

1 **Title: The Effect of COVID-19 Pandemic on US Medical Students in their Clinical Years**

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3 **Author names:** Raed Qarajeh¹, Farah Tahboub², Nikita Rafie³, Nurry Pirani^{1,3}, Mary Anne Jackson^{3,4}, C.
4 Douglas Cochran^{1,3}

5 **Degrees:** Raed Qarajeh (MD), Farah Tahboub (Medical Student), Nikita Rafie (Medical Student), Nurry Pirani
6 (MD and Assistant Professor), Mary Anne Jackson (MD and Professor of Pediatrics), C. Douglas Cochran
7 (MD and Assistant Professor)

8 **Affiliations:**

- 9 1. Department of Internal Medicine, University of Missouri-Kansas City, Missouri, USA.
- 10 2. University of Jordan School of Medicine, Amman, Jordan.
- 11 3. University of Missouri–Kansas City School of Medicine, Missouri, USA.
- 12 4. Division of Infectious Diseases, Children's Mercy Hospital, Kansas City, Missouri, USA.

13 **About the author:** Raed Qarajeh is currently a PGY-2 at the University of Missouri-Kansas City internal
14 medicine residency program.

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- 28 • **Facebook:** <https://www.facebook.com/Raed.Qarajeh>
- 29 • **Twitter:** <https://twitter.com/RaedQarajehMD>

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31 **Discussion Points:**

- 32 1. COVID-19 pandemic: safety concerns and suspension of clinical rotations.
- 33 2. Failure to meet residency application deadlines with suspension of examinations.
- 34 3. Cancellation of important milestones, loss of research, early graduation, and the psychological toll on
35 medical students.

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1 **THE EXPERIENCE.**

2 Since December 31, 2019, when China identified the first cases of SARS-CoV-2 respiratory disease, this topic
3 has dominated all news outlets, medical journals, and household conversations. On January 30, 2020, the
4 World Health Organization (WHO) announced coronavirus disease of 2019 (COVID-19) to be a global health
5 emergency following identification of cases from 18 countries outside of China including 8 cases of human to
6 human transmission. The declaration called on countries to implement consistent evidence-based decisions,
7 identify gaps in resources, share knowledge and experience, and move forward on vaccine development. The
8 first coronavirus pandemic was announced on March 11, 2020 following confirmed infections in 114 countries.
9 Within the US, hot spots developed first in Washington State and then shifted to New York. The surge in
10 disease overwhelmed resources and the ripple effect impacted the entire medical community. Medical
11 students, like many others, are experiencing the repercussion of COVID-19 firsthand and are not exempt from
12 its many lasting effects.¹ The Association of American Medical Colleges (AAMC) announced, on March 17th,
13 2020, a minimum two-week suspension of medical students' participation in patient contact activities with
14 possible longer suspension left to medical school discretion.² Herein, we present challenges, concerns, and
15 impacts of the COVID-19 pandemic on medical students across the nation as well as suggestions for possible
16 solutions.

17 18 **The Safety of Medical Students**

19 With the epidemiology, transmission, and treatment of COVID-19 still not fully understood, the safety of
20 medical students is a major concern. Many medical students have never been trained to don and doff
21 personal protective equipment (PPE) and are not N95 fit tested. The AAMC's decision to suspend clinical
22 rotations was twofold: to ensure the safety of both students and patients, and conserve PPE. Lessons can be
23 drawn from medical student suspension in the 2003 SARS outbreak in Hong Kong and Canada which were
24 successful in setting up several plans to be implemented based on escalation of the situation.^{3,4} If this
25 pandemic becomes prolonged, return of medical students to rotations should be considered after receiving
26 infection control and transmission prevention training, and should be excused from interacting with suspected
27 or confirmed COVID-19 cases.

28 29 **Changes to Clinical Rotation Structure and Exposure**

30 From institutional and personal perspectives, every stakeholder in medical education is concerned of the
31 detrimental effect that loss of face to face clinical teaching can have. Medical schools have been quick to
32 propose innovative ways for students to continue learning using online teaching. Tufts University easily
33 merged existing online teaching programs into "flip classrooms" which involve small video discussion groups
34 with specialized software programs. Successful models already in place can be adopted by other programs.
35 Hospitals have cancelled all elective procedures and resorted to telemedicine for clinics. This is a good time
36 for medical students to learn and participate in telemedicine.

37
38 Changes to remaining clerkships and electives length to allow missed clinical experience to be made up would
39 ensure students have adequate exposure to core clerkships. Many students faced cancellation of electives
40 inside and outside their institutions, including opportunities overseas. These electives expose students to
41 fields of interest and different patient populations and health care systems from their own home institutions.

1 The cancellation will impact the knowledge and experience of medical students and their residency
2 applications. Students should be given the opportunity to re-enroll in outside electives in subsequent years.

3
4 Medical students have the unprecedented experience of a pandemic, a new disease with unknown
5 epidemiology, etiology and treatment. The skills learned during this time will give students new insight to their
6 approach to medicine, patients, knowledge, and research. Students can reach out to their home institutions to
7 explore volunteer opportunities during clinical suspension. Some existing projects include answering phone
8 queries via telehealth technology, using decision trees and prepared scripts, assisting with research,
9 determining trial eligibility, mask collections and sewing, making infographics, blood donation drives, and
10 restocking hospital warehouses.

11
12 In response to the need for health care providers, Harvard Medical School (HMS), Boston University, Tufts
13 University, and University of Massachusetts issued an option for medical students to graduate early.⁵ The
14 ACMGE warned of “serious ramifications to early appointment Centers for Medicare and Medicaid Services
15 (CMS) reimbursement for direct graduate medical education (DGME)/indirect medical education (IME) and
16 Match participation agreements, among many others” and urged medical schools to carefully consider these
17 ramifications before making their decision.⁶ Many programs in the harder hit areas have opted for early
18 graduation, however, the majority of programs are following their original calendar and are virtually graduating
19 students on time.

