Reimagining Undergraduate Medical Education in a Post-COVID-19 Landscape

Matthew Z. Guo, BA1, Jawara Allen, PhD1, Matthew Sakumoto, MD2, Amit Pahwa, MD3, and Lekshmi Santhosh, MD, MAEd2

1Johns Hopkins School of Medicine, Baltimore, MD, USA; 2Department of Medicine, University of California-San Francisco, San Francisco, CA, USA; 3Department of Medicine, Department of Pediatrics, Johns Hopkins School of Medicine, Baltimore, MD, USA.

Online education due to the COVID-19 pandemic caused many medical schools to increasingly employ asynchronous and virtual learning that favored student independence and flexibility. At the same time, the COVID-19 pandemic highlighted existing shortcomings of the healthcare field in providing for marginalized and underserved communities. This perspective piece details the authors’ opinions as medical students and medical educators on how to leverage the aspects of pandemic medical education to train physicians who can better address these needs.

KEY WORDS: undergraduate medical education; social determinants of health; virtual learning.

The Flexner Report and 1918 pandemic thus led to many medical schools adopting the biomedical model and overhauling their curricula. Since then, shortcomings of the Flexner Report, such as limiting the opportunities of Black physicians and excluding social determinants of health from the medical model5, 6, have been acknowledged and medical education has increasingly prioritized diversity and inclusion and public health education to better serve the diverse health needs of society7–9. The biopsychosocial model of medicine has largely supplanted the biomedical model7, 8, and many medical schools have modified their biomedical curricula to incorporate systems-based learning and social determinants of health.

Yet healthcare is far from perfect today, with issues of cost, access, and systemic inequality still plaguing patients. As medical students and medical educators, we strive for a medical education that will better prepare the next generation of physicians to address these failures of the profession. We also have experienced how the current COVID-19 pandemic, similar to the 1918 influenza pandemic, has caused great crises in healthcare and changes in medical education10–12. As vaccines have made a post-COVID era more tangible, we believe the medical field is once again ripe for revolution. In this perspective piece, we detail how we can leverage the current flux in medical education, capitalizing on asynchronous and virtual learning with a focus on social determinants and disparities, to better train physicians who will be prepared to serve the public health in a post-COVID era.

THE COVID-19 PANDEMIC EXACERBATED HEALTH DISPARITIES

The COVID-19 pandemic significantly altered the practice of medicine and highlighted existing failures of the US healthcare system by disproportionately affecting historically marginalized communities, particularly Black and Latinx patient populations who suffered higher COVID infection and mortality rates13–15. Additionally, COVID-19 has severely impacted rural areas, which
tend to be less resilient, have less capability to recover from significant changes\(^\text{16}\), and are experiencing a significant shortage of primary care physicians\(^\text{17, 18}\). Although the increased use of telehealth has improved access to care for these patient populations, particularly in psychiatry\(^\text{19}\), many patients experiencing socioeconomic insecurity and technology inequality cannot access these virtual physician visits\(^\text{20–23}\).

The disparities seen with the COVID-19 pandemic are not new; the same disparities in healthcare access and outcomes for underserved populations have plagued the US for many years\(^\text{9}\). As medical students and medical educators, we believe that medical school is a key location to begin addressing healthcare disparities by training physicians who will make it a priority. Sharma et al. eloquently present medical education with this charge, insisting it is a failure to teach about “poverty but not oppression, race but not racism, sex but not sexism, and homosexuality but not homophobia.” We believe that medical education can meet this charge and accomplish this by incorporating more aspects of public health education and social determinants of health and increasing exposure to diverse patient and provider populations in the curriculum. Many of the changes in medical education precipitated by the COVID-19 pandemic can be adapted to accomplish these goals.

