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## COVID-19 Pandemic: Disruption or a Fertile Experiential Learning Platform for Emergency Medicine Residents?

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### ABSTRACT

With pandemics such as COVID-19, there will be disruptions to routines. A new norm should be established, knowing that the new disequilibrium can catalyse conflicts, misunderstandings, frustrations, avoidance, panic, anxiety, confusion and even fear. These must be anticipated and planned for early, addressing them through strategic plans, interventions and communications. In training and educating our emergency medicine residents, who are providing clinical service at the front line during the outbreak, a conscious effort has to be put in and be made known to them that the changes in workload, added practices and new training will value add to their development and experience in becoming an emergency physician. The changes will include a multitude of surrogate learning methodologies and tools, but also a relook at old practices through fresh eyes. The emergency medicine residents will also learn the importance of discipline, alignment with protocols and algorithms, how to be organised and create order, even if the untrained eye sees “chaos”. COVID-19 presented a very fertile ground for these residents, with the opportunity to learn and acquire so many new experiences. They are emotionally engaged. It offers a rich platform of experiential and embedded learning. Residents can “feel” the energy and dynamism. Without realising it, all these are critical to building the culture of the department and the practice of emergency medicine.

**Keywords:** *Experiential learning, Emergency medicine, Residency, COVID-19, Pandemic, Surrogate learning*

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## INTRODUCTION

In early December 2019, cases of persons with pneumonia of uncertain etiology began to surface in Wuhan, Hubei Province, China. Many of them were linked to a seafood wholesale market, selling Huanan delicacies. This is a market popular with the sales of live animals, which is very commonly found in this part of China. Other sources of the potential links were still being investigated then. A cohort of these patients developed severe acute respiratory distress and some rapidly developed acute respiratory distress syndrome (ARDS) and respiratory failure. By early January 2020, a novel coronavirus was identified by the Chinese Communicable Diseases Centre and this was then subsequently named the COVID-19 by World Health Organization. By then the numbers affected across many nations outside China, began to increase (1). The numbers of death within China itself increased exponentially. The global community watched anxiously as reported numbers climbed and countries began to execute border checks, travel restrictions, temperature monitoring, screening questionnaire and other restrictions protocols. By then, the spread had reached pandemic levels, globally. There were patients affected by COVID-19 in over 50 countries. In healthcare institutions, concerns loomed as to whether the world would see another infectious disease epidemic similar to severe acute respiratory syndrome (SARS). There began the heightened awareness and concerns due to the interdependence in the world today... whether in transportation, travels, mass migration, financial and even education sectors (2).

Work flow in our healthcare institutions across Singapore changed quickly to a pandemic model of preparedness which we have trained for and executed previously with other outbreaks of infectious diseases such as SARS. Healthcare systems are indeed complex systems. As such the preparedness plans are also multi-faceted,

multi-layered, multi-disciplinary and are made-up of multiple algorithmic steps. As all our public or government healthcare institutions in Singapore also serve as learning institutions for the training of doctors, nurses and other healthcare students and professionals, changes affected them. The training and learning of these healthcare students and professionals comprise of combinations and permutations of didactic, classroom teaching as well as bedside clinical learning and on the job training in clinical areas. They would usually be rotated to different departments within the same institution or to departments across different institutions during their training to gain as much exposure as possible. This is also because different institutions have a focus and strengths in different areas and it is important for those in training to learn and understand these. These may eventually have an impact on their future decisions to join institutions or to specialise in certain disciplines.

With our infectious diseases pandemic plans, cross-over of staff from different departments and across different institutions must be minimised. Non-clinical activities such as research (which can be single or multi-centre research), seminars, lunch time talks or conferences have to be curtailed as well. Personnel distancing and reduction of face-to-face interaction, only to the most essential is practiced. In hospitals, frontline and essential services became busier. Non urgent services and elective surgery were reduced. Manpower were seconded according to the area of need and demand but in a controlled fashion, in order to minimise interaction. In the emergency department (ED), teams (doctors, nurses and administration staff) were formed to work long shifts of 12–15 hours each. There must not be cross over of staff from the different teams and at change-over times there must be only the most crucial, short and targeted interaction for handovers.

Our public healthcare institutions are also active learning grounds for our medical students from the three medical schools

in Singapore as well as students from medical schools around the world, who come for their elective postings. There are also nursing and allied health students. One main difference between residents and medical students during outbreaks/pandemics is that the former are already working and on a roster or schedule. Thus, they will continue to work in the system and contribute towards the manpower. They are involved in providing care and are part of the response teams. Medical students on the other hand, are from a different institution and as such, their postings to healthcare institutions during the pandemic are halted. This is in order to reduce the chances of people from different institution or cohorts mixing.

