OPINION ARTICLE

Continuing medical education during pandemic waves of COVID-19: Consensus from medical faculties in Asia, Australia and Europe [version 1]

Carmen Wong3, Walter van den Broek7, Gillian Doody6, Martin Fischer1, Michelle Leech2, Fabrizio De Ponti4, Alexander Gerbes1, Hiroshi Nishigori5, Young Mee Lee8, Maarten Frens7, Hideki Kasuya5, Franco Bazzoli4, Reinhard Hickel1, Hong Sik Lee8, J.P.T.M van Leeuwen7, Christina Mitchell2, Kenji K odomatsu5, John Atherton6, Francis Chan3

1 The Chinese University of Hong Kong
2 Erasmus University Medical Center
3 University of Nottingham
4 Ludwig Maximilian University of Munich
5 Monash University
6 University of Bologna
7 Nagoya University
8 Korea University

V1 First published: 08 Mar 2021, 10:64
https://doi.org/10.15694/mep.2021.000064.1

Abstract
This article was migrated. The article was marked as recommended.

Medical faculties have the responsibility to train tomorrow’s doctors and in a crisis face the challenge of delivering students into the workforce promptly and safely. Worldwide, medical faculties have faced unprecedented disruptions from viral outbreaks and pandemics including SARS, Ebola, H1N1 and COVID-19 which bring unique challenges. Currently there is worldwide disruption to medical faculties and medical education due to COVID-19. Despite close links with clinical medicine and the known risks of pandemics, many medical faculties have been caught off guard without pandemic planning in place, to deal with an exponential rise in infections and deaths, overwhelmed health services and widespread community risk of transmission. Assessing transmission risk of COVID-19 in teaching, clinical and community attachments and continuing medical education is paramount as medical faculties face subsequent pandemics waves. Consensus statements based on best available

Open Peer Review

Migrated Content
”Migrated Content” refers to articles submitted to and published in the publication before moving to the current platform. These articles are static and cannot be updated.

| Version | View | View |
|---------|------|------|
| 1       |      |      |
| 2       |      |      |

version 1
08 Mar 2021

1. Balakrishnan Nair, Centre for Medical Professional Development and University of Newcastle

2. Samar Aboulsoud, CAIRO UNIVERSITY, SCHOOL OF MEDICINE

Any reports and responses or comments on the article can be found at the end of the article.
evidence and international expertise from medical faculties in Asia, Australia and Europe were developed to help guide the protection of staff and students, priorities on teaching activities and further educational development. Infection prevention, infection control, contact tracing and medical surveillance are detailed to minimise transmission and to enhance safety. Recommendations on teaching activities planning can enhance responsiveness of medical faculties to tackle subsequent waves of COVID-19 infection. A global approach and dialogue are encouraged.

**Keywords**
COVID-19, pandemic, infection control, teaching, medical faculties, consensus, guidance

**Corresponding author:** Carmen Wong (carmenwong@cuhk.edu.hk)

**Competing interests:** No competing interests were disclosed.

**Grant information:** The author(s) declared that no grants were involved in supporting this work.

**Copyright:** © 2021 Wong C et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**How to cite this article:** Wong C, van den Broek W, Doody G et al. Continuing medical education during pandemic waves of COVID-19: Consensus from medical faculties in Asia, Australia and Europe [version 1] MedEdPublish 2021, 10:64 https://doi.org/10.15694/mep.2021.000064.1

**First published:** 08 Mar 2021, 10:64 https://doi.org/10.15694/mep.2021.000064.1
Introduction

The initial alert of the novel coronavirus in Wuhan, China on 31 December 2019 and subsequent community transmission (Huang et al., 2020) was initially under the radar of many medical schools across the world. As epidemics erupted in Iran, Italy and transmitted across Europe, United States and globally, medical faculties had to respond rapidly to regional and national containment and mitigation efforts as well as ensuring the safety of medical staff, medical students and patients. The timing of COVID-19 pandemic had varying impacts on teaching and assessment arrangements in different countries and medical faculties. The COVID-19 pandemic is estimated to persist for many more months into 2021 with researchers suggesting episodic quarantine and lockdown as a possible strategy to reduce transmission until a vaccination is available and widespread (Ferguson et al., 2020).

Medical schools are now experiencing the impact of this on their curriculum planning and infection control measures in the longer term as they anticipate further waves of COVID-19 infections in the near future. In Western countries, approximately 10% of health care professionals have been infected with COVID-19 (Remuzzi and Remuzzi, 2020; Ng et al., 2020) health care facilities and intensive care units were overwhelmed, resulting in exponential rise in infection and deaths with a large national and regional diversity (Xie et al., 2020). In addition, clinical staff had to deal with inadequate or insufficient personal protective equipment (PPE), lack of ventilators and make difficult treatment decisions (Truog et al., 2020) resulting in ongoing physical risks and psychological toil with many cases of physical and psychological exhaustion as health care workers became infected, quarantined or unwell (Chen et al., 2020; Cai et al., 2020). This has and will continue to have a direct impact on capacity of medical faculties to provide teaching and assessments as well as the provision of experienced examiners. Many medical schools, noting previous infection risks to students during SARS (Patil and Yan, 2003; Clark, 2003) have suspended face to face clinical and community teaching as the pandemic evolved. Some schools have opted to forgo or postpone the final clinical examinations and graduating students early (Amante and Balmer, 2003; General Medical Council, 2020) and discuss whether to continue online learning into the next academic year.