### SELF-DIRECTED LEARNING AND PRE-COVID CHANGES IN MEDICAL EDUCATION

To understand how medical education should move forward in a post-COVID era, we first detail the trajectory of medical education prior to the pandemic. In the past few decades, many medical schools have shifted towards curriculum delivery methods that favor self-directed learning. Prior to the COVID-19 pandemic, we were already starting to see greater utilization of flipped classroom learning, in which students spend most of their synchronous class time working on case-based problem sets and their asynchronous class time watching pre-recorded lectures. With less time in the large lecture hall and more time in small groups, nonclinical and clinical education came more from practical problem sets, clinical correlations and scenarios, and individualized mentorship from faculty dedicated to investing in their students personally\(^\text{24–27}\).

With these changes in pedagogy, medical students practiced more mastery learning, focusing on synthesis and application of material rather than memorization of every detail. Furthermore, they found themselves with more elective time and opportunities for individual career interest exploration and expression\(^\text{24–27}\). It was in this structure of medical education, already leaning towards self-directed learning, that we entered the COVID-19 pandemic and transitioned to an unprecedented time of virtual and remote curriculum delivery.

### LEVERAGING THE CHANGES TO MEDICAL EDUCATION DUE TO COVID-19 TO ADDRESS HEALTHCARE DISPARITIES POST-COVID

#### Lecture Reformattting and Course Content Reevaluation

In the wake of the COVID-19 pandemic, the asynchronous delivery of pre-recorded lectures for nonclinical classes has allowed for several improvements in curriculum delivery, including increased flexibility of medical student schedules and a greater shift towards self-directed learning\(^\text{28, 29}\). Many institutions have also begun updating their suite of team-based learning cases and pre-recorded lectures to a style that is more suitable for a virtual learning format.

The task of re-recording lectures and re-designing team-based learning cases to be better suited for remote delivery provides the perfect opportunity to engage in course content evaluation to identify and address systemic influences of bias. For example, previous studies of medical curriculum have shown that race is often presented as a biological risk factor for disease without explaining social context\(^\text{30}\). Visual representations of disease are also typically presented on white patients, particularly in dermatology\(^\text{31}\), limiting medical student exposure to how diseases may present themselves in patients of different races. These and other examples of systemic bias in medical education can result in medical students being less equipped to diagnose and treat patients who come from various backgrounds. A recent study examining 880+ lectures from 21 medical institutions for mechanisms that propagate physician bias for race identified areas for improvement in lectures and curriculum delivery\(^\text{32}\). Another study found similar areas of improvement in training medical students to provide high-quality care for patients with disabilities\(^\text{33}\). Re-adapting lectures and problem sets for online delivery is the perfect time to also charge curriculum leadership and individual lecturers with examining and correcting how systemic racism and other inequalities have infiltrated their teachings. The AAMC DEI toolkit\(^\text{34}\) and AAMC MedEd Portal\(^\text{35, 36}\) are resources for faculty development in identifying and eliminating bias in teaching material. Medical schools should task their educators to familiarize themselves with these findings and resources as they re-adapt their lectures and other curricula for post-COVID delivery.

#### Online Educational Tools to Diversify Discussion

Prior to the COVID-19 pandemic, the flipped classroom learning model had been increasingly adopted, facilitating active discussions among medical students and educators about structural inequalities in public health. The virtual learning spaces of the pandemic can enhance the already expanding use of flipped classrooms by increasing the diverse array of patients, policymakers, and physicians from whom students may not have otherwise had the opportunity to learn. For example, future medical school lessons on COVID-19 could...
have an asynchronous pre-recorded component detailing the disparities of the pandemic. This could then be followed up with live discussion in small groups facilitated equally by frontline physicians, patients from diverse communities that were hit the hardest by the COVID-19 pandemic, and policy advocates involved in addressing healthcare disparities. Such a repertoire of representatives is best assembled virtually because it allows for the prioritization of the time and comfort of patient and community volunteers.