## EMERGENCY MEDICINE CORE CURRICULUM AND TRAINING

All educational activities had to be modified accordingly during the COVID-19 outbreak. This included the weekly Emergency Medicine Core Curriculum (EMCC) training and clinical postings for residents.

The usual learning platform for EMCC comprises of the following:

### 5. Formal weekly training/teaching

It included pre-set topics and themes which can be delivered in the following ways:

- a. Didactic classroom teaching or lecture style delivery.
- b. Interactive sessions by experts or faculty members (these would cover both clinical and non-clinical topics).
- c. Resident led presentations.
- d. Flipped classroom sessions whereby learning and reading materials were circulated beforehand.

- e. Simulation-based learning: This can be done using the whole spectrum of simulation such as using task trainers, standardised patients, hybrid simulation, high fidelity simulation, virtual reality, etc.
  - f. On-site visits: an example would be to visit the emergency medical services controls room which received all 995 calls (common access) in Singapore.
  - g. E-learning platforms and blackboards.
  - h. Escape room activities.
  - i. Self-learning sessions, with guided materials to be provided by faculty in charge.
  - j. Projects, which may last several weeks to months such as a targeted, focused quality improvement project in the ED.
6. Clinical learning platforms

These are conducted in the EDs, the wards and intensive care units (ICUs) for the different postings the residents go through. Some of these would include ICUs postings (e.g., medical ICU, surgical ICU, neuro-surgery ICU, paediatric ICU and other respiratory medicine, general surgery, internal medicine, orthopaedics wards and operating theatres). Many of these teachings are at the bedside, with total immersion in the clinical environment. Mini-clinical evaluation exercise (CEX) assessments, bedside ultrasound training and hands-on procedural assessment are examples of teaching going on at the bedside in the clinical areas. After every shift in the ED, residents were also provided with their individualised “shift cards” which detail their performance for

that shift; what went well, what did not, what can be improved, by their supervising faculty. This open discussion allows for “on the job” as well as “of the job” reflection. At times, after the shift, residents would be taken through a case-based discussion on any interesting or complex patients they would have seen and managed during that shift.

7. Other learning platforms and opportunities

There will be an ad-hoc seminars and conferences:

- a. Expert lectures (by visiting experts).
- b. Appraisal of research paper.
- c. Research projects and meetings.
- d. Educational projects or proposals.
- e. Others.

## UNIQUE LEARNING OPPORTUNITIES...IN THE TIME OF COVID-19

With pandemics such as COVID-19, there will be disruptions to routines. A new norm should be established, knowing that the new disequilibrium can catalyse conflicts, misunderstandings, frustrations, avoidance, panic, anxiety, confusion and even fear. These must be anticipated and planned for early, addressing them through strategic plans, interventions and communications (3–5). Leaders, supervisors and faculty can help to facilitate the adaptation. They can help by ensuring early engagement with the healthcare staff. This is critical. As face-to-face interactions were being curtailed during this outbreak, non-essential gatherings were reduced significantly. The practice of social distancing was encouraged and the usual learning processes were modified and customised. New innovative techniques

were introduced. It is a matter of looking at old routines, processes and habits, through new lenses.

### History-Taking in a New Light

Starting with the routine history-taking, which is something every doctor performs many times over daily, there are critical questions that need to be put forth during this outbreak. Residents have to get details of travels, stop-overs, transits, places the patient had frequented, their job details, their exact symptomatology duration and people they had been in contact with (6). Contact tracing itself is very detailed and time consuming and this is often done by the staff from the epidemiology and public health departments in order to relieve some of the doctors’ workload. The residents will also acquire new terminologies in their vocabulary. An example related to COVID-19 would be a “superspreading event”, which is defined as three or more cases on a ward, 2–10 days after admission of an index patient, or as the development of three or more cases within an eight day period on a ward with no identifiable source of any cases (7). For some, this could be like re-learning history-taking for a pandemic. One could argue that these are questions doctors should be asking anyway. The fact is that when not encountering a pandemic or crisis, these are often overlooked and shortcuts may be taken, as a learned mechanism to accommodate a very busy practice.