Current knowledge about COVID-19 includes substantial pre-symptomatic and asymptomatic transmission (Bai et al., 2020; Zhang et al., 2020; Zhou et al., 2020) with an average 3 infections (range of 1.4 -6.5) from a single infection (Liu et al., 2020), although transmission rates can vary depending on the national and regional situation. COVID-19 has been shown to affect all ages but serious illness or death mostly occur in the elderly and those with comorbidities such heart disease, lung disease and diabetes (Emami et al., 2020; Guo et al., 2020). Main transmission routes appear to be by droplets transmission to close contacts or contact with contaminated surfaces, although in some circumstances, there is evidence of aerosol transmission. Emerging information about infection risk and transmission of COVID-19 allows medical faculties to can make measured responses in optimizing staff, communications and infection control to better provide medical education particularly in clinical settings. As further pandemic waves of COVID-19 looms, a clear and thoughtful policy regarding infection prevention and control, prioritisation of class resumption and planning for further waves of infections will be required. Through the Global Alliance of Medical Excellence (GAME) is an international collaboration of medical faculties, consensus guidance from medical faculties in Asia, Australia and Europe in continuing medical education cover three main topics:

1. How to protect staff and medical students during the COVID-19 viral pandemic?
2. What teaching and assessment activities should be prioritised?
3. How can medical faculties evolve to enhance medical education for subsequent pandemic waves?

Method

A Pubmed/MEDLINE search was performed using ‘severe acute respiratory distress syndrome’ ‘SARS’ ‘COVID-19’ ‘pandemic’ ‘pandemic planning’ ‘medical education’ ‘medical schools’ ‘medical students’ as MeSH terms. Statements from the international Medical Associations (e.g. American Medical Association, British Medical Association etc.), Medical College Associations e.g. Association of American Medical Colleges etc.) and international medical bodies such as the World Health Organization and Centers’ for Disease Prevention and Control were prioritized. In addition, opinion and perspectives articles of medical journals were also discussed to stimulate consensus.

Guidance was grouped according to WHO pandemic phase descriptions: Phase 4 - 6, post peak and containment, delay and mitigation (World Health Organisation, 2020a). Phase 4 is sustained human to human transmission, Phase 5 and 6 are peak of the pandemic where there is widespread transmission.

Containment phase aims to prevent disease transmission by early detection, isolation, medical surveillance with contact tracing and screening e.g. in Hong Kong, Australia. Delay phase aims to slow the spread and lower and delay the peak of
infected cases. Measures include social distancing, closure of schools and cancellation of mass gatherings e.g. in United Kingdom, The Netherlands and United States. The mitigation phase occurs once infection is widespread and optimises medical health care personnel and facilities to optimise care e.g. in China, Iran, Italy (World Health Organisation, 2020a).

All member institutes were invited to contribute and respond to statements and consensus was reached when agreement was reached in $\geq 75\%$ of all member institutions. Member institutions were asked to state the degree of agreement (strongly agree, agree with minor reservations, agree with major reservations, disagree with major reservations, strongly disagree). Statements, tables and figures which reached $\geq 75\%$ agreement (strongly agree, agree) were retained and a second round of revisions were made similarly by consensus. Details of member institutions who responded are detailed in Appendix 1.

**Recommendations**

**Part 1: How to protect faculty staff and medical students during COVID-19 pandemic**

**General Comments**

1. A rapid response team for pandemic response should be set up to review regular updates and coordinate the pandemic response (Centers for Disease Control and Prevention, 2020a). Wherever possible, this should include a multidisciplinary team of public health specialists, medical educators/ academic year coordinators, communications experts and clinicians active in service. Staff with experience in pandemic planning or in response to previous epidemic or pandemics (e.g. SARS, Ebola etc.) can be helpful.

2. Student exchanges to affected countries should be terminated immediately and medical schools should assist students in returning to their home or study country as soon as possible. Future student exchanges may be risk assessed as the pandemic evolves but all student exchanges should be suspended if there are any cases of global infection (Medical Schools Council, 2020a). Medical schools may need to seek guidance from government for evacuation assistance.

3. Medical schools should act in accordance with national guidelines. If no guidance is given, all curricular clinical and community attachments should be suspended at the first detection of infection regionally (Medical Schools Council, 2020a) and remain suspended until there are no signs of local or community acquired infection for the recommended 14 day period (Larsen et al., 2020). Final year students and those volunteering in community electives and activities may be supported by medical schools following careful evaluation of risks, infection control and hospital and community needs.

4. A voluntary self-reporting surveillance system should be set up for students and staff. Details of the surveillance includes travel history and plans, contact with COVID-19 patients or high-risk individuals (e.g. returning residents from affected countries), daily signs and symptoms e.g. fever, cough etc., place of residence. The surveillance system allows easy identification, monitoring and risk assessment for work/study at home and return to work/schools/ examinations (Centre for Disease Control and Prevention, 2020a). State or national policy may influence decision of medical schools to adopt voluntary surveillance.

5. All staff and students should receive communication on infection and prevention control for COVID-19. This should include updated advice about potential sources of contamination, use of facemasks, handwashing or use of alcohol gel >70%, social distancing, self-isolation, help seeking and availability and criteria for testing (Centre for Disease Control and Prevention, 2020a).

6. Medical faculties should liaise with hospital/clinic partners and facilitate feedback processes, evaluation and incident reporting from staff and students about infection control measures.

7. Staff and students may also be vulnerable to mental ill health e.g. anxiety from the threat of COVID-19, ill health or death of a loved one, self-isolation etc. (Al-Rabiaah, 2020; Chen et al., 2020). Adequate counselling support should be available e.g. dedicated mental health team or counsellor and capacity for student support can be enhanced with extending the roles of mentors, academic advisors and teachers.