Given how disproportionately the COVID-19 pandemic has affected minoritized and disadvantaged populations, it is not enough now to only teach the social determinants of health without also emphasizing the need to challenge and change them. Virtual learning spaces can be used to expand discussions with various stakeholders and allow students the time and exposure needed to better understand and affect these forces. Importantly, to promote cooperative and synergistic rather than extortive discussion in these spaces, particularly when addressing sensitive and discriminatory topics, it is imperative to have skilled facilitation by those who have experience working in virtual domains and those with pre-existing personal connections with the community.

Telehealth to Increase Exposure and Extend Care to Diverse Populations

Simulated patient encounters were an essential part of teaching and assessment prior to the COVID-19 pandemic. The necessary transition of these in-person encounters to virtual encounters has provided the perfect opportunity for medical schools to enhance teaching around telehealth, which is essential if we hope to address issues of inequality surrounding patient care in rural communities or those caused by transportation barriers and access issues for older or disabled populations.

While telehealth can increase the flexibility and availability of medical care for some patient populations, other populations, primarily those of disadvantaged SES, language, race, ethnicity, or location, may face barriers that must be addressed. For example, one study found that rural youth were less likely than urban youth to have reliable access to the Internet, and other studies have highlighted ways that the healthcare field and telehealth inadequately serve people with disabilities. Topically, a study of telehealth utilization in New York City during the COVID-19 pandemic found that Black patients had lower odds of accessing telehealth than white patients. Actions towards addressing these disparities will vary necessarily by the disadvantaged population in question, but education of medical students regarding these issues is the first step to identifying solutions through partnerships with members of these communities. Medical school curricula should therefore be updated to include content on inequalities in telehealth and tools to address them as separate skills from in-person patient encounters to better prepare medical students for the burgeoning use of telehealth to expand healthcare access to areas previously inaccessible.

Additionally, as telehealth visits are increasingly utilized to reach patients in rural areas, medical schools should incorporate training for elements unique to the virtual physician encounter. During the COVID-19 pandemic, standardized patients were trained to interact with medical students in virtual environments in nearly all core clinical clerkships. This training should be formalized, and medical schools should use standardized patients to teach students about the utility of telehealth visits in various specialties and clinical scenarios. For example, by the end of their neurology clerkship, medical students should understand which parts of the physical exam can reliably be performed in a telehealth encounter and what signs and symptoms should warrant an immediate in-person medical evaluation. This early introduction to virtual patient care will allow medical students to begin imagining how telehealth can be integrated into their future medical practices, expanding the reach of specialist medical care, an area already under active investigation.

The Impact of Virtual Learning on Isolation and Mental Health

Thus, as the pandemic eventually wanes and it becomes safer for in-person instruction, it will be important to invest significant resources to capitalize on the curriculum structures implemented during the COVID-19 pandemic that promote self-directed learning and enhanced education on health disparities. To do this, we must leverage efforts to re-record asynchronous lectures to address bias in medical education, better utilize synchronous learning time to incorporate a more diverse array of voices in discussions around health equity, and introduce competency in telehealth and its inequalities as a new learning objective for all graduating medical students. These advancements in medical education will better equip students to address the severe inequalities in our healthcare system that have been highlighted by the COVID-19 pandemic.

However, it is important to acknowledge that virtual learning is not without drawbacks. Online learning has increased student isolation and disconnection, negatively affecting the mental health of already strained medical students and educators, particularly those from underrepresented backgrounds who already suffer discrimination during their medical training. Teaching to the blank screen and learning alone from the screen non-stop can also manifest burnout and “Zoom fatigue.” The impact of the pandemic on physician burnout and post-traumatic stress also cannot be understated, particularly given the historically higher rates of depression and suicide in physicians compared to the general population.

As we navigate the post-COVID-19 medical education landscape, critical importance must be placed on how we support the mental health of medical students and medical educators with an emphasis on disparities even within the healthcare field. As vaccination rates increase and virtual learning becomes less necessary, more hybrid approaches may be favorable to capitalize on the aforementioned benefits in online
learning in teaching students to address disparities while mini-
mitizing these unintended consequences.

