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EDITED AND REVIEWED BY
Rukhsana Ahmed,
University at Albany, United States

*CORRESPONDENCE

Md. Anwarul Azim Majumder
✉ azim.majumder@cavehill.uwi.edu
Mainul Haque
✉ mainul@upnm.edu.my
Mohammed S. Razzaque
✉ mrazzaque@lecom.edu

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Editorial: Trends and challenges of medical education in the changing academic and public health environment of the 21st century

Md. Anwarul Azim Majumder^{1*}, Mainul Haque^{2*} and
Mohammed S. Razzaque^{3*}

¹The University of the West Indies, Bridgetown, Barbados, ²National Defense University of Malaysia, Kuala Lumpur, Malaysia, ³Lake Erie College of Osteopathic Medicine, Erie, PA, United States

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Editorial on the Research Topic

Trends and challenges of medical education in the changing academic and public health environment of the 21st century

Medical education faces challenges in keeping pace with the rapidly changing healthcare needs of populations worldwide (Majumder et al., 2004; Wartman, 2019; Gaur et al., 2020). Traditional curricula, inadequate funding, and weak quality assurance and accreditation practices contribute to the production of under-equipped graduates (Torres-Calixto, 2021). To effectively address the health problems of the twenty-first century, there is a need for new, more efficient, and effective paradigms in medical and public health education. Health professional institutes must play a central role in developing evidence-based curricula, incorporating new technology, and promoting new programs (Wartman, 2019; Torres-Calixto, 2021). Major stakeholders must take a proactive role in bringing about the necessary changes in medical education and public health. Major challenges and changes include the shift toward competency-based education, the increased emphasis on interprofessional education, the use of technology, and addressing social determinants of health in medical education (Thibault, 2020).

In recent years, one of the most significant shifts in medical education has been the transition toward competency-based education (CBE) (Frank et al., 2010; Thibault, 2020). CBE focuses on acquiring specific skills and knowledge, as opposed to time-based education, and is viewed as a means of better aligning medical education with the requirements of the healthcare system and patients. Another trend in medical education is the interprofessional education which trains healthcare students from several disciplines to offer patient-centered care through teamwork (Thibault, 2020; van Diggele et al., 2020). This strategy is crucial for enhancing healthcare quality and meeting the complicated demands of patients in the current healthcare system. Furthermore, use of technology in medical education—virtual reality, simulation, and online learning are being increasingly used to supplement traditional medical education and provide students with new opportunities for hands-on learning and practice (Han et al., 2019; Thibault, 2020).

In addition to these changes, there is a growing emphasis on addressing social determinants of health in medical education (Lewis et al., 2020; Thibault, 2020). This includes teaching medical students about the impact of social and economic factors on health outcomes and providing them with the skills to work with communities to address these issues. Despite the changes mentioned above, medical education has largely failed to keep pace with the challenges facing the healthcare system; some of the challenges include the high cost associated with healthcare, concerns of health equity, racial disparities, and shortage of skilled healthcare providers. The current educational strategy fails to deliver value-based care, primarily due to traditional, didactic, fragmented, and static curricula which do not adequately prepare graduates for the complexities of modern healthcare (Wartman, 2019; Gaur et al., 2020). To design and implement cost-effective value-based care, the adaptation of updated medical educational curricula is necessary to train the next generation of healthcare providers who can contribute to improve the quality of life of the population. Additionally, global expenditure for medical education and research is inadequate, and this lack of investment in medical education has led to weak quality assurance, accreditation, and educational practices in health professional schools worldwide. To deal with the challenges of the twenty-first century, a needs-based medical education is required that produces a competency-based public health workforce (Boniol et al., 2022). This will require a significant investment in health professional education and a shift from traditional, didactic teaching methods to more innovative and effective ways of instruction (Torres-Calixto, 2021).

In this Research Topic, 35 articles have been published from 17 countries covering medical education and public health-related topics, and a total of 217 authors contributed. Among those, 22 are original articles—17 covered medical education, and the rest highlighted public health aspects. The medical education articles can be organized under two major themes: (i) the use of technology in health professional education, and (ii) health professional education and training by traditional methods.