**Faculty staff and facilities**

1. Delineate essential work staff and roles and initiate work at home policies. Work at home policies will be influenced by state and national guidelines e.g. during lockdown. For essential workers ensure social distancing for those who return to office e.g. stagger start and finish times to avoid crowding at public transport and distancing of office space. Offer technical support and guidance for those working at home (Centers for Disease Control and Prevention, 2020a).
2. COVID-19 (SARS-CoV-2) can persist on paper for 2 days and hard surfaces e.g. glass, stainless steel for 4-7 days (Chin et al., 2020) and can be inactivated by bleach and common disinfectants (World Health Organisation, 2020b). Routine disinfection in medical schools may be guided by state or national regulations. In the absence of guidance and if resources are available, it is recommended that common spaces and facilities and areas of high use e.g. handrails, lift buttons and door handles should be routinely cleaned and disinfected (U.S. Department of Health & Human Services, 2020).

3. Staff should triage their symptoms daily and only enter office areas if they are symptom free and use appropriate respiratory protective equipment such as the use of facial masks. The use of FFP1 or cloth masks should be used if available (World Health Organisation, 2020b; Department of Health, 2020; Feng et al., 2020). FFP2/3 masks should be used in higher risk clinical contact areas, provided there is ample sample and hospital use has been prioritised. The wearing of facial masks will be influenced by state and national guidelines.

4. Regular updates regarding step up and step-down pandemic work arrangements should be communicated as far ahead as possible (Centers for Disease Control and Prevention, 2020a).

5. Medical schools should be aware of staff working in separate hospitals or units taking care of infected patients or patients with high suspicion of infection and minimise contact with other faculty staff and students to reduce the risk of infection to medical students.

**Medical students**

1. Effective communication is vital. Utilise effective modes of communication and connection with students e.g. regular liaison with class representatives and regular communications should be made to manage expectations as the pandemic evolves. Timely communication about surveillance, infection control and prevention can lessen anxiety. A named contact person or unit should be made available for student queries and assistance (Centers for Disease Control and Prevention, 2020a).

2. Low risk teaching areas e.g. off-site non-clinical facilities such as simulation teaching areas can be identified in advance as reserve facilities for use when there is limited community transmission and satisfactory containment measures. Additional infection control and prevention measures such disinfection, social distancing, small groups may be used to further reduce infection risk (Centers for Disease Control and Prevention, 2020a).

3. Careful consideration regarding which examinations are deemed essential is critical and the option of and feasibility for online assessment and should be encouraged e.g. remote testing using open book format to test critical thinking. If essential examinations are conducted on site during low risk periods of the pandemic strict measures including surveillance of examiners, supporting staff and students, triage, social distancing and regular disinfection are required (See Table 1). Resources for onsite examination will become limited in the mitigation phase. In this phase staff resources may be low and there is increased infection risk in patients and simulated patients and asymptomatic COVID-19 carriers. In this phase may need to be delayed or alternative/online arrangements should be sought.

4. Medical schools are responsible for students’ safety in campus, community or clinic/hospital-based activities and should maintain close liaison with teaching hospitals and clinic. Medical schools have an ethical responsibility to provide adequate guidance for students who volunteer e.g. competencies, safety, infection control (Harvey, 2020; Medical Schools Council, 2020b; Whelan et al., 2020a; Whelan et al., 2020b). Health or community partners should provide indemnification for volunteer placements and early employment.

As the pandemic evolves, there is a need to step-up and step-down infection control measures. Table 2 details recommendations based on the current updates about COVID-19.

**Part 2: Prioritising teaching and assessment activities during COVID-19**

1. When face to face teaching in community and clinical attachments is suspended, course coordinators should review and revise teaching activities and assessments in line with learning outcomes.

2. Medical faculties should support rapid staff development in online teaching and learning for teachers and students. Support may be technological e.g. internet access, provision of notebooks, webcams, microphones,
Table 1. Infection control and prevention for on-site essential examinations

| Period                      | Procedure                  | Details                                                                 |
|-----------------------------|----------------------------|-------------------------------------------------------------------------|
| Preparation                 | Medical surveillance       | Mandatory completion of online health declaration of travel history,     |
|                             |                            | contact history and symptoms by supporting staff, examiners and students |
| Examination criteria and    |                            | **Written examinations**                                                |
| logistics                    |                            | Revisit format of examinations e.g. written versus multiple choice to   |
|                             |                            | reduce handling of test paper                                           |
|                             |                            | Ensure physical distancing of 1.5m between students.                    |
|                             |                            | Consider multiple venues for conducting examination                    |
|                             |                            | **Clinical examinations**                                              |
|                             |                            | Simulated patients should be used instead of real patients and deemed   |
|                             |                            | infection free (e.g. self-declaration of symptoms and travel/contact    |
|                             |                            | history +/- testing)                                                   |
|                             |                            | Reduce number and duration of test stations if possible                 |
|                             |                            | Ensure social distancing of 1.5m or more between students and staff    |
|                             |                            | and examiners.                                                         |
|                             |                            | Reduce length of time and number of students in waiting areas         |
| Ventilation                 |                            | Examination rooms, waiting areas and test stations should be well      |
|                             |                            | ventilated                                                            |
| Liaison and communication    |                            | Inform students of examination procedures in advance                   |
|                             |                            | Arrange online briefing session to respond to student queries          |
| Crowd control               |                            | Stagger student registration times                                     |
|                             |                            | Utilise multiple register areas or venues                              |
| Examination Coordination    |                            | Support staff and examiners should be clear about their roles, infection |
|                             |                            | controls and tasks. A central coordinator or coordinating team is      |
|                             |                            | required to ensure procedures and processes.                           |
| Personal protection         |                            | All staff, students and examiners should wear respiratory facial      |
|                             |                            | protection. FFP1 or cloth facial mask should be used. FFP2/3 can be    |
|                             |                            | used if in ample supply.                                               |
|                             |                            | This measure could be influenced by state and national guidelines     |
| Triage                      |                            | Use infrared temperature probe for screening and identification of staff, |
|                             |                            | students and examiners with a temperature > 37.5 Celsius. A second     |
|                             |                            | tympanic temperature probe can provide a more accurate reading for     |
|                             |                            | confirmation. Those who are confirmed with temperature > 37.5 Celsius  |
|                             |                            | would not be allowed to continue with the examination and advised to   |
|                             |                            | seek medical assistance.                                               |
| Hand hygiene                |                            | Hand sanitisers with alcohol content >70% should be readily available in |
|                             |                            | examination rooms and waiting areas. If hand sanitisers are not       |
|                             |                            | available, easy access to handwashing facilities are necessary.       |
| Environmental disinfection  |                            | Supporting staff should disinfect high traffic areas and surfaces with 1:|
|                             |                            | 99 diluted bleach.                                                     |
|                             |                            | Provision of individual alcohol wipes to students can enhance           |
|                             |                            | disinfection of the student's immediate vicinity.                     |
| Personal belongings         |                            | Students should place personal belongings in designated guarded area  |
|                             |                            | for self-collection or on a trolley if transferred to a different venue |
| Post examination            | Environmental disinfection | All areas and surfaces including test devices e.g. table computers/     |
|                             |                            | laptops should be disinfected with 1:100 dilution of 5% sodium         |
|                             |                            | hypochlorite or alcohol wipes > 70% alcohol                           |