CONCLUSION

When the COVID-19 pandemic first hit, many of us thought
we would be back to normal within a month. Now, more than
a year later, uncertainty, loss, and change have become the
new normal. Medical education, which has had to reshape itself
to be safely delivered during the pandemic, faces the
great burden of preparing physicians who will be equipped
to care for patients in the post-COVID-19 era. The pandemic has
highlighted existing needs in healthcare such as challenging
inequality and improving accessibility. The pandemic has also
forced innovations in medical education that can be capitalized
on to address these long-standing issues. We must resist the
urge to return to the norm. We must use the lessons we have
learned while adapting to the COVID-19 pandemic to improve
medical education to better train physicians who will tackle
healthcare disparities. Now more than ever, we have the tools
needed to form a system of medical education that prioritizes
public health education, virtual patient care, and the social
determinants of health with the ultimate goal of ensuring that
the medical students of today will be fully equipped to serve
the public health effectively and equitably as the physicians of
tomorrow.

Acknowledgements: We would like to acknowledge Dr. Andrew
Auerbach, Dr. Charlie Wray, and the HomeRun network for their
support and feedback.

Corresponding Author: Lekshmi Santhosh, MD, MAEd; Department
of Medicine, University of California-San Francisco, San Francisco,
CA, USA (e-mail: lekshmi.santhosh@ucsf.edu).

Declarations:

Ethical Approval: Not applicable

Disclaimers: None

REFERENCES

1. Barry JM. The Great Influenza: The Epic Story of the Deadliest Plague in History. Penguin Books; 2005.
2. Custers EJFM, Cate OT. The History of Medical Education in Europe and the United States, With Respect to Time and Proficiency Acad Med 2018;93(35):S49-S54. https://doi.org/10.1097/ACM.0000000000001679
3. Cooke M, Irby DM, Sullivan W, Ludmerer KM. American Medical Education 100 Years After the Flexner Report. Cox M, Irby DM, eds. 2004;291(17):2139-2140. https://doi.org/10.1073/pnas.200419178118
4. Farre A, Rapley T. The New Old (and Old New) Medical Model: Four Decades Navigating the Biomedical and Psychosocial Understandings of Health and Illness. Healthcare. 2017;5(4):88. https://doi.org/10.3390/
healthcare5040088
5. Wade DT, Halligan PW. Do biomedical models of illness make for good healthcare systems? BMJ. 2004;329(7479):1398-1401. https://doi.org/10.1136/bmj.329.7479.1398
6. Sharma M, Pinto AD, Kumagai AK. Teaching the Social Determinants of Health: A Path to Equity or a Road to Nowhere? Acad Med. 2018;93(1):25-30. https://doi.org/10.1097/ACM.0000000000001689
7. Lacey CR, Johnston SC. The Transformational Effects of COVID-19 on Medical Education. JAMA. 2020;324(11):1033. https://doi.org/10.1001/jama.2020.14136
8. Rose S. Medical Student Education in the Time of COVID-19. JAMA. 2020;323(21):2311. https://doi.org/10.1001/jama.2020.5227
9. Goldhamer MEJ, Pusic MV, Co-JPT, Weinstein DF. Can Covid Catalyze an Educational Transformation? Competency-Based Advancement in a Crisis. N Engl J Med. 2020;383(11):1003-1005. https://doi.org/10.1056/NEJMp2018570
10. Webb Hooper M, Nápoles AM, Pérez-Stable EJ. COVID-19 and Racial/Ethnic Disparities. JAMA. 2020;323(24):2466. https://doi.org/10.1001/jama.2020.39598
11. Bambra C, Riordan R, Ford J, Matthews F. The COVID-19 pandemic and health inequalities. J Epidemiol Community Health. Published online June 13, 2020.jech-2020-214401. 10.1136/jech-2020-214401
12. Piscella K, Sanders MR. Racial and Ethnic Disparities in the Quality of Health Care. Ann Rev Public Health. 2016;37(1):375-394. https://doi.org/10.1146/annurev-publhealth-032315-021439
13. Mueller JT, McConnell K, Burrow PB, Fofahli K, Merdanoff AA, Farrell J. Impacts of the COVID-19 pandemic on rural America. Proc Natl Acad Sci. 2021;118(1):2019378118. https://doi.org/10.1073/pnas.2019378118
14. Basu S, Berkowitz SA, Phillips RL, Bitton A, Landon BE, Phillips RS. Association of Primary Care Physician Supply With Population Mortality in the United States, 2005-2015. JAMA Intern Med. 2019;179(4):506. https://doi.org/10.1001/jamainternmed.2019.7624
15. Bodenheimer T, Pham HH. Primary Care: Current Problems And Proposed Solutions. Health Aff (Millwood). 2010;29(5):805-809. https://doi.org/10.1377/hlthaff.2010.0626
16. Di Carlo F, Sociali A, Piccuti E, et al. Telepsychiatry and other cutting-edge technologies in COVID-19 pandemic: Bridging the distance in mental health assistance. Int J Clin Pract. 2021;75(1):13716. 10.1111/jcpr.13716
17. Rajasekaran K. Access to Telemedicine—are We Doing All That We Can During the COVID-19 Pandemic? Otolaryngol Neck Surg. 2020;163(1):104-106. https://doi.org/10.1177/0194599820952049
18. Vazquez J, Islam T, Gursky J, Beller J, Correa DJ. Access to Care Matters: Remote Health Care Needs During COVID-19. Telemed E Health. 2021;27(4):468-471. https://doi.org/10.1097/TA.0000000000001371
19. Ramírez AL, Ojeaga M, Espinoza V, Henriksen B, Hourais V. Telemedicine in Minority and Socioeconomically Disadvantaged Communities Amidst COVID-19 Pandemic. Otolaryngol Neck Surg. 2021;164(1):191-92. https://doi.org/10.1177/0194599820947667
20. Rhee K. Dankowa-Mulan I, Brennan V, Clark C. What is TechQuity? J Health Care Poor Underserved. 2021;32(2S):xxiii-xviii. 10.1353/hpu.2021.0045
21. Chen K-S, Mourouze L, Lu Y-H, et al. Academic outcomes of flipped classroom learning: a meta-analysis. Med Educ. Published online June 25, 2018. https://doi.org/10.1111/medu.13616
22. Ramnaran C, Pound LD. Advances in medical education and practice: student perceptions of the flipped classroom. Adv Med Educ Pract. 2017;8:63-73. https://doi.org/10.2478/amep-2017-0037
