine the best course of action for training,⁽²³⁾ deciding on learning objectives, teaching curriculum, education strategies and methods of delivery so that some form of normality can be restored until the crisis is over. However, this response takes time. Major events such as COVID-19 can occur again. It is therefore important to formulate contingency plans before they occur so that disruptions to medical education can be minimised.

CONCLUSION

This crisis should not go to waste. In the time of COVID-19, education opportunities exist for emergency medicine residents, but educators need to mitigate barriers and be creative in their approach to teaching. Further research and guidance are needed to identify training needs and

assess the effectiveness of the educational strategies we have described to support training for emergency medicine residents during a major event.

REFERENCES

1. World Health Organization. Coronavirus (COVID-19) outbreak. Available at: <https://www.who.int/westernpacific/emergencies/covid-19>. Accessed March 23, 2020.
2. Ministry of Health, Singapore. Updates on COVID-19 (coronavirus disease 2019) local situation. Available at: <https://www.moh.gov.sg/covid-19>. Accessed May 4, 2020.
3. Lim BL. Residency programmes in Singapore – challenges ahead. *Ann Acad Med Singapore* 2013; 42:265-6.
4. Counselman FL, Babu K, Edens MA, et al. The 2016 model of the clinical practice of emergency medicine. *J Emerg Med* 2017; 52:846-9.
5. Mo Y, Archuleta S, Salmon S, Fisher D. Residency training at the front of the West African Ebola outbreak: adapting for a rare opportunity. *PLoS Curr* 2016; 8.
6. Wong JEL, Leo YS, Tan CC. COVID-19 in Singapore – current experience: critical global issues that require attention and action. *JAMA* 2020 Feb 20. <https://doi.org/10.1001/jama.2020.2467>. [Epub ahead of print]
7. Singapore Statutes Online. Infectious Diseases Act. Available at: <https://sso.agc.gov.sg/Act/IDA1976>. Accessed April 3, 2020.
8. Carter EJ, Wyer P, Giglio J, et al. Environmental factors and their association with emergency department hand hygiene compliance: an observational study. *BMJ Qual Saf* 2016; 25:372-8.
9. Rosenbaum L. Facing Covid-19 in Italy - ethics, logistics, and therapeutics on the epidemic's front line. *N Engl J Med* 2020; 382:1873-5.
10. Torda A. Ethical issues in pandemic planning. *Med J Aust* 2006; 185(S10):S73-6.
11. Cruess RL, Cruess SR, Boudreau JD, Snell L, Steinert Y. A schematic representation of the professional identity formation and socialization of medical students and residents: a guide for medical educators. *Acad Med* 2015; 90:718-25.

12. Ong AML. Impact of COVID-19 on medical education and resident burnout in a postgraduate programme. *Singapore Med J* 2020 Jun 26. <https://doi.org/10.11622/smedj.2020100>. [Epub ahead of print]
13. Ishak WW, Lederer S, Mandili C, et al. Burnout during residency training: a literature review. *J Grad Med Educ* 2009; 1:236-42.
14. Tacci JA. The resident as teacher: a neglected role. *JAMA* 1998; 280:934m.
15. Tan KI, Foo J, Ang BWG, Chua JW, Teo DB. Perspectives of medical students on local medical education during COVID-19. *Singapore Med J* 2020 Jul 16. <https://doi.org/10.11622/smedj.2020105>. [Epub ahead of print]
16. Wong CS, Tay WC, Hap XF, Chia FL. Love in the time of coronavirus: training and service during COVID-19. *Singapore Med J* 2020; 61:384-6.
17. Sherbino J, Atzema C. “SARS-Ed”: severe acute respiratory syndrome and the impact on medical education. *Ann Emerg Med* 2004; 44:229-31.
18. Clark J. Fear of SARS thwarts medical education in Toronto. *BMJ* 2003; 326:784.
19. Lim EC, Oh VM, Koh DR, Seet RC. The challenges of “continuing medical education” in a pandemic era. *Ann Acad Med Singapore* 2009; 38:724-6.
20. Lim EC, Seet RC, Oh VM, et al. Computer-based testing of the modified essay question: the Singapore experience. *Med Teach* 2007; 29:e261-8.
21. Association of American Medical Colleges. *MedEdPortal: the journal of teaching and learning resources*. Available at: <https://www.mededportal.org>. Accessed March 23, 2020.
22. Kandel N. Is there a business continuity plan for emergencies like an Ebola outbreak or other pandemics? *J Bus Contin Emer Plan* 2015; 8:295-8.
23. Alvarez A, Messman A, Platt M, et al. The impact of due process and disruptions on emergency medicine education in the United States. *West J Emerg Med* 2020; 21:423-8.