*aWorld Health Organisation, 2020b; Department of Health, 2020; Feng et al., 2020*

*bWorld Health Organisation, 2014*

*cCenters for Disease Control and Prevention, 2002*

*dWorld Health Organisation, 2014; Centers for Disease Control and Prevention, 2020b*

Technical assistance for online learning and video conferencing platforms e.g. use of platform features, setting up video communications as well as educational support e.g. use of enhanced program features, exploring different teaching models. The capacity for individual support and guidance require need sufficient resources. Training and use of department support staff can also help problem solve common issues.

3. Sufficient time should be given for online curriculum planning and team meetings, which can enhance a collaborative approach and efficient use of strengths and skills within the team.
Online modalities can be effective for lectures, case based, problem based and team-based learning (Abrahamson, 2006; Augestad and Lindsetmo, 2009; Barrows, 1996; Joyce et al., 2017; Lim et al., 2006; Lim et al., 2009; Wong et al., 2005) Interactive sessions can be enhanced by using small groups and multimodal teaching including patient and virtual simulation (see Table 3).

As COVID-19 pandemic evolves and with the likelihood of recurrent community transmission, the strategy should prioritise key tasks which require face to face teaching during the period of no or low transmission with capacity in delivery (see Table 4).

**Table 2. Infection control: Pandemic phases and key actions for medical faculties for COVID-19**

| Phase 4 Sustained human to human transmission | Phase 5 & 6 Widespread human infection | POST PEAK PERIOD Level of pandemic drops below pandemic level. Possibility of recurrent events | POST PANDEMIC Disease activity at seasonal levels |
|---------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------|
| No regional cases | Observation | Set up rapid response team and review updates | Minimal or limited disruption to community activity | Containment | Consider continuation of essential examinations | Consider restarting essential teaching and examinations | No cases or sporadic/ cluster of cases | Containment | Liaise with hospital to assess readiness for teaching | Resume face to face teaching |
| First regional case | Containment | Follow national guidelines (if any) | Limited community activity | Delay | Rota of essential office staff, flexible hours, work from home. Postpone examinations or seek alternatives. | Regular +/- flexible home office working | Minimal or limited disruption to community activity | Delay | Rota of essential office staff, flexible hours, work from home. Postpone examinations or seek alternatives. | Regular communication and activation of medical surveillance when required |
| **Phase 5 & 6 Widespread human infection** | | Regular communication and updates to staff and students. Mental health support for staff and students | | | | | | | | |
| | | Mandatory respiratory protection (facial mask), physical distancing and regular office disinfection | | | | | | | | |
| | | Minimal or limited disruption to community activity | Containment | Consider continuation of essential examinations | Consider restarting essential teaching and examinations | Routine +/- flexible home office working | | | |
| | | Limited community activity | Delay | Rota of essential office staff, flexible hours, work from home. Postpone examinations or seek alternatives. | | Routine +/- flexible home office working | | | |
| | | Lockdown and essential activities only | Mitigation | Work from home. Key worker in office only. Postpone examinations or seek alternatives. | | | | | |
| **POST PEAK PERIOD Level of pandemic drops below pandemic level. Possibility of recurrent events** | | Continue regular communication and mandatory respiratory protection (facial mask), physical distancing and regular office disinfection | | | | | | | |
| | | Continue mandatory respiratory protection (facial mask), physical distancing and regular office disinfection | | | | | | | |
| | | No cases or sporadic/ cluster of cases | Containment | Liaise with hospital to assess readiness for teaching | Consider restarting essential teaching and examinations | Routine +/- flexible home office working | | | |
| | | Minimal or limited disruption to community activity | | | | | | | |
| | | Sustained human transmission | Delay | Rota of essential office staff, flexible hours, work from home. Postpone examinations or seek alternatives. | | | | |
| | | Limited community activity | | | | | | | |
| **POST PANDEMIC Disease activity at seasonal levels** | | Regular office disinfection. | | | | | | | |
| | | No cases or sporadic/ cluster of cases | Containment | Resume face to face teaching | Regular communication and activation of medical surveillance when required | | | | |
| | | Minimal or limited disruption to community activity | | | | | | | |

4. Online modalities can be effective for lectures, case based, problem based and team-based learning (Abrahamson, 2006; Augustad and Lindsetmo, 2009; Barrows, 1996; Joyce et al., 2017; Lim et al., 2006; Lim et al., 2009; Wong et al., 2005) Interactive sessions can be enhanced by using small groups and multimodal teaching including patient and virtual simulation (see Table 3).