23. Tang B, Core A, Querejeta R, Barron A. Ablington Lecture: Online Lectures in Undergraduate Medical Education: Scoping Review. J Med Educ. 2021;118(1):2019378118. https://doi.org/10.1073/pnas.2019378118
24. Holford TR, Monro JR, McNeil JG. Does the flipped classroom improve learning? A systematic review. Med Educ. 2007;41(7):619-628. https://doi.org/10.1111/j.1365-2923.2007.02873.x
25. Armstrong N, Dodd M, Mant J, Prolific Academic. Health Professions: A Scoping Review of the Evidence. Med Educ. 2017;51(9):1021-1030. https://doi.org/10.1111/medu.13716
26. Doshi S, Hassman A, Shehab M, Abolshahed A, Al-Nassar L. Perceptions of medical students towards online teaching during the COVID-19 pand-
ematic: a national cross-sectional survey of 2721 UK medical students. BMJ Open. 2020;10(1):e024378. https://doi.org/10.1136/bmjopen-2020-024378
27. Shahrvini B, Baxter SL, Coffey CS, MacDonald BV, Lander L. Pre-clinical remote undergraduate medical education during the COVID-19 panden-
emic: a survey study. BMC Med Educ. 2021;21(1):13. https://doi.org/10.1186/s12909-020-04452-5
28. Tao J, Uckl L, Baldwin N, Hasslinger C, George P. Race Matters? Examining and Rethinking Race Portrayal in Preclinical Medical
Education: Acad Med. 2016;91(7):916-920. https://doi.org/10.1097/ACM.0000000000001232
31. Kamath P, Sundaram N, Morillo-Hernandez C, Barry F, James AJ. Visual Racism in Internet Searches and Dermatology Textbooks. J Am Acad Dermatol. Published online October 2020:S0190962220328930. https://doi.org/10.1016/j.jaad.2020.10.072
32. Amutah C, Greenidge K, Mante A, et al. Misrepresenting Race — The Role of Medical Schools in Propagating Physician Bias. Malina D, ed. NEnglJ Med. 2021;384(9):872-878. https://doi.org/10.1056/NEJMms2025768
33. Ankam NS, Bosques G, Sauter C, et al. Competency-Based Curriculum Development to Meet the Needs of People With Disabilities: A Call to Action. Acad Med J Assoc Am Med Coll. 2019;94(6):781-788. https://doi.org/10.1097/ACM.0000000000002686
34. Diversity and Inclusion Toolkit Resources. https://www.aamc.org/professional-development/affinity-groups/cfas/diversity-inclusion-toolkit/resources
35. Anti-racism in Medicine Collection https://www.mededportal.org/anti-racism
36. Diversity, Inclusion, and Health Equity Collection. https://www.mededportal.org/diversity-inclusion-and-health-equity
37. Melissa Rohman. Medical Student Helps Organize Outreach for Older Adults Experiencing COVID-19 Isolation. Published July 21, 2020. https://news.feinberg.northwestern.edu/2020/07/medical-student-helps-organize-outreach-for-older-adults-experiencing-covid-19-isolation/
38. Graves JM, Abshire DA, Amiri S, Mackelprang JL. Disparities in Technology and Broadband Internet Access Across Rurality: Implications for Health and Education. Fam Community Health. 2021;44(4):257-265. https://doi.org/10.1097/PCH.0000000000000306
39. Annaswamy TM, Verduzco-Gutierrez M, Frieden L. Telemedicine barriers and challenges for persons with disabilities: COVID-19 and beyond. Disabil Health J. 2020;13(4):100973. https://doi.org/10.1016/j.dhjo.2020.10.073
40. Chunara R, Zhao Y, Chen J, et al. Telemedicine and healthcare disparities: a cohort study in a large healthcare system in New York City during COVID-19. J Am Med Inform Assoc JAMIA. 2021;28(1):33-41. https://doi.org/10.1093/jamia/ocz217
41. Myers CR. Using Telehealth to Remediate Rural Mental Health and Healthcare Disparities. Issues Ment Health Nurs. 2019;40(3):233-239. https://doi.org/10.1080/01612840.2018.1499157
42. Kohler JE, Falcone RA, Fallet ME. Rural health, telemedicine and access for pediatric surgery: Curr Opin Pediatr. 2019;31(3):391-398. https://doi.org/10.1097/MOP.0000000000000763
43. Marcin JP, Shaikh U, Steinhorn RH. Addressing health disparities in rural communities using telehealth. Pediatr Res. 2016;78(1-2):169-176. https://doi.org/10.1097/PRR.0000000000000494
44. Batsis JA, Fletcher SN, Stahl JE. Telemedicine and primary care obesity management in rural areas – innovative approach for older adults? BMC Geriatr. 2017;17(1):6. https://doi.org/10.1186/s12877-016-0396-x
45. Duthie F, Aubert C, Pereira B, et al. Suicide among physicians and health-care workers: A systematic review and meta-analysis. PLoS One. 2019;14(12):e0226361. https://doi.org/10.1371/journal.pone.0226361

Publisher's Note: Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.