### Work Flow and Processes

The other challenge is that as the outbreak progresses from the pre-pandemic to the pandemic stage, there were multiple changes to the case definition, the local clusters healthcare workers have to be aware of, and even the number of countries with significant community spread. This means the residents have to be updated in their practice, maybe even up to several times a day. This can prove to be a mental “marathon” and extremely exhausting. They

have to be familiar with the local algorithm to approach high risk patients, know when to advise throat swabs and be familiar with the workflow, which may be changed or updated regularly (7, 8). For the residents working in the fever screening area (FSA), where high risk patients, or those potentially more likely to be harbouring the infection, they may have to do this repeatedly during the course of their long shifts. When working in these areas, residents and doctors have to be donning their personal protective equipment (PPE) and gears. This can be quite exhausting, working in their impervious gowns, masks, gloves, face shields and eye goggles. Not forgetting that they would also have to perform procedures from the simple venipuncture to intubating the patient in respiratory distress and for the latter, the powered air-purifying respirator (PAPR) would have to be used (9, 10). These are some experiences which reading and watching a video cannot replicate.

### Infection Control Reinforcements

Since SARS in 2003, the ED has upgraded its infrastructure to include negative pressure areas for the management of patients at high risk of droplet infection transmission. Some of the residents will be working in these areas. They will have to abide by PPE guidelines, gowning and de-gowning procedures and many more. This is also the period when the essential steps of handwashing are re-visited to ensure every staff complies. In fact, the infection control division sends their staff down to perform audits of these practices by direct observations, during outbreaks. Every department in the institution continues to be audited on this. This helps reiterate to everyone their part and contribution towards zero-infection spread. Every staff, in particular those working in ICUs, EDs and front line care areas have been trained and gone through proper mask fitting sessions as well as PAPR training. At the early stages, anyone requiring refresher training or re-fitting of mask can choose any of several sessions help in the institution. The mask

refitting may become critical as there are different models of N95 masks and also facial features may have been altered, for example in someone who has lost weight, the mask fit may now be different and requires updating as well. A properly fitted mask can be life-saving for our healthcare workers. Performing procedures with PPE can be challenging and the “feel” of equipment can be more clumsy. This is something that residents would have to practice via simulation sessions, at regular intervals to upkeep their skills.

### Investigations and Droplet Infection

In terms of investigations that are to be ordered for patients, there may be a greater emphasis on serology and immunology tests, full blood counts, cultures and swab taking. The residents may also need a refresher in reading and ordering these investigations. Results that are returned positive will need to be informed to patients, or the inpatient teams in the wards. All confirmed cases in Singapore have to be updated to the Ministry of Health. Contact tracing then would have to be done by the epidemiology team. This can be time-consuming and must be done in a timely manner in order to get the fastest detection and identification of any potential clusters developing. This is also where residents will have to communicate with officers from Ministry of Health, Epidemiology Department, National Environment Agency, police and even the quarantine officers. This is something they do not regularly perform during non-pandemic times. They have to also make the accurate decision as to whether the patient can be discharged, needs quarantine, “stay home notice” or admission. There are also isolation wards, where they have to be familiar with the admission criteria.

During infectious disease outbreaks where droplet spread of the infectious agents is of great potential, we have stopped using nebulisation. Metered dose inhalers are delivered using a spacer to reduce the

dissemination of respiratory droplets. Nebulisation is a source of spread of infections such as SARS and COVID-19 (11–12). There are also precautions in the use of non-invasive ventilation such as continuous positive airway pressure (CPAP) and bi-level positive airway pressure (BiPAP) (13). These observations were made during the SARS outbreak. Despite the evidence being inconsistent, precautions are still implemented to ensure the safety of medical and healthcare staff caring for these patients. The residents will have to be familiar with all these changes within a short span of time. That is a whole lot of unlearning and re-learning for everyone (14–15).

In the institution as well as departmental pandemic committee, there are both senior and junior staff inter-professional representation. The young professionals are being exposed to such robust and dynamic committees for them to familiarise themselves and get the idea of workings and brain-storming that needs to be done in such outbreaks and crisis. They become empowered and feel the sense of belonging to the department and institution. This also comes with a sense of ownership of their commitment, work as well as the effort they put in. Also, with the teams in the ED, senior residents are given certain responsibilities with the faculty providing oversight and guidance as needed. This way, they get to learn through building up their experiences. This is all part and parcel of the process of grooming and developing our emergency physicians of the future (8–9). It is part of their professional growth cycle. This way they get to harness their clinical and critical reasoning processes and thought processes in approaching patients or issues in healthcare (9, 16). Faculty can prompt, assist and also educate them and this is done at strategic points, which will help them remember better. This kind of dynamic, transformative thinking and planning opportunities are indeed valuable. It keeps

them agile and nimble in a very robust and competitive, dynamic environment (17–18).

## **SURROGATE AND SUPPLEMENTAL LEARNING**

Knowledge is better and more lasting when it is constructed and not just transferred. It is built based on information, past and present experiences, hands-on skills and procedural familiarity through practice (8, 16). The supporting and nurturing environment is also important. Experience can indeed enhance the confidence levels in residents (19).