5. As COVID-19 pandemic evolves and with the likelihood of recurrent community transmission, the strategy should prioritise key tasks which require face to face teaching during the period of no or low transmission with capacity in delivery (see Table 4).

**Part 3: Enhancing medical education**

1. The mass adoption of online teaching and learning brings opportunities for collaborative efforts in content development e.g. clinical case and clinical signs/photos library, patient narratives. This is particularly useful for countries in which medical schools share curriculum or qualifying examinations e.g. United State, Canada, Germany. Further discussion is necessary on minimal competency frameworks and the feasibility and adaptation of national clinical exams in further waves of COVID-19 infection. Meanwhile, there is potential for international collaboration to expand the cultural and diversity and development of global resources for medical education.

2. Pandemic preparedness is particularly pertinent for final year students as they prepare to work during COVID-19 pandemic. Evidence of pandemic preparedness teaching in medical schools have largely been theoretical,
with teaching and learning during COVID-19 pandemic logistically and technically challenging (Li et al., 2020). There is a role for medical schools to liaise with local hospital and primary care networks to establish key areas and tasks in which medical schools can assist to train students. This can include opportunities for clinical case studies, medical ethics as well as infection control and PPE training.

### Table 3. Enhancing online teaching

| Effective | Strategies to enhance student engagement |
|-----------|----------------------------------------|
| Recorded lectures | Use of chat feature can enable students to ask questions - for large groups, a facilitator (i.e. staff or peer student) can help monitor the questions and responses. Polls can help teachers and students gauge understanding. Use short small group sessions with online video can enhance interaction |
| Live lectures | Consistent grouping of students can help group dynamics and cohesion: to this end, organising breakout rooms and the role of digital moderator (i.e. student representatives or junior staff) can be very useful to help peer-to-peer interaction during online teaching sessions A consistent tutor can further gauge student’s progress and offer feedback. |
| Flipped classroom | Virtual clinics using constructed cases and multimodal tasks can help students to contextualise cases seen e.g. photograph of clinic, patient or clinical signs, excerpts from clinical notes, roleplay, data interpretation etc. Many universities have simulated patient programmes and activities. History taking skills can be developed in novice learners through the inclusion of simulated patient in tutorials. Plan content with the view to share recorded sessions of different teachers and cases between different groups to enhance learning. For roleplays in communication skills, assign alternating roles in advance and email corresponding scripts for preparation. Use of material on the internet e.g. videos on physical examination, patient stories and clinical case based teaching can augment the learning experience. Student presentations and demonstrations can help assess understanding in clinical procedures and assessment. |
| Case based scenarios | |
| Problem based learning | |
| Team based learning | |
| Roleplays | |
| Communication Skills | |
| Video vignettes | |
| Simulated patients via video | |

### Table 4. Priorities and adaptations in medical education during COVID-19

| Priority | Suggested adaptations |
|----------|-----------------------|
| **High Priority** | |
| Final year clinical examinations | Change written examination format to viva or computerised adaptive testing which can be done online or opportunistic delivery using multiple venues. Opportunistic clinical examination delivery with strict infection control measures |
| Final year written examinations | Change clinics to virtual clinics (See Table. 3) with real case scenarios of that clinic session and incorporate clinical tasks e.g. history taking, clinical assessment and counselling. Describe and demonstrate procedures and examinations |
| Final year clinical teaching on wards/clinics | |
| Final year high fidelity simulation of complex cases e.g. intensive care, acute care | |
| Clinical teaching and examination in other years | |
| **Normal priority** | |
| Active adaptation to online learning, resume face to face when able (subject to national policy, community activity restriction and infection risk). Schedule courses most amenable to online learning e.g. anatomy, biochemistry, radiology etc. first over clinical courses in peak and post peak pandemic period Continue simulated patient teaching and preclinical teaching and use of cadavers in small groups with infection control and social distancing when amenable | |
| **Low priority** | |
| Asynchronous courses with established online format | Use programmatic approach and self-directed learning for established asynchronous online courses. Postpone community visits. When visits can resume, distribute experiences between student groups and use presentations and sharing to enhance learning and reflection. Build a library of online interviews with non-governmental organisations and patient interviews |
| Community/ service learning e.g. attachment with community non-governmental organisations, home visits. | |
3. During COVID-19, suggested roles for medical students include assisting with childcare for health professionals, assisting the elderly to participating in low risk clinical tasks (Lee, 2020; Miller et al., 2020), whilst there are evident needs where additional help is required e.g. in nursing homes (Orrechio-Egrestiz, 2020). Much less is known about the medical students’ attitudes and willingness to volunteer. Further research and discussion are needed to explore opportunities for learning and how medical schools can facilitate learning roles in placements or alternatives e.g. telemedicine, protect students in at-risk areas and enhance social responsibility efforts and roles in the community.

Conclusion
In this evolving COVID-19 pandemic, medical training must continue to ensure an uninterrupted competent workforce and the recommendations set out this consensus guidance can help medical schools prepare and facilitate teaching and assessment with guidance on infection control for staff and students, enhancing online teaching and prioritising teaching activities as well the need for research and development to enhance medical education to withstand future pandemic waves of COVID-19.

Take Home Messages
- As COVID-19 pandemic evolves, medical faculties must continue medical education to ensure an uninterrupted competent workforce.
- This consensus guidance developed from medical faculties in Asia, Australia and Europe of current best evidence and expertise can help medical schools prepare and facilitate teaching and assessment in subsequent pandemic waves of COVID-19.
- Guidance covers infection control measures for faculty staff and students, recommendations in teaching modalities and planning as well as suggestions for further faculty and educational development.
- A global approach and dialogue in tackling subsequent waves of COVID-19 is encouraged.