21 **Medical school examinations, USMLEs, and residency applications**

22 Administering traditional exams given CDC recommendations against social gatherings is a challenge.
23 Medical schools should explore alternative options like changing exams to case presentations simulating true
24 clinical settings or by utilizing online resources such as Lock Down Browser® and Zoom®. Evaluations can be
25 assessed based on interaction of students in online sessions and discussions. Grades should be compared
26 with previous rotations to ensure they are reflective of the students’ performance; any discrepancies should be
27 addressed.

28
29 On March 16th, 2020, the United States Medical Licensing Examination (USMLE) Step 2 Clinical Skills (CS)
30 examinations were suspended until further notice and the Prometric center announced temporary closure of
31 testing centers for 30 days starting March 18th.⁷ The USMLE program announced that it cannot resume the
32 Step 2CS exam in its current format and is exploring plans to employ a telehealth model via a web browser
33 and is expected to resume after July. Prometric resumed partial testing for USMLE exams starting May 1st,
34 however Prometric test centers were erroneously listed as open but examinees were met with closed doors,
35 and USMLE program is looking for alternatives outside of Prometric to increase capacity. Schools requiring
36 Step 1 to start clinical training and Step 2 Clinical Knowledge (CK) to start fourth year should extend deadlines
37 to account for test center reopening and scheduling. Delay in test taking, and thus reporting will also impact
38 fourth year medical students unable to have their scores by residency application deadline.

39
40 The AAMC announced a change in the date where residency programs may begin reviewing applications from
41 the usual September 15th to October 21st. This change in deadline will help accommodate the cancelled

1 testing and application requirements, however, the examination situation remains unclear and is uncertain if
2 the testing capacity will meet the needs and if the scores will be available for the new date. The AAMC also
3 issued a statement encouraging medical schools and teaching hospital faculties to “conduct all interviews with
4 potential students, residents, and faculty in a virtual setting - either by phone or through video conferencing”.⁸
5 Safety is the priority and whilst virtual interviews will eliminate the need for travel and will help maintain social
6 distancing, much of the interview activities such as taking tours of the campuses, meeting with the residents
7 and attendings, having in person interviews, and experiencing the feel of the program and campus would be
8 lost.

10 **Scholarly activities**

11 Medical students’ research projects are also impacted by the COVID-19 pandemic. In a letter to the HMS
12 Community, Dean George Q. Daley wrote, “I understand that everyone is concerned about the very real loss
13 of research productivity”, as ‘stay at home orders’ have necessitated “for the emptying of our laboratories and
14 encourage all to pursue alternative scholarly activities in isolation”.⁹ The inability to continue research will
15 result in loss of data, hours invested, having to redo parts of research and delays in completion and
16 publication. Fourth year medical students who will not continue residency at their school’s institution, may not
17 complete their research prior to leaving, resulting in significant loss of research output. Allowing remote
18 access to necessary documents and databases and setting up at-home laboratories within technological
19 capability can help alleviate research loss.

21 **Cancellation of scholarly conferences and important milestones**

22 All conferences and meetings have been cancelled causing students to lose the opportunity to present their
23 work and meet with peers and experts in the field. Conferences should identify virtual options that allow
24 students to present their research and provide a chat or comment feature so traditional discussions with
25 experts at these meetings are not lost and the advancement of medicine and discussion is continued.

27 An important milestone that medical students look forward to are match day activities which have been
28 cancelled forcing institutions to carry out virtual activities. Graduation ceremonies will likely be cancelled.
29 Alternatives to the traditional celebration such as virtual graduation ceremonies allowing students and their
30 families to actively participate in this milestone should be explored.

32 **Psychological effects of COVID-19**

33 Rotenstein et al.’s meta-analysis estimated that “the prevalence of depression or depressive symptoms among
34 medical students was 27.2% and that of suicidal ideation was 11.1%”.¹⁰ Adding the COVID-19 pandemic to
35 stressors can increase the severity and number of medical students with depression. The uncertainty of
36 schedules, rotations, clinical requirements, exams, and cancellation of important milestones including
37 graduation and matching can further heighten depression symptoms. Health care workers have suffered
38 serious repercussions from COVID-19, even death, which will negatively impact medical students’ mental
39 health. Medical schools should proactively address this and provide resources, including psychotherapy.
40 Medical schools should also provide students with as much transparency as possible in updating medical
41 students via short, regular email notices or allowing virtual town hall meetings.

1

2 **International Medical Graduates**

3 International medical students (IMGs) faced cancellation of electives required for US residency positions as
4 well as cancellation of Step 2 CS. Many students plan months in advance for travel and are now faced with
5 visa constraints and financial strain and would benefit from applications deadline extension. Perhaps the most
6 immediate impact on the health care system is on IMGs that have recently matched in residency programs in
7 the US that are set to begin this July. There is a possibility that IMGs will not be able to travel to the US and
8 will be forced to delay the start date of residency. This would negatively impact the health care system and
9 cause a shortage of residents that hospitals are in dire need of.

10

11 **Conclusion**

12 The impact of the COVID-19 pandemic on medical students' safety, education, research, clinical rotations,
13 residency applications and mental health are important issues to address. Managing the needs of medical
14 students, finding innovative alternatives, and involving students with dialogue and solutions are extremely
15 important. Medical students will soon enter the healthcare system as new doctors, and how they are handled
16 will have a direct impact on the future of the healthcare system.

Accepted, in-press

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