Public health and medical education are closely linked, as both seek to improve the health and wellbeing of individuals and communities (Rao et al., 2020). Medical education equips healthcare practitioners with the competencies necessary to successfully diagnose, treat, and prevent diseases, whereas public health focuses on recognizing and addressing the broader health issues and needs of the population. Together, they aim to advance health equity and enhance health outcomes generally. To assist future physicians in understanding how to consider population health and address health inequities, medical training can also place a significant emphasis on public health education (Thibault, 2020).

Six articles investigated the impact of technology on health professional education. Technology is used for assessment, such as electronic testing and tracking student progress and to enhance the educational experience of students and faculty. Technology has been widely used during the COVID-19 pandemic for distance learning and online courses, making education more accessible to students specially in remote areas (Gaur et al., 2020). Singh et al. examined the use of smartphones and related medical education apps by medical students which improved their educational experiences. Luo et al. found that high-quality YouTube videos related to atrial fibrillation submitted by medical personnel

were not popular and did not receive much attention. Gilavand showed a positive impact of M-Learning among faculty members. Bisdas et al. explored the perception of artificial intelligence among medical and dental students in 63 countries. Peng et al. evaluated the teaching effect of simulation-based education in clinical medical students and found that first aid simulation-based education effectively improved the students' proficiency in managing real emergencies. Coronel-Ocampos et al. identified that the majority of the students experienced computer vision syndrome during the COVID-19 pandemic. The pandemic has presented a unique set of challenges to health professional education. These challenges should act as catalysts for reimagining how we deliver health professional education and training in the future (Gaur et al., 2020; Singh et al., 2020; Majumder et al., 2021; Lashley et al., 2022). In the following section, a number of authors (Choi et al.; Pedro et al.; Yu et al.; Xin et al.) highlighted their experiences in relation to the implementation of modified learning strategy during the pandemic.

Eleven articles were published under the second theme—health profession education and training. Health professional education and training are essential for ensuring that healthcare professionals have the knowledge, skills, and attitudes necessary to provide safe and effective care to patients. Healthcare workers with the proper education and training are better equipped to make correct diagnoses, administer appropriate treatments, and communicate effectively with patients, relatives, and other members of the healthcare team (Boniol et al., 2022). Education and training also ensure that healthcare personnel can keep up with breakthroughs in medical knowledge and the development of novel treatments. Given the rapid rate of change in healthcare and the exponential growth of scientific information, this is particularly crucial. Furthermore, the global shortage of healthcare professionals and the rising demand for healthcare services demonstrate the significance of competency-based health professional education and training. Countries can meet the needs of their populations and enhance health outcomes when their workforces are properly educated and well-trained. In addition, as concerns about patient safety increase, the quality of care and patient outcomes are strongly correlated with the education and training of healthcare personnel. Thus, effective education and training of healthcare personnel are necessary for sustaining high standards of care and enhancing patient outcomes (World Health Organization, 2016). Tang et al. observed the improvement in the quality of training of resident physicians in China using “Plan-Do-Check-Action” Plan. An et al. assessed the training needs of continuing medical education of general practitioners in Tibet and recommended adopting “demand-oriented curriculum” and “staged training plans” to enhance the core professional capability of general practitioners. Awang et al. adopted a Clinical Practice Guideline in a Nurse-Led Ventilator-Weaning program and noticed the change in the perception of practice and professionalism among nurses in Malaysia. Noorali et al. reported the success of a nationwide virtual research education program for Medical Students in Pakistan. Choi et al. discussed the experiences of “chaos and change” in laboratories and clinical teaching in nursing education in South Korea during the COVID-19 pandemic. Pedro et al. conducted a comparative analysis of undergraduate psychiatry and mental health curricula and Yu et al. examined

the impact of the COVID-19 pandemic on the mental health and academic performance of postgraduate medical students. [Xin et al.](#) observed the impact of “Real Workload-Situated Training” in COVID-19 Prevention and control targeted for general practice residents, and [Chawłowska et al.](#) examined the potential of student volunteering in undergraduate health professional education. [You et al.](#) conducted a bibliometric analysis to explore emerging high-intensity interval training in health promotion, and [Leadbeater et al.](#) used a virtual approach to promote inter-professional learning between biomedical science and medicine to benefit patient care. Finally, [Asakawa et al.](#) conducted a qualitative study among resident physicians to assess coping and learning through self-disclosure after medical errors.