Notes On Contributors
Prof. Carmen Wong is Assistant Dean of Education at the Chinese University of Hong Kong in Hong Kong SAR China. ORCID ID: https://orcid.org/0000-0003-2164-3673

Prof. Walter van den Broek is Director of Medical Education at Erasmus Medical Centre in Rotterdam, The Netherlands.

Prof. Gillian Doody is Dean of Medical Education at University of Nottingham in the United Kingdom.

Prof. Martin Fischer is Associate Dean for Students at Ludwig Maximilian University of Munich in Germany.

Prof. Michelle Leech is Deputy Dean of the Medicine Nursing and Health Sciences Faculty at Monash University in Australia.

Prof. Fabrizio De Ponti is Professor at the Department of Medical and Surgical Sciences, University of Bologna in Italy.

Prof. Alexander Gerbes is Professor at the Faculty of Medicine at the Ludwig Maximilian, University of Munich in Germany.

Prof. Hiroshi Nishigori is Associate Professor at the Center for medical education at Nagoya University in Japan.

Prof. Young Mee Lee is Professor at the Department of Medical Education in Korea University in Korea.

Prof. Maarten Frens is Professor at Erasmus University Medical Center in the Netherlands.

Prof. Hideki Kasuya is Associate Dean of International Affairs at Nagoya University in Japan.

Prof. Franco Bazzoli is Professor of Gastroenterology at the University of Bologna in Italy.
Prof. Reinhard Hickel is Professor and Dean at Ludwig Maximilian University of Munich in Germany.

Prof. Hong Sik Lee is Professor at the Department of Medical Education in Korea University in Korea.

Prof. J.P.T.M van Leeuwen is Dean and vice-chairman Executive Board Erasmus Medical Centre in the Netherlands.

Prof. Christina Mitchell is Dean of Faculty of Medicine Nursing and Healthcare sciences at Monash University in Australia.

Prof. Kenji Kadomatsu is Professor at Nagoya University Graduate School of Medicine in Japan.

Prof. John Atherton is Pro Vice Chancellor and Dean of Faculty of Medicine and Health Sciences at the University of Nottingham in United Kingdom.

Prof. Francis Chan is Dean of Faculty of Medicine at the Chinese University of Hong Kong in Hong Kong SAR China.

Appendices

Appendix 1: Medical institutions: student intake and initial faculty pandemic response

| Institution, Country | Student intake per year (duration of study) | Faculty Pandemic Response (from January 2020) |
|----------------------|--------------------------------------------|-----------------------------------------------|
| The Chinese University of Hong Kong, Hong Kong SAR, China | 230-240 students 6 years | Fully virtual teaching by 1 February 2020. Staff work at home arrangements. Essential staff arrangements in office. All clinical examinations successfully conducted March - April 2020 (Medical years 4-6) during second wave of infection. Staff resume normal office hours May 4th 2020. |
| LMU Munich, Bavaria, Germany | 870-880 students (preclinical yrs. 1 + 2), 470-500 (clinical yrs. 3-6), 6 years | Fully virtualized semester started April 20th, selected exams on a voluntary basis on Campus allowed when hygiene rules can be secured, stay in home office whenever possible. |
| Korea University College of Medicine, Seoul, South Korea | 106 students 6 years | Faculty members and staffs of university hospitals and medical college have worked on-site, not at home for all periods of COVID-19. However the entire curriculum has transformed to online format since Feb. 25th. Clinical rotations were suspended for three weeks and recommenced from March 16th. The face to face cadaveric dissection recommenced on April 21. Anatomy and Physiology mid-term examinations were conducted face to face on April 16th, and 20th, respectively. All deferred examination and simulation sessions are planned to conduct by face to face around early July. At the entire university level, KU recommended online lecture for the semester, but small group sessions less than 30 students was allowed form May 4th, only if students agree with their attendance. |
| Monash School of Medicine, Melbourne, Australia | 500 students 5 years | Campus based activity fully online and faculty deliver teaching from home. Hospital based staff work from in situ clinical school facilities. Senior students continue in hospital placements. |
| Erasmus MC, Rotterdam, The Netherlands | 410 students 6 years | Lockdown Medical education fully remote teaching for bachelor students. Last year of master has restarted their clerkships |
| University of Bologna, Bologna, Italy | 350 students for each of the 6 years (Italian stream) Approx.. 60 students for each year (English stream) | Lockdown Medical education: fully remote teaching started in March (lessons; oral and written exams; graduation). Staff allowed to work from home whenever possible; apart from clinical activities, staff must justify circumstances requiring their presence in the University premises. |
Appendix 1:  Continued

| Institution, Country | Student intake per year (duration of study) | Faculty Pandemic Response (from January 2020) |
|----------------------|---------------------------------------------|---------------------------------------------|
| Nagoya University, Japan | 680-190 students 6 years | Online remote classes onlyBoth undergraduate and graduate students are prohibited from coming to the university. Graduate students engaged in ongoing experiments and research activities are permitted. |
| University of Nottingham, United Kingdom | 485 4 years 5 years 6 years | Lockdown since 23rd March. University premises closed, no access unless special permission granted. All staff working from home. Immediate online teaching for early years and postgraduate students. Online learning provided for clinical years from 6th April. Early graduation of final year students (exams Feb), virtual resits. Medical Faculty Staff co-opted into NHS service. |

Declarations
The author has declared that there are no conflicts of interest.

Ethics Statement
Ethics approval was not required as this paper did not involve patient interaction or data.