In learning, especially with the changes and disruption, attention and focus is the key. Our sensory memory is being bombarded by multiple stimuli from all our senses every day. Some of these are distractions and can be ignored. We will have to choose on the key and important ones to focus on. This is the gist of the cognitive load theory, which suggest for us to focus on the essential or critical information or actions and minimise other extraneous distracting elements (20). What is also important is to keep the learning process engaging, stimulating and enjoyable. When at ease, more learning can happen, but the contrary may also be true; which is that some level of stress and discomfort during learning allows for stronger and deeper engagement of the learner. Multi-modality stimuli, with all these other factors can help embed and assimilate new learning into our neural networks.

During pandemics, we have to rethink about how medical education is conducted and delivered. There would probably be an increase in the use of technology, but this has to be of the correct balance and combination in order to maintain realism, credibility and capabilities (5, 9). At the same time, issues of maintaining confidentiality and ensuring cyber-security must be mainstreamed (10, 16).

Some of the modalities and measures utilised would include (10, 16):

1. Use of patient surrogates.
2. Video-taped vignettes.
3. Using non-healthcare volunteers.
4. Use of video and audio recordings for multiple purposes.
5. The whole spectrum of simulation-based learning and training.
6. Webinars and web-casting.
7. Emailing materials e.g., reading materials, journal articles.
8. E-learning modules on various platforms, blackboard systems.
9. Virtual and augmented reality training.

These are possible not just for teaching during pandemics but can also be used at other times. In fact, they are getting more popular today. If there were high stakes summative examinations planned to be held and it coincides to the period of the outbreak, face-to-face appearance may be replaced with video-conferencing, telephone-based viva voce, zoom technology amongst other techniques.

Simulation based training is also used frequently for training emergency medicine residents to don PPE, perform procedures with PAPR, assess team coordination and performance, as well as managing high risk, complex patients. Besides for teaching and examination, artificial intelligence (AI) can also be used in clinical management. For example, AI can be used to monitor patients and staff's temperature and robots can be the interphase for communications with patients in isolation.

## SUB-CONSCIOUS AND INDIRECT LEARNING

As the residents embed themselves and are exposed to new information, procedures, algorithms, techniques and so on, they will inadvertently learn new things and acquire knowledge. This may happen even without them consciously realising it. This is experiential and can be very important and impactful in terms of learning (21). Their ability to be involved and immersed in this new workflow during the pandemic is significant and the steps will become embedded in their neural networks. This is spontaneous, unplanned learning. Subconsciously, faculty becomes their role models and the seniors certainly have to "walk the talk". The values, principles and practices they portray and transmit will rub off onto the residents and can certainly leave a lasting impression. Other values such as teamwork, camaraderie, working collaboratively, objectively brainstorming cases and issues together, having flexibility and adaptability to the ground situation are also important. So is the level of care and concern shown for each other and the inter-professional collaborative practice values. Inter-professional collegiality can at times be overlooked in the busy lives of medical professionals. Communications style and techniques, level of kindness and graciousness demonstrated in interactions are other important values. This is also where relationships are built. Strong bonds can be forged and the use of positive words and positive energy can help keep the whole team motivated during an extremely difficult and challenging period such as the COVID-19 pandemic.

Besides the above, residents also learn the importance of discipline, alignment with protocols and algorithms, how to be organised and create order, even if the untrained eye sees "chaos". COVID-19 presented a very fertile ground for the emergency medicine residents with the opportunity to learn and acquire so many new experiences. They are emotionally

engaged. It offers a rich platform of experiential and embedded learning. Residents can “feel” the energy and dynamism. Without realising it, all these are critical to building the culture of the department and the practice of emergency medicine. These cannot be essentially learnt from reading textbooks or watching videos, but have to be personally felt and experienced. How we perform together during the pandemic or any other crisis will impact our departmental and organisational culture. Culture is after all, about how we do things.

## CONCLUSION

With emerging infectious diseases, we will continue to see disruption in the coming years. Thus, the need to prepare our healthcare systems and healthcare learning systems is to negotiate these. The infectious diseases management and containment practices must be mainstreamed into healthcare institutions. It is also about the management of the mindsets of faculty, teachers and learners. As we have seen, the dynamic and robust changes during the COVID-19 pandemic calls for both residents and faculty to have a very adaptable and flexible approach that can help them get through the challenges. Thinking, feeling and doing are all habits of our mind and the experience of working during the pandemic is invaluable, as a learning platform for all. It offered a very fertile ground and our preparedness, moving forwards to gain extremely practical insights and experience. It should not be viewed as just another disruption but a call to improve and upscale ourselves.

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