Three original studies covered public health issues focusing on exercise and physical fitness, healthcare financing, and the evolution of the healthcare system. [Lv et al.](#) reported how peri-operative exercise could improve physical fitness and health status to reduce the risk of peri-operative morbidity and mortality. Chinese people’s peri-operative exercise intention level is low, and multiple factors, including biological and social environments, influence it. The authors recommended that the intention for peri-operative exercise should consider gender, the intensity of daily exercise, hospital grade, positive attitude toward daily exercise, preoperative anxiety, positive attitude toward peri-operative exercise, and social support.

The finance of health professional education serves as the basis of effective and sustainable health systems, yet relevant empirical research is scarce due to the lack of financial data. [Gao et al.](#) aimed to bridge the gap by presenting the financing of health professional institutions in China and exploring how the stratification of institutions affected their funding disparities. Using the Chinese Ministry of Education data, the authors reported that the number of health professional institutions has kept growing over the past two decades, with funding per institution and funding per student increasing steadily. The funding disparities between tiers of health professional institutions gradually became more accentuated, with the top-tier institutions taking up the largest share. Unified quality assurance of medical personnel training is a practical pathway to achieve stable and sustainable development in health professional education.

[Marchenko and Bykov](#) reported the importance of developing research in techno-scientific biomedical communication during the COVID-19 pandemic. The authors analyzed the evolution of the healthcare system in Russia with an emphasis on public communication and found that the promotion of high-tech medicine is related to the proportionate output of governmental institutions. There is also a concern over import substitution resulting from the current geopolitical crisis.

Apart from these, two brief research reports highlighted the gender differences and influencing factors in specialty choices ([Yin et al.](#)) and health communication and inter-professional care ([Pati et al.](#)). Three articles were published under the category of Curriculum, Instruction, and Pedagogy, which focused on tailored teaching of cell biology ([Schoenmaker et al.](#)), inter-professional education ([Liller et al.](#)), and nursing curriculum ([Alias et al.](#)).

[Zhao et al.](#) conducted a systematic review to examine the knowledge about, attitude toward, and practice of complementary and alternative medicine of nursing students. Four narrative reviews discussed the lifestyle interventions and oncology

education ([Jia et al.](#)), pathology workforce challenges during the pandemic ([Hassell and Afzal](#)), gynecologic oncology subspecialty training ([Erem et al.](#)), and antimicrobial resistance ([Dhingra et al.](#)). The widespread use of antimicrobial drugs to treat COVID-19 patients and the likely emergence of antibiotic-resistant microorganisms is a global health concern ([Razzaque, 2021a](#)). Integrating antimicrobial stewardship teaching in medical curricula to train future prescribers is essential to avoid such disastrous consequences ([Majumder et al., 2020](#); [Razzaque, 2021b](#)). [Dhingra et al.](#) and [Razzaque](#) highlighted a global health threat posed by antimicrobial resistance. [Razzaque](#) wrote a commentary highlighting the importance of coordinated and collaborative efforts of national and international governmental and private organizations to counter the emerging threat. A minireview examined the trends and innovations of simulation training in medical education ([Herrera-Aliaga and Estrada](#)). Under the Perspective category, [Yokomichi et al.](#) discussed cross-disciplinary collaboration and innovation in epidemiology in Japan. Finally, [Amin et al.](#) addressed the challenges in humanistic communication during COVID-19 through medical education.

In conclusion, despite the changes in medical education, it has largely failed to keep pace with the challenges facing the healthcare system in the twenty-first century. This problem has been compounded by the traditional didactic and fragmented teaching approach to medical education, as well as the absence of funding for health professional education and research. To address the issues, medical education must take a more interdisciplinary and comprehensive approach focusing on population health, multidisciplinary teamwork, and community-based education and training. In addition, it is crucial that medical education be centered on the priority health needs and specific concerns of the community ([Nzabonimana et al., 2019](#)). It is also essential to invest in training diversified public health personnel in order to address the various health issues facing communities by including epidemiology, health promotion, and health policy in the training curricula. To effectively handle the healthcare concerns of the twenty-first century, medical education and public health training must adopt a more collaborative and community-based approach.

Author contributions

MM wrote the first draft. MM, MH, and MR revised and approved the final submitted version. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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