External Funding
This article has not had any External Funding

Bibliography/References

Abrahamson, S. D., Canzian, S. and Brunet, F. (2006) Using simulation for training and to change protocol during the outbreak of severe acute respiratory syndrome. Critical Care (London, England). 10(1), R3. Reference Source

Abdul-Rahim, A., Temsah, M.H., Al-Eyadhy, A.A., Hasan, G.M., et al. (2020) Middle East Respiratory Syndrome-Corona Virus (MERS-CoV) associated stress among medical students at a university teaching hospital in Saudi Arabia. Journal of Infection and Public Health. 13(5), pp. 687-691. Reference Source

Amante, A. and Balmer, C. (2020) Italy Rushes New Doctors Into Service as Coronavirus Deaths Rise Above 2,500, Reuters. Available at: Reference Source (Accessed: 1 August 2020).

Augustad, K. M. and Lindsetmo, R. O. (2009) Overcoming Distance: Video-Conferencing as a Clinical and Educational Tool Among Surgeons. World Journal of Surgery. 33(7), pp. 1356–1365. Reference Source

Bai, Y., Yao, L., Wei, T., Tian, F., et al. (2020) Presumed Asymptomatic Carrier Transmission of COVID-19. JAMA 323(14), p. 1406. Reference Source

Barrows, H. S. (1996) Problem-based learning in medicine and beyond: A brief overview. New Directions for Teaching and Learning. 1996 (68), pp. 3–12. Reference Source

Cai, H., Tu, B., Ma, J., Chen, L., et al. (2020) Psychological Impact and Coping Strategies of Frontline Medical Staff in Hunan Between January and March 2020 During the Outbreak of Coronavirus Disease 2019 (COVID-19) in Hubei, China. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research. 26, e924171. Reference Source

Centers for Disease Control and Prevention. (2020a) Interim Guidance for Administrators of U.S. Institutions of Higher Education. Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19). Available at: Reference Source (Accessed: 1 August 2020).

Centers for Disease Control and Prevention. (2020b) Interim Recommendations for U.S. Households with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19). Cleaning and Disinfection for Households. Available at: Reference Source (Accessed: 1 August 2020).

Chen, Q., Liang, M., Li, Y., Gui, J., et al. (2020) Mental health care for medical staff in China during the COVID-19 outbreak. The Lancet Psychiatry. 7(4), e15–e16. Reference Source

Chin, A. W. H., Chu, J. T. S., Perera, M. R. A., Hui, K. P. Y., et al. (2020) Stability of SARS-CoV-2 in different environmental conditions. The Lancet Microbe. 1(1), e10. Reference Source

Clark, J. (2003) Fear of SARS thwarts medical education in Toronto. BMJ (Clinical Research Ed.). 326(7393), p. 784. Reference Source

Department of Health. (2020) Guidelines on prevention of coronavirus disease 2019 (COVID-19) for the general public. Department of Health, Hong Kong S.A.R. Available at: Reference Source (Accessed: 1 August 2020).

Emami, A., Javanmardi, F., Pirbonyeh, N. and Akbari, A. (2020) Prevalence of Underlying Diseases in Hospitalized Patients with COVID-19: a Systematic Review and Meta-Analysis. Archives of Academic Emergency Medicine. 8(1), e35. Reference Source

Feng, S., Shen, C., Xia, N., Song, W., et al. (2020) Rational use of face masks in the COVID-19 pandemic. The Lancet Respiratory Medicine. 8(5), pp. 434–436. Reference Source

Ferguson, N. M., Laydon, D., Nedjati-Gilani, G., Imai, N., et al. (2020) Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand, Imperial College COVID-19 Response Team, London, March 16 2020. Available at: Reference Source (Accessed: 1 August 2020).

General Medical Council. (2020) Joint statement: early provisional registration for final year medical students. Available at: Reference Source (Accessed: 1 August 2020).
Liu, Y., Fan, Y., Chen, M., Wu, X., et al. (2020) Cardiovascular Implications of Fatal Outcomes of Patients With Coronavirus Disease 2019 (COVID-19). JAMA Cardiology. 5(7), pp. 811–818. Reference Source

Harvey, A. (2020) Covid-19: medical students should not work outside their competency, says BMA. BMJ (Clinical Research Ed.). 368, m1197. Reference Source

Huang, C., Wang, Y., Li, X., Ren, L., et al. (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. 395(10223), pp. 497–506. Reference Source

Joyce, M. F., Berg, S. and Bittner, E. A. (2017) Practical strategies for increasing efficiency and effectiveness in critical care education. World Journal of Critical Care Medicine. 6(1), pp. 1–12. Reference Source

Larsen, D., Dimeo, R. E., Asiago-Reddy, E., Green, H., et al. (2020) A review of infectious disease surveillance to inform public health action against the novel coronavirus SARS-CoV-2. Reference Source

Lee, Y. J. (2020) Medical Students Around the US Are Offering to Babysit for Hospital Workers on the Frontlines of the Coronavirus Pandemic. New York, NY: Business Insider. Available at: Reference Source

Li, L., Lin, M., Wang, X., Bao, P. and Li, Y. (2020) Preparing and responding to 2019 novel coronavirus with simulation and technology-enhanced learning for healthcare professionals: challenges and opportunities in China. BMJ Simulation & Technology Enhanced Learning. 6(4), pp. 196–198. Reference Source

Lim, E. C. H., Oh, V. M. S., Koh, D.-R. and Seet, R. C. S. (2009) The challenges of “continuing medical education” in a pandemic era. Annals of the Academy of Medicine, Singapore. 38(8), pp. 724–726. Reference Source

Lim, E. C. H., Ong, B. K. C. and Seet, R. C. S. (2006) Using videotaped vignettes to teach medical students to perform the neurologic examination. Journal of General Internal Medicine. 21(1), p. 101. Reference Source

Liu, Y., Gayle, A. A., Wilder-Smith, A. and Rocklov, J. (2020) The reproductive number of COVID-19 is higher compared to SARS coronavirus. Journal of Travel Medicine. 27(2). Reference Source

Medical Schools Council (2020a) Advice from Medical Schools Council to UK Medical Schools on actions surrounding Covid 19. Available at: Reference Source

Medical Schools Council (2020b) Statement of expectation. Medical student volunteers in the NHS. Available at: Reference Source

Miller, D. G., Pierson, L. and Doernberg, S. (2020) The Role of Medical Students During the COVID-19 Pandemic. Annals of Internal Medicine. 173(2), pp. 145–146. Reference Source

Ng, K., Poon, B. H., Kiat Puar, T. H., Li Shan Quah, J., et al. (2020) COVID-19 and the Risk to Health Care Workers: A Case Report. Annals of Internal Medicine. 172(11), pp. 766–767. Reference Source

World Health Organisation. (2014) Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care: WHO guidelines. Available at: Reference Source (Accessed: 1 August 2020).

Orrechio-Egrestiz, H. (2020) As many as half of Europe’s COVID-19 deaths were people in long term facilities. Business Insider. Available at: Reference Source (Accessed: 1 August 2020).

Patil, N. G., Chan, Y. and Yan, H. (2020) SARS and its effect on medical education in Hong Kong. Medical Education. 37(12), pp. 1127–1128. Reference Source

Remuzzi, A. and Remuzzi, G. (2020) COVID-19 and Italy: what next? The Lancet. 395(10231), pp. 1225–1228. Reference Source

Teixeira, P. and Shin, J. C. (eds.) (2020) Encyclopedia of international higher education systems and institutions. Dordrecht: Springer.

Truog, R. D., Mitchell, C. and Daley, G. Q. (2020) The Toughest Triage - Allocating Ventilators in a Pandemic. The New England Journal of Medicine. 382(21), pp. 1973–1975. Reference Source

U.S. Department of Health & Human Services. (2020) Cleaning and Disinfecting Your Facility. Available at: Reference Source (Accessed: 1 August 2020).

Whelan, A., Prescott, J., Young, G., Catanese, V. M., et al. (2020) Guidance on Medical Students’ Participation in Direct Patient Contact Activities, Association of American Medical Colleges. Available at: Reference Source (Accessed: 1 August 2020).

Wong, M. L., Koh, D., Phua, K. H. and Lee, H. P. (2005) Teaching community, occupational and family medicine at the National University of Singapore: past, present and future. Annals of the Academy of Medicine, Singapore. 34(6): 102C–107C. Reference Source

World Health Organisation. (2020a) Operational planning guidelines to support country preparedness and response. Available at: Reference Source (Accessed: 1 August 2020).

World Health Organisation. (2020b) WHO Coronavirus disease (COVID-19) advice for the public: when and how to use masks. Available at: Reference Source (Accessed: 1 August 2020).

World Health Organisation. (2014) Annex G. Use of disinfectants: alcohol and bleach. Infection Prevention and Control of Epidemic- and Pandemic-Prone Acute Respiratory Infections in Health Care. Geneva: World Health Organization. Available at: Reference Source (Accessed: 1 August 2020).

Xie, J., Tong, Z., Guan, X., Du, B., et al. (2020) Critical care crisis and some recommendations during the COVID-19 epidemic in China. Intensive Care Medicine. 46(5), pp. 837–840. Reference Source

Zhang, J., Li, J., Wu, L., Wang, W., Wang, Y., et al. (2020) Evolving epidemiology and transmission dynamics of coronavirus disease 2019 outside Hubei province, China: a descriptive and modelling study. The Lancet Infectious Diseases. 20(7), pp. 793–802. Reference Source

Zhao, S., Gao, D., Zhuang, Z., Chong, M. K. C., et al. (2020) Estimating the Serial Interval of the Novel Coronavirus Disease (COVID-19): A Statistical Analysis Using the Public Data in Hong Kong From January 16 to February 15, 2020. Frontiers in Physics. 8. Reference Source
Open Peer Review

Migrated Content

Version 1

Reviewer Report 21 March 2021

https://doi.org/10.21956/mep.18917.r27039

© 2021 Aboulsoud S. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Samar Aboulsoud
CAIRO UNIVERSITY, SCHOOL OF MEDICINE

This review has been migrated. The reviewer awarded 4 stars out of 5

I would like to thank the prestigious group of authors for sharing this well-thought review. I found the recommendations very useful with many tips that are relevant to the majority of undergraduate medical programs across the globe. I have only one comment and a suggestion. 1. The title of the article (CME) doesn't reflect the content (UGE) and this might be misleading for the readers and researchers. 2. There are clearly two themes in the paper; the protective approach for the faculty and students (infection control) and the educational enhancement techniques. Although they seem to be two sides of the same coin, however and given the importance of the topic, the authors might like to consider expanding on the two themes and splitting them into two separate papers. Thank you again for sharing this valuable information

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 14 March 2021

https://doi.org/10.21956/mep.18917.r27040

© 2021 Nair B. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Balakrishnan Nair
Centre for Medical Professional Development and University of Newcastle
This review has been migrated. The reviewer awarded 4 stars out of 5

This is a well thought out and researched article on how to continue undergraduate medical education in the face of the current pandemic. The authors are very senior academics and the lead many medical education programs. The article can guide others to manage medical education programs when faced with such emergencies. This gave us an opportunity to reflect on what we have done and what else we could have done during this crisis. The title can be misleading. “Continuing Medial Education” usually means CME and implies continuing professional development for practising physicians. May be “Maintaining Undergraduate Medical Education ---- “ or similar would have been more accurate

**Competing Interests:** No conflicts of interest were